City of Richmond

Memorandum

Engineering and Public Works
Project Development

To:	Mayor and Councillors	**Date:**	January 11, 2019
From:	Jim V. Young, P. Eng. Senior Manager, Capital Buildings Project Development	**File:**	10-6000-01/2019-Vol 01
Re:	**Building Facilities Design Guidelines and Technical Specifications – Additional Information**		

Attached please find a revised "Building Facilities Design Guidelines and Technical Specifications", which has incorporated the comments made at the January 9, 2019 General Purposes Committee meeting.

- Committee identified that the Guidelines refer to different BC Energy Code "Levels".

  The intent of presenting the Guidelines with reference to the BC Energy Step Code was to identify Level 3 (Pages GP 28 and 40) as the target and Level 4 (GP 31) as a stretch "target" for projects with residential development. It was intended that the Level 4 target would be encouraged for the present time and become mandatory when Council adopts future policies or bylaws that support this higher level for private development. Further analysis and policy options recommendations on the BC Energy Step Code, as it will be applied to City facilities, will be bought forward in 2019 with further development of the High Performance Building Policy.

  Given the comments by Committee, staff have provided greater clarity to the Guidelines by deleting and adding the following sentences on GP Page 28 (Page 8).

  Deleted: It is the City of Richmond's desire to show leadership in the transition to net-zero energy by constructing its new City-owned buildings to the highest applicable step, with Level 3 being the present target goal.

  Added: It is the City of Richmond's desire to show leadership in the transition to net-zero energy by constructing its new City-owned buildings to the highest applicable step, with Level 3 being the target and Level 4 being the stretch "target".

- Section 3.4 on GP 31 (Page 11) of the Guidelines has been revised to include the following regarding embedded carbon emissions.

    - Consider embedded energy, carbon emissions and the lifecycle of the product in building products; prioritizing products with recycled contents supports the objective of reducing the embedded energy of building products.

Following the GP Committee meeting on January 9, 2019 staff sent the Guidelines to Stuart Olson (the City's Construction Manager) for comment. At the time of preparing this memo, comments had not been received from Stuart Olson. Staff will advise Council should any comments be received.

Please contact the undersigned should you have any questions or require further information.

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(604-246-4610)

Att: 1

pc: SMT
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Building Facilities

DESIGN GUIDELINES AND TECHNICAL SPECIFICATIONS

Richmond

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These City of Richmond Building Facilities Design Guidelines and Technical Specifications ["The Guidelines"] were approved by City Council on (mm/dd/yyrr) as an administrative document to be updated from (TBD by council).

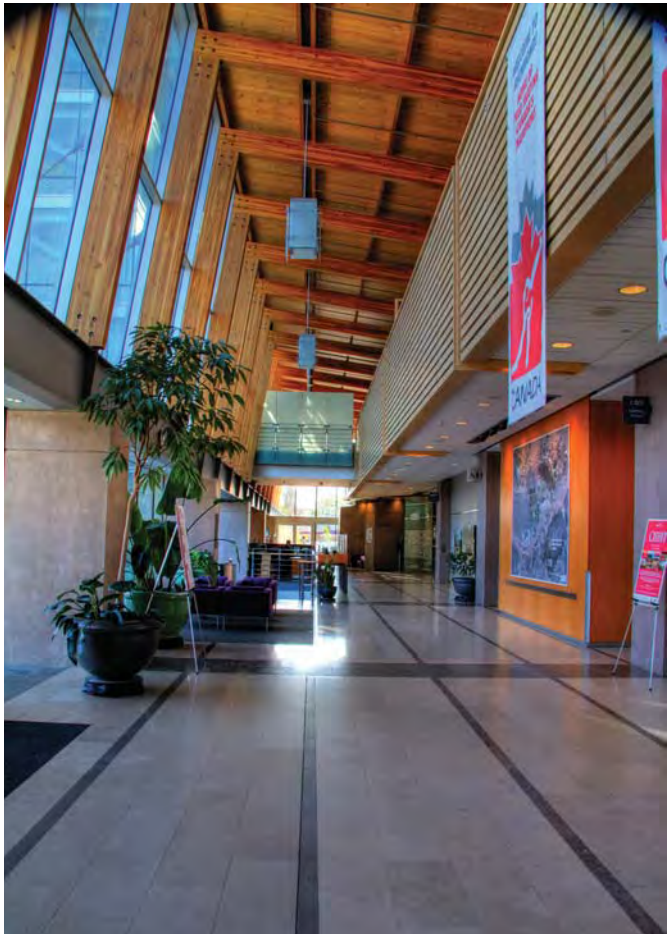
The City of Richmond provides these Guidelines to assist City staff and the development community with a better understanding of what City expectations are for the design and construction of City-owned or City-leased premises. The Guidelines are provided to the public as well as a resource on an information only basis.

Therefore, while the content is thought to be accurate on the publication date shown, the Guidelines are provided on an "as is" basis, and without warranty of any kind, either expressed or implied.

The City of Richmond, its elected officials, officers, agents, employees and contractors will, in no event, be liable or responsible for losses or damages of any kind arising out of the use of the Guidelines. Additionally, changes may be made to the Guidelines without prior notice.

The information contained in the Guidelines is always subject to the provisions of all governing legislation and bylaws including, without limitation, the BC Building Code, the City of Richmond Zoning Bylaw 8500, the City of Richmond Building Regulation Bylaw 7230, and the City of Richmond Subdivision and Development Bylaw 8751, Transportation Association Canada (TAC) regulations, City of Richmond Engineering Design Specifications, Master Municipal Construction Documents (MMCD), the City of Richmond MMCD Supplementary Specifications and Detailed Drawings, including all as they may be amended or replaced from time to time.

Executive Summary



Richmond City Hall exemplifies a civic building with good design quality and the use of durable materials.

Construction of new City-owned facilities in Richmond, or the renovation of existing City-owned ones, represents a significant investment of public resources for the municipality. Further, ongoing upkeep of City buildings requires additional resources, to ensure that the original investments in City building assets are well-maintained and operating with optimum efficiency.

It has been City Council policy for many years, to set out administrative procedures and guidelines that provide appropriate direction for the design and development of City building assets, in order to promote a good return on investment in civic infrastructure and better serve the community. The City continues to be keenly interested in fostering a high level of design quality in its buildings and open space and engineering infrastructure, but also in ensuring that the design of these built assets is such that operation and maintenance goals are met, and that upkeep costs are minimized as much as possible.

The intent of these Design Guidelines and Technical Specifications is to organize into a single resource document, what the City's general expectations are for the design and delivery of the various components that make up a City-owned construction project. It is not intended to provide barriers or limit the creative inputs of designers or constructors that work on the City's behalf, but rather to delineate in a general way, what aspects of design and materiality the City wishes to see delivered in its buildings and associated public works.

Construction of a new build, renovation of a City-owned or leased building, maintenance of City facilities or development of civic infrastructure can, generally be a complex undertaking. With this resource document, the intent is that with City expectations for design and construction of civic assets clearly identified, the task of delivering functional, resilient and quality civic infrastructure can be better facilitated.

1.0 Introduction

1.1 Mission Statement

It is the intent of The City of Richmond to standardize requirements for City-owned construction projects, both for new builds and for the renovation of existing buildings. The goal is to provide clear direction to developers, architects, contractors, material suppliers, installers, and others in the development industry, regarding the City's expectations for the design and delivery of the various components that make up City-owned construction projects.

Contemporary new builds and renovations typically feature complex mechanical and electrical systems. These Guidelines and Technical Specifications provide direction for delivering appropriate service systems and building assemblies for City-owned buildings.

1.2 Intent of Guidelines and Technical Specifications and How They Are to be Applied

In the City of Richmond, the construction of new buildings and the renovation of existing ones is mandated through the development and buildings approval process. The intent of these Guidelines and Technical Specifications is to provide general performance and specification requirements for the various components that make up a City-owned building project. It is intended that this information will provide assistance to the contractors and vendors involved in the building project to gain project approvals, as well as deliver the appropriate building assemblies, service systems and material finishes that the City expects in completed buildings.

1.3 City of Richmond's Commitment to Quality and Resilience in City Buildings

The City wants to facilitate quality construction, and optimize life-cycle benefits and overall building resilience in its new builds and building renovations, and in its new and rehabilitated public spaces. This initiative is based on the following core planning principles:

- meeting the needs of the community.
- commitment to public engagement in the delivery of useful and resilient City-owned and City-leased buildings and public spaces.
- optimally meeting program and functional requirements for the visiting public and for staff in civic buildings.
- embodying principles of sustainability in City new builds and renovations that minimize maintenance costs over the life of the facility.
- commitment to sound public finance economic practice.
- commitment to working pro-actively with all stakeholders in the delivery of quality buildings and public spaces.
- commitment to partnering with other civic bodies or community organizations.
- commitment to delivering public buildings and open spaces that enhance accessibility and independence for all building users.

1.4 How the Development Process in the City of Richmond Works, and How Principles to Incorporate Quality Construction and Resilience in Buildings and Open Spaces Can be Integrated into the Development Process

1.4.1 Overview of the Process

The City wants to work with the public, the development community, the various players in the non-profit sector, and with other involved groups, to help create high quality, fully resilient and accessible buildings and open spaces.

To facilitate this process, it is important for building and public space project proposal applicants to follow an appropriate development methodology in order to promote applications that successfully meet City and Provincial guidelines and requirements for new development.

An overview of the types of approvals process involved is as follows:

City Approvals

a) Zoning
- confirm whether proposed us is permitted under the sites existing zoning
- if not, a rezoning application and review process is required. This involves staff review, a Public Hearing, and adoption by City Council.

b) Development Permit (DP)
- A DP regulates bulidng form and character. Staff reviews the process for compliance with approved design guidlines (includes landscape plan.)

c) Building Permit
- City approval that allows construction to begin. It is comprised of working drawings and specifications that demonstrate compliance with the Building Code, Development Permit requirements, and these Design Guidelines and Technical Specifications.

d) Final Building Permit
- City final approval and commissioning of the constructed facility, indicating that it is ready for use.

The City of Richmond is committed to constructing high quality, resilient and fully accessible buildings, for new builds, tennant improvements and renovated City facilities.

Definitions Pertaining to City-Owned Buildings and Public Spaces 2

2.0 Glossary

Developments incorporating Building Resilience and Construction Quality have a descriptive and regulatory language that is specific to the requirements of this design and construction strategy:

Accessibility
A design standard that allows for persons with disabilities to approach, enter, pass to and from, and make use of an area and its facilities, without the assistance of a third party or caregiver. Accessibility allows for independence of use and movement by individuals who have a loss or a reduction of functional ability, including persons in wheelchairs or those with a sensory disability, such as visual or hearing impairment.

Active Transportation Routes
Human-powered transportation modes such as walking, cycling or rollering. Providing for barrier-free design typically enhances the functionality of Active Transportation Routes, as well as improves accessibility for people with diverse abilities.

Active Transportation Routes.

Adaptable Buildings and Public Spaces
Anticipating future needs, or changing aspects of existing buildings and public spaces to make them more functionally useful, to people with diverse abilities.
For example, bathrooms without grab bars can be constructed with backing in the wall framing, to enable the addition of grab bars in the future.

Aging in Place
The ability to live in one's home for as long as possible. Often this will depend on the living space being adaptable in order to assist with livability and health and wellness goals.

ANSI
The American National Standards Institute [ANSI] is a standards organization that oversees the development of voluntary consensus standards for a large variety of products, services, systems, and personnel in the United States. In addition, the organization coordinates U.S. standards with international standards to try to ensure consistency.

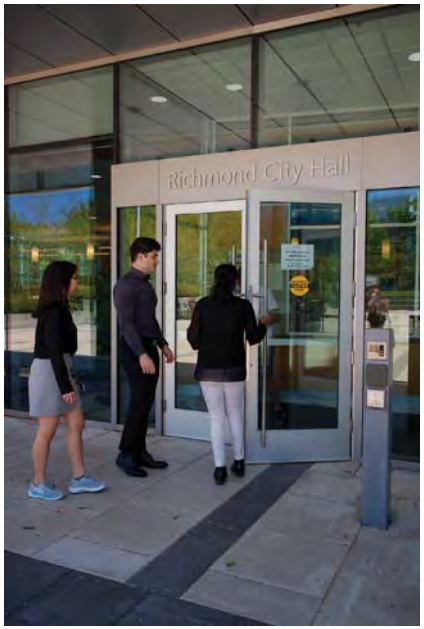
ARCNet
Attached Resource Computer Network [ARCNet] is a communications protocol for local area networks of mechanism, through coaxial cabling.

ASHRAE
The American Society of Heating, Refrigerating and Air-Conditioning [ASHRAE] is an international standards organization for numerous building related systems. It is the organization's mission to advance the arts and sciences of heating, ventilating, air conditioning and refrigerating to serve humanity and promote a sustainable world. The Society and its members focus on building systems, energy efficiency, indoor air quality, refrigeration and sustainability within the industry.

Definitions Pertaining to City-Owned Buildings and Public Spaces 2

Assistive Listening Device
Wireless sound transmission systems that improve sound reception for persons with hearing disabilities. Such systems provide adjustable amplification for the user, while blocking out background noise disturbances.

Automatic Door / Power-Assisted Door
A door equipped with power-operation and controls that open and close the door without manually touching the door. Switches for such doors typically are push plates to enable accessibility, but can also include photoelectrical devices, or floor mat actuators.



Power - assisted doors to promote accessibility should be installed at building entrances and key interior doors, such as public washroom doors.

BACNet
Is an ANSI / ASHRAE standard communications protocol for direct digital control networks and automated building mechanisms. It was designed to be used for applications such as heating, ventilation, and air-conditioning control, lighting, access control, and fire detection systems and their associated equipment.

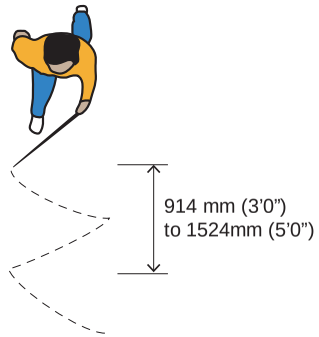
Barrier-Free Design
A design philosophy that looks to eliminate physical barriers on the ground plane that impede freedom of movement. Primarily concerned with avoiding curbs, steps or changes in grade that make movement in a wheelchair difficult or impossible, barrier-free design also helps the average person's ease of mobility, since trip hazards are avoided or eliminated.

BC Building Code
The legislation that governs the design and construction of new buildings, additions to buildings, alterations to existing buildings, and the occupancy of any building. The BC Building Code sets out the minimum requirements for accommodating accessibility in buildings.

Block Programming
Is a pre-programmed set of instructions (block) that can be used in a Direct Digital Control (DDC) system to control a specific action or transfer function. To understand the specific action that the block programming can accomplish, it is crucial that the pre-programmed instructions are able to be interpreted.

Canadian 2017 NECB
The National Energy Code of Canada for Buildings (NECB) 2017 provides minimum requirements for the design and construction of energy-efficient buildings and covers the building envelope, systems and equipment for heating, ventilating and air-conditioning, service water heating, lighting, and the provision of electrical power systems and motors.

Definitions Pertaining to City-Owned Buildings and Public Spaces 2



Cane Detectable Range

Cane Detectable
The condition of an object being within the detection range of a user's cane as it is swept or tapped.

Circulation Path
A way of passage for pedestrians, including walkways, hallways, courtyards, stairways and stair landings. Accessible circulation paths must meet minimum regulatory standards in order to comply with building code requirements.

Clear Space
The minimum unobstructed floor area or ground space required to accommodate a single stationary wheelchair, scooter, or other mobility device, including the user of the device.

Closed-Circuit Telephone [Enterphone]
A house or courtesy phone, or a telephone to gain entrance to a building. The telephone should be installed at an appropriate mounting height to provide accessibility.

Colour Contrast and Conspicuity
Must be provided on building elements like stair nosings or signage, to promote legibility for persons with low vision challenges.
Research shows that elements are more conspicuous when there is a colour contrast of at least 70%, with light-coloured characters on a dark background providing the best readability.

Crime Prevention through Environmental Design [CPTED]
An approach to building and urban design which can foster feelings of security for residents and users. CPTED principles should also endeavor to accommodate principles of Enhanced Accessibility.

Detectable Warning and Indicator Surface
A surface treatment on pedestrian walkways, ramps and stairs, that provides a warning for persons with visual impairments of obstructions on the circulation path. As well, when providing for colour contrasts, indicator surfaces must be textured differently in order to be cane-detectable.

Direct Digital Control [DDC]
Refers to the building automation system that will typically be used to control lighting and HVAC mechanical systems in a building.

Disability
A limitation occurring when an individual's physical environment fails to accommodate their functional needs. The experience of a disability can be alleviated by designing environments that accommodate a range of physical and sensory capabilities.

Egress, Means of
A continuous and unobstructed path of exit travel, in a vertical or horizontal travel direction, or a combination of both, that provides for the ability to safely leave a building. On upper floors of a building, an accessible means of egress allows for exit to be accommodated without the use of stairs, elevators or escalators, by means of providing areas of rescue assistance, such as areas of refuge or protected lobbies.

Definitions Pertaining to City-Owned Buildings and Public Spaces 2

Energy Star* and Energy Star* Certified [Also, Energy Star* Portfolio Manager**]
Energy Star* is an international standard for energy efficient consumer products. Energy Star* qualified products meet strict technical specifications for energy performance --- tested and certified.
Energy Star* Certified refers to products and buildings that meet strict North American energy performance standards. Typically these products and buildings use 20-30% less energy than required by comparable federal standards.
Energy Star* Portfolio Manager** is an online tool that can be used to measure and track energy use, water consumption, and greenhouse gas emissions, and to benchmark your building's performance against similar type buildings in Canada. A certification is provided when a building scores above the 75th percentile on the Energy Star* performance scale.

Floor Area Ratio [FAR]
A calculation where the total floor area of a building or development is divided by the area of the site. With respect to building accessibility issues, since providing enhanced accessibility is often about providing more space in a building --- which often can often encroach into the maximum FAR permitted --- a municipality can provide floor space exclusions so that economics of development of a building with a level of enhanced accessibility is not as negatively impacted.

Front End Software
Typically refers to a direct digital control graphical package and user interface that the building operator will usually interact with to review operating building systems, change scheduling, and access system use data.

Gateways
Pre-programmed hardware devices in a direct digital control system that act as communication protocol translators for different protocols, such as from BACNet to ARCNet and Tridium.

General Control Language
Refers to a direct digital control system programming language that is textual.

HVAC
Heating, Ventilation and Air Conditioning [HVAC] is the technology of indoor environmental comfort. HVAC system design is a sub-discipline of mechanical engineering, based on the principles of thermodynamics, fluid mechanics, and heat transfer.

HVI
The Home Ventilating Institute [HVI] is a non-profit association offering a variety of services for manufacturers including, but not limited to, test procedures, certification and verification programs for airflow, sound and energy performance, and market support. Its mission is to advance residential ventilation practices for healthy, energy-efficient homes.

IESNA
The Illuminating Engineering Society of North America [IESNA] is a non-profit organization that publishes standards for the lighting industry.

IP
Refers to Internet Protocol, the principal communications protocol in the Internet protocol suite for relaying datagrams across network boundaries.

Definitions Pertaining to City-Owned Buildings and Public Spaces 2

MERV
The minimum efficiency reporting value [MERV], is an ASHRAE measurement scale designed to rate the effectiveness of air filters, based on a rating scale of 1 to 16. Higher MERV ratings correspond to a greater percentage of air particles being captured on each pass through a filter. A MERV 16 filter will capture more than 95% if particles sized from 0.3 to 10 micrometers.

Mixed-Use Development
A building or development that contains two or more uses, such as retail, office, institutional and residential uses. Mixed-use developments are more urban in character and must incorporate barrier-free design attributes to help foster the establishment of complete and accessible communities.

MSTP
Multiple Spanning Tree Protocol [MSTP] is an open source communications protocol language connecting terminal controllers to a main direct digital control processing system, and is defined by the applicable networking standard IEEE 802.1Q.

Multi-Use Pathway
Paths that typically accommodate both bicycle and pedestrian use on the same path system. Both uses benefit from a continuous barrier-free design without curbs or steps, but care must be taken to design the multi-use path in order to avoid conflicts between pedestrians, and pedestrians who use mobility-assisting devices such as wheelchairs or strollers, and cyclists.

NRCan
Natural Resources Canada [NRCan] works with other government departments, the provinces and territories, and other Canadian and international partners to address energy needs and potential, while considering new policies, practices, and technologies.

Operable Portion of Piece of Equipment
The part of a piece of equipment that is used to activate, de-activate or adjust how it performs. These include door handles, push buttons, and coin slots.

Ramp, including Ramp Slope and Cross Slope
A ramp could be less than 1 in 20 [5%]. The City's Engineering Design Specifications specifies that the "maximum slope of the wheelchair ramp should not exceed 6% and appropriate landing pads be provided (as per TAC). Cross slopes at ramps must be minimized to allow for surface drainage [maximum 6.35 mm (¼") in one foot], while not compromising the safety of the ramp.
Handrails and guards are required by code to accommodate safe use of ramps.
Regulations for ramps at street curb cuts differ from typical walking surface ramps.
Refer to City of Richmond Engineering Design Specifications for regulations concerning curb cut- related ramps at street sidewalks.

Stairs and ramps can be integrated to enhance the public realm.

Resilient Cities and Neighbourhoods
An urban planning strategy that encourages new development to be built for the long term, with an emphasis on a high level of energy utilization, and a reduction in the need to replace buildings systems or components.
Elements that provide accessibility in buildings must be designed with the same level of resilience in mind.

Definitions Pertaining to City-Owned Buildings and Public Spaces 2

SEER
The Seasonal Energy Efficiency Ratio [SEER] rating of a unit is the cooling output during a typical cooling season divided by the total electric energy input during the same period. The higher the unit's SEER rating, the more energy efficient it is. In North America, the SEER is the ratio of cooling in British Thermal Units (BTU's) to the energy consumed in watt-hours.

Service Entrance
Typically a non-public entrance, provided for the delivery of goods and services. As such entrances often also provide entry for staff, principles of accessibility should also be considered.

Signage
In providing for general information or way-finding in buildings and in the public realm, signage should provide for a wide range of effectiveness in communication, and include an appropriate combination of written word, pictorial, and tactile information, including Braille.

Speaking Port
A piece of security equipment that provides for effective two-way communication. Often amplification of voice levels is required to deliver effective communication at speaking ports.

Step Code
The BC Energy Step Code is a Provincial standard enacted in April 2017 that provides an incremental and consistent performance-based approach to achieving more energy-efficient buildings that go beyond the requirements of the basic BC Building Code.
The Province has set a requirement that all new buildings must be net-zero energy ready by the year 2032.
It is the City of Richmond's desire to show leadership in the transition to net-zero energy by constructing its new City-owned buildings to the highest applicable step, with Level 3 being the target and Level 4 being the stretch "target".

Sustainability
Meeting present needs without compromising the ability of future generations to meet their needs. Sustainability is described as having three main components: economic, social and environmental. Providing for accessibility and barrier-free design enhances the social sustainability of urban places for the long term.

The BC Energy Step Code emerged from a desire to provide a consistent set of higher-efficiency standards for the building industry, while offering local governments a simple and effective set of standards to support their efforts to meet targets for energy efficiency and greenhouse gas emissions. The Energy Step Code Council is keenly interested in ensuring the BC Energy Step Code is adopted in a coordinated and thoughtful manner to ensure these benefits come to fruition for all parties. For that reason, it is important that local governments follow the guidance offered in this document.

The Energy Step Code Council is also encouraging local government leadership by requiring the Upper Steps for any public-building project that may be on the horizon, such as a community centre or public-safety complex. These buildings will serve as high-profile case studies – building local capacity while demonstrating to the market what can be accomplished.
By referencing one or more steps of the standard, your community is doing more than just accessing co-benefits and ensuring your industry has a head start on changes to the BC Building Code. It is contributing to a growing national effort to dramatically reduce energy demand in buildings across the country.

BC Energy Step Code
A Best Practices Guide for Local Governments
Version 1.2 September 15, 2017

TCP/IP
Transmission Control Protocol / Internet Protocol. It is the principal communication protocol in the Internet protocol suite for relaying datagrams across network boundaries.

Technically Not Feasible [Building Renovations and Alterations]
When an existing building is being altered, at times a building upgrade cannot be contemplated because of structural or building services considerations.
In some instances building upgrades that promote use of the building by persons with disabilities should be contemplated, even though they do not provide complete compliance with minimum code requirements for new construction, and are "technically not feasible".
An example of such a condition would be the installation of a wheelchair lift in a building that cannot accommodate installation of a code-compliant elevator.
[Note: inadequate budget is not a reason to relax full code compliance].

Transit-Oriented Development [TOD]
An urban planning strategy the looks at encouraging pedestrian-oriented developments by clustering higher density urban developments around public transit infrastructure investments, such as rapid transit stations.
Transit-oriented developments must incorporate accessible design and further benefit from barrier-free and enhanced accessibility strategies.

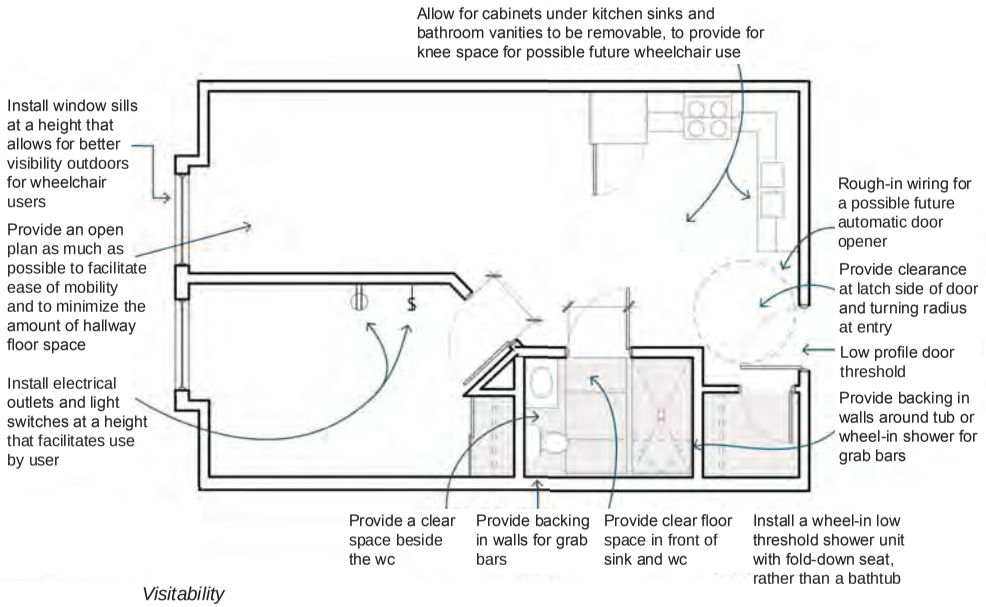
Truncated Domes
Small domes with flattened tops that are inset into paving as tactile warnings at hazardous places such as transit platforms or at stair and ramp landings. They also can act as directional cues for pedestrians at curb edges at curb ramps.

Universal Design
The design of spaces, environments and products to be usable by all people, including those with disabilities, without the need of specialized design. Universal Design is linked to "Enhanced Accessibility" and barrier-free design, as well as the concept of Visitability.

Virtual Metering
Function of monitoring energy use of specific systems or pieces of equipment, based on demand and run time, through a building's direct digital control system and analog current transducers.

Visitability
A strategy to change home construction practices, so that all new housing incorporates features that improve access and functional comfort for people with mobility challenges, both in their own homes and in other dwelling units that they may visit.

Wayfinding
The spatial problem-solving process that a person uses to reach a destination. Wayfinding is assisted by orientation clues that can be made available in the local setting, and includes signage, surface textures, colours, illumination, acoustic treatments, and other architectural features.



Visitability
Home construction features that assist 'Aging in Place', also enhance visitability- the ability for people with mobility challenges to visit the home.

Basic Universal Housing Unit (also known as adaptable housing unit)
Features to assist "aging in place"
One bedroom unit shown - minimum unit size 535 sq. ft.

3.0 Principles Guiding Design for City-Owned Facilities

The City of Richmond's goal is to have its buildings reflect design choices that enhance overall construction quality, embody best practices in construction technology, work to minimize long-term operations and maintenance costs, and promote building usefulness, resilience and longevity. These principles should be applied to all types of City-owned construction projects, whether new builds, renovations or alterations, heritage projects, or tenant improvements.

3.1 Functional Program

- identify building areas and functional components that are to be included in the civic asset.
- identify functional inter-relationships for the proposed spaces along with area requirements.
- engage internal and external stakeholders throughout program development

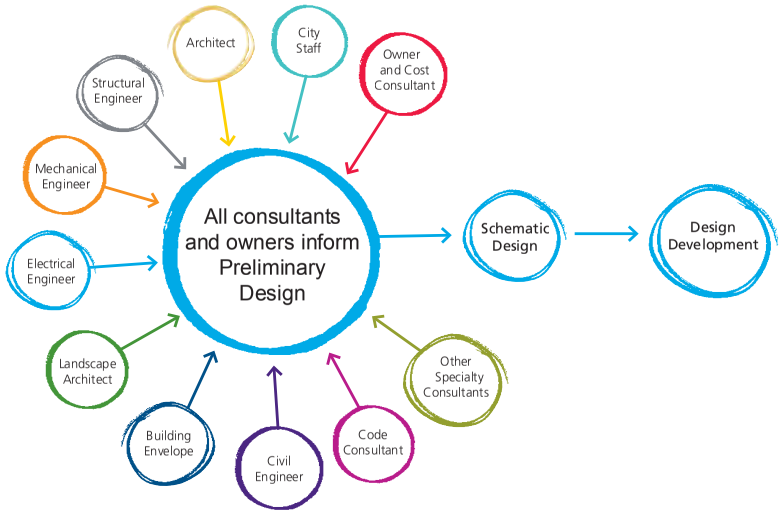
3.2 Site Planning and Building Form

- review site opportunities and constraints, and take into account building orientation and how the public will access and use the building.
- assume that wall assemblies will have a high level of energy utilization.
- review solar orientation impacts, and formulate early design options for glazing based on general principles of solar orientation and façade design:
  - North Façade - minimize glazed areas and heat loss as much as possible.
  - East Façade - provide for potential early morning heat gain with glazing, but limit late morning heat gain by the use of shading devices.
  - South Façade - provide for shading devices at glazed areas.
  - West Façade - provide for shading devices at glazed areas, especially relating to late afternoon sun and associated heat gain.

3.3 Integrated Design Process

- early on in the design process, involve all building design consultants in a design charette where the design goals for the civic asset are clearly articulated.
- create a well-defined set of performance objectives for the new building or renovated space, and associated outdoor spaces, and identify strategies for achieving desired outcomes.
- identify general building systems that are expected to be incorporated in the building early on at the schematic design stage, for the benefit of all consultants.
- clarify consultants', and staff and user group representatives' roles and responsibilities.

INTEGRATED DESIGN - THE TEAM APPROACH



3.4 Energy Efficiency and Reducing Greenhouse Gas Emissions

Ensure that City buildings or spaces are built with occupant safety, comfort, and indoor environmental quality in mind. Refer to the following documents:

- Sustainable "High Performance Building Policy for City-Owned Facilities Policy 2307, adopted by Council 24 February 2014.
- Optimizing Maintenance and Energy Performance. (City Administrative Procedure Reference - see Appendices)
- Requirements over BC Building Code - implementation of British Columbia "Step Code" provisions at a high level [Target of Level 4].

Also, consider the following:

- Building Commissioning.
- on-site renewable energy systems.
- Consider embedded energy, carbon emissions and the lifecycle of the product in building products; prioritizing products with recycled contents supports the objective of reducing the embedded energy of building products.

3.5 Integration of Building Automation Systems

- optimize the City's Building control and energy monitoring capacity to maximize efficiencies.
- standardize the City's DCC systems and graphic Interface in new and existing buildings. (City Administrative Procedure Reference - see Appendices)

3.6 Optimizing Building Lighting Systems (City Administrative Procedure References)

- standardize lighting types in relation to function.
- optimize performance in building exterior and interior lighting through specification of appropriate lighting fixtures and controls.

3.7 Air Quality

- reduce emissions and particulate pollutants into the environment.

3.8 Indoor Air Quality

- optimize the design of indoor environments to promote occupant comfort, health, and enjoyment. (City Administrative Procedure Reference - see Appendices).

3.9 Water Usage and Quality

3.9.1 Indoor Use

- reduce indoor potable water use, reducing the burden on local water supply and wastewater demands.
- optimize water efficiency (City Administrative Procedure Reference)

3.9.2 General Environmental Water Quality Considerations

- stormwater balance
  - stormwater retained on site to the same level of annual volume allowable under redevelopment conditions.
- stormwater retention and re-use
  - look to recycle stormwater where feasible for sanitary flushing purposes or irrigation for landscaping.
- removal of suspended solids before dispersal into the sewer system.
- control E.coli
- create drought-tolerant landscapes

3.10 Solid Waste Management - See City of Richmond Waste Management Guidelines

- waste streams and collection.
- deal with bulk waste.
- deal with and recycling construction and demolition debris.
- elimination of waste through education and performance tracking.
- use of recycled construction materials.

3.11 Ecological and Pedestrian and Public Realm Considerations

- connectivity of pedestrian areas.
- weather protection.
- lighting of pedestrian areas and shielding exterior lighting.
- reduction of glare and reducing light spillage and pollution.
- existing tree protection.
- tree planting requirements on street frontages and in parking lots.
- reduction of urban heat island effect.
- biodiversity in the landscape and limitation of invasive species.
- bird friendly design and limitations to glazing near the ground plane.
- roof reflectivity and design.
- roof vegetation issues.
- ground-scape porosity and limiting the speed of site drainage.

4.0 Design Guidelines and Technical Specification References

4.1 Purpose

- organize the design, construction, material and building system requirements for City-Owned Projects into industry-standard specification system nomenclature.
- to be used as a tool for preparing cost estimates early in the design process.
- for use by consultants who are ultimately responsible for ensuring that the completed Project meets the standards and conforms to the regulations of all authorities having jurisdiction.

MasterFormat, published by CSI and CSC, is a master list of numbers and titles classified by work results. It is primarily used to organize project manuals and detailed cost information, and to relate drawing notations to specifications.

4.2 Applicable Regulations and Policies

- British Columbia Building Code
- City of Richmond Zoning and Development Bylaws
  - Official Community Plan
  - Applicable Area Plans
  - Redevelopment Permit Guidelines
  - Richmond Social Development Strategy
  - Affordable Housing Strategy
  - Enhanced Accessibility Design Guidelines
  - Child Care Design Guidelines
- Sustainability
  - Stand-alone and Mixed Use Projects
  - Tenant Improvement
- Building Envelope Standards
- Energy Utilization and Building Performance
  - BC Step Code
  - references to ASHRAE Standards

4.3 Technical Specification Sections

Consultants for City-owned building projects should use the Divisions and Sections annotations in this document, as a basic guideline for the formulation of construction specification document packages accompanying construction drawings.
Specification packages will vary from project to project, and it is the consultant's responsibility to ensure that the specification requirements adequately describe the scope of work associated with the specific project.

Note: the following specification references are organized according to the construction industry standard Masterformat Specification System.

4.4 Outline Specification - General Requirements

4.4.1 Procurement and Contracting Requirements

a) Instructions to Bidders
- refer to documents distributed by the City of Richmond or its agents
- the Bidder will comply with all bidding requirements and will ensure that the Work will be performed in accordance with the Bid Documents without exception.
- any proposed alternate wordings to the Bid Documents or Form of Contract, must be submitted with the Bid Submission, and the City of Richmond or its agents, reserve the right to accept any or none of the proposed alternate wordings.

b) Form of Agreement and General Conditions of the Construction Contract
- standard CCDC contracts will be utilized.

c) Supplementary General Conditions of the Construction Contract
- the City of Richmond reserves the right to include Supplementary General Conditions to the standard forms of contract as may be required to identify City objectives for the specific construction contract.

d) Division 01 - General Requirements
- the number of General Requirements Sections will vary from project to project, but typically, the number of Sections is extensive in order to fully delineate the responsibilities of the General Contractor or Construction Manager who is contracted to construct the work.

4.4.2 Overview of New Construction General Design Requirements

- provide new buildings that respond to the City's needs and those of the anticipated users and tenants of the building.
- provide designs for new durable buildings, that are efficient and cost effective. Designs should stress simplicity and ease of construction, as well as ease of maintenance. Building siting, form, and choice of building materials and systems should consider life cycle costs in response to the site's location, orientation and context.

4.4.3 Overview of Conversion of Existing Buildings

- Confirm the proposed use is permitted under the City's Official Community Plan, Area Plans and Zoning Bylaw 8500
- assess the design and condition of the existing building in order to determine whether the existing building can accommodate the proposed uses and functional program within the constraints of available budgets.
- incorporate the recommendations of a structural engineering consultant and code consultant regarding meeting change of use structural capacity and fire and life safety requirements.
- ascertain how a proposed renovation can best meet BC Step Code energy utilization targets.
- determine the optimal approach to addressing building envelope concerns without compromising the integrity of existing building assemblies in the long term.
- meet requirements for access for people with disabilities, including the provision of an accessible elevator in multi-floor buildings.

Branscombe House, City of Richmond.

4.4.4 Overview of Location Considerations, Building Form and Site Planning

- Refer to any applicable design guidelines for the area in the Official Community Plan and associated Area Plans
- take into account opportunities for solar access, and use by the public including access to transit and pedestrian routes. If ambient noise is an issue, consider acoustic mitigation measures as part of site planning.
- incorporate sustainability features and siting criteria.
- building form should be simple, efficient and easy to build, but not ignore neighbourhood context in its design or the benefits of articulation in the exterior appearance of the building.
  Foundation plans should be simple and the continuity of load-bearing elements should be maintained between floors. Avoid constructing heated space over unheated space (exposed floors). Provide simple roof designs that drain rainwater efficiently and avoid ice-damming. Avoid numerous projects or recesses in façade articulation.
- the building design and its exterior spaces should promote accessibility of use for persons with disabilities, including access from parking areas. Exterior spaces should accommodate ease of snow removal.
- Project design should also incorporate CPTED [Crime Prevention Through Environmental Design] strategies.

4.4.5 Overview of Design and Specification Requirements

(to Pre-Building Permit Application Stage)

- Conform Zoning and whether a razoning application is required. (Note: only Council can approve a change in land use)
- Preliminary Review Stage, including vehicle parking and loading.
- Pre-Development Permit Application Stage / Checklist.
  - includes Building Code review, compliance with BC Energy Step Code, Building Envelope Standards, Civil Engineering and Landscaping.
- requirements for specialist consultants, including acoustic, security, hardware, energy modeling and food services [kitchen] consultants.
- Development Permit Application Stage.
- Pre-Building Permit Application Stage, including Draft of Construction Documents and referring to Checklists.
  (Refer to City Administrative Procedure References)
  - includes Energy Performance Standards compliance and Building Envelope specifications.

Site Planning opportunities can provide possibilities for extending on-site open space into the public realm, to create small plazas and pedestrian amenity areas.

4.5 Outline Specification

- ***Construction Standards and Notes on Best Practices***
  - ***with reference to Masterformat Sections***

4.5.1 Consultant Inspector - Terms of Reference

The City of Richmond will provide or appoint an Owner's Representative or Consultant Inspector with the purpose of:

- reviewing construction contract documents to advise on consistency with the City's objectives for the project, including conformity with the Design Guidelines and Technical Specifications.
- reviewing construction work to establish compliance with City objectives. Note that the role of this Inspector does not assume any of the contractual or professional responsibilities of the design consultants or contractors who are engaged on the project.
- Sample Site Visit Report

The Consultant Inspector will attend job and site meetings when construction is in progress, and provide reports of same.

A Sample Site Visit Report is included in the Appendix of this document.

4.5.2 Subsurface Investigation

The City of Richmond will provide for a geotechnical investigation report for the City-owned or leased project site, that indicates the following:

- identifies soil conditions.
- provides recommendations for excavation, dewatering, pre-loading, and foundation design for the building and associated site development.
- provides recommendations for backfill and compaction.
- provides curb, pavement and hard surfacing design, including loadings from heavy vehicles that may utilize the paved areas.

The geotechnical report is provided for information only, and no guarantee of subsurface conditions is made, other than those documented at exact borehole investigation locations. Any Contractor engaged by the City to make improvements or install new construction on the site is required to make him or herself familiar with all existing conditions and with the findings of the geotechnical report.

Specification Reference - Section 00 31 32 - Soils Investigation Data

4.5.3 Excavation, Backfill and Compaction

The Contractor will comply with all municipal bylaws and applicable building codes as well as all Master Municipal Construction Documents and Richmond Supplements to these, especially as they relate to subsurface and paving work.

Comply with the recommendations of the project's Geotechnical Engineer for all excavation and shoring, fills and backfill, and drainage for the project.

The Contractor will engage and pay for independent testing as specified by the Geotechnical Engineer.

Specification Reference - Section 01 35 43 - Environmental Protection
Section 01 57 13 - Erosion and Sediment Control
Section 31 00 00 - Earthwork

4.5.4 Exterior Surface Finishes - Hard and Soft Surfaces / Landscaping

- Provide well-designed exterior surface and landscape areas that are simple in design and layout and that require lower amounts of maintenance.
- Provide parking areas as required by the City of Richmond, and that meet accessibility and parking area delineation standards.
- Under-building structured parking should be designed to meet building and occupant security requirements. Provide for visibility into stair and elevator vestibules with rated glass assemblies within the requirements of applicable codes, and provide for safe lighting levels.
- Landscaping over building and parkade structures requires careful attention in order to avoid ongoing maintenance. Avoid small areas of sod and trees and shrubs with aggressive root systems.
- Locate trees to avoid maintenance resulting from falling leaves in gutters or catch basins, or tree root issues at building foundations.
- Specify plantings that require little or no irrigation. Generally employ native plant species.

Specification Reference - Section 03 35 00 - Concrete Finishing
Section 31 22 13 - Rough Grading (Landscape)
Section 32 01 90 - Landscape Establishment Maintenance
Section 32 05 23 - Concrete for Exterior Improvements
Section 32 14 13 - Precast Concrete Unit Paving
Section 32 12 16 - Asphalt Paving
Section 32 17 23 - Pavement Markings
Section 32 91 21 - Growing Medium and Finish Grading
Section 32 93 10 - Trees, Shrubs and Groundcovers

4.5.5 Building Envelope

The City of Richmond requires that a registered architect or engineer licensed to practice in the province of BC be engaged to provide building envelope consulting services on any City building project, preferably as a sub-consultant to the architect for the project.

The building envelope consultant should have at least five years relevant local building envelope experience, and provide a scope of services consistent with best practice local industry standards. They should ensure that the assemblies specified for the proposed building possess acceptable water management characteristics, and are designed to meet the intent and requirements of the BC Building Code, the BC Energy Utilization Step Code, and other applicable standards.

Specification Reference - Section 01 40 00 - Quality Requirements
Section 01 43 39 - Mock Ups
Division 07 - Thermal and Moisture Protection
Division 08 - Openings

Ensure building envelope detailing sheds the weather in an appropriate manner, and meets energy utilization performance standards.

4.5.6 Environmental Design Rating Systems

The City of Richmond typically requires certification by third party environmental rating systems or agencies, such as LEED or Passive House, unless indicated as such by the city or another authorized sponsor organization. Review pertinent requirements with city staff.

Specification Reference - Section 01 33 16 - Design Submittal Requirements (Performance Design Criteria)
Section 01 33 29 - General LEED Requirements
Section 01 60 13 - LEED Product Requirements
Section 01 60 14 - Passive House Standards and Project Requirements

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4.5.7 Basic Concrete Materials and Methods

Architectural and/or structural concrete specifications should be prepared by the project's architect and/or structural engineer.
The Contractor will appoint and pay for a CSA certified inspection agency to review concrete mix designs and perform concrete testing in accordance with latest CAN/CSA and other relevant industry standards.
The architect should prepare concrete topping specifications to ensure compatibility with floor finish materials, including specification of moisture content requirements,
Repairs to defective concrete must be done as soon as possible after the removal of formwork, and after the consultant has established a material and methods schedule for concrete repair. The consultant reserves the right to reject concrete installations with defects comprising over 1% of the area of the concrete or if defects are in close proximity. Defective concrete will be removed and replacement concrete will be installed at no additional cost to the project.
Floors that are be left exposed, or that receive carpeting, resilient flooring, or sheet membrane waterproofing, should be finished flat, free from defects that would telegraph through finish materials.
Provide control joints at required locations to control cracking.
Concrete sidewalks and paving should meet municipal engineering standards.

Specification Reference - Section 03 33 00 - Cast-In-Place Concrete
Section 03 35 00 - Concrete Finishing
Section 03 54 00 - Concrete Self-Leveling Topping

4.5.8 Basic Masonry Materials and Methods

A pre-construction meeting is required with the masonry contractor and the consultant to review specifications, submittals and construction issues. A site mock-up of masonry construction will be made for review by the design consultant and City inspector before construction begins.
Meet all BC Masonry Guide specifications as well as industry standards for brick veneer, concrete block, all connectors metal flashings and thru-wall membrane flashings, and mortar mixes.
Concrete unit paving is not preferred, owning to differential settlement problems that are typical in the City of Richmond.

Specification Reference - Section 04 21 13 - Brick Masonry
Section 04 22 00 - Concrete Unit Masonry
Section 04 50 00 - Masonry Restoration and Cleaning [Existing Buildings]

Ensure masonry assemblies are detailed to the technical standards of the Masonry Institute of BC.

4.5.9 Basic Metals Materials and Methods

Steel Structural design should be provided by the structural engineer and architect.

Cold-Formed Metal Framing

- provide complete wind load-bearing steel stud system with accessories, to design loads specified on the structural drawings. Install insulation and vapour barrier in areas that will become inaccessible as construction progresses, and protect these installations from the weather as required.

Miscellaneous Metals

- The Contractor will retain a structural engineer registered in the Province of BC to prepare signed and sealed shop drawings for guardrails, handrails and other miscellaneous metal fabrications.
  Finish for miscellaneous aluminum or steel metals should be powder coat paint.
  Anchoring systems to be typically vertically mounted base plates with neoprene gaskets.

Specification Reference - Section 05 10 00 - Structural Steel
Section 05 40 00 - Cold-Formed Metal Framing
Section 05 50 00 - Metal Fabrications
Section 05 58 00 - Historic Metalwork Restoration [Existing Buildings]

Miscellaneous metals should have a powder coat paint finish.

4.5.10 Rough Carpentry

Provide lumber grades and products as shown on the structural drawings.
Minimum standards for Rough Carpentry Products:

Interior Floor Sheathing:

- use T&G D.Fir or Spruce plywood, glue and screw.

Floor Underlayment:

- 3 ply, 9mm (11/32”) thick spruce plywood with the finish face double-sanded and the back face lightly sanded. Prior to installation, confirm that the finish product will be acceptable to the resilient flooring manufacturer.

Exterior Deck Sheathing:

- Sheathing grade, D.Fir T&G plywood. If PVC deck waterproofing is to be installed, use select tight face plywood.

Exterior Fascias and Trims:

- No.2, S-P-F textured (combed) finish, pre-primed, not less than 51mm (2”) nominal thickness for new builds. For heritage buildings, typically nominal 51mm (2”) thick D.Fir select pre-primed S4S material is required.

Exterior Heavy Timber Construction, Landscaping:

- No.2, S-P-F pressure-treated material.

Fencing:

- cedar with Hem-Fir treated posts set in concrete, all stained.

Wire Mesh (Fencing or Storage Lockers):

- 76x76mm (3”x3”) x 10 gauge welded wire mesh, galvanized.

Sill Gaskets:

- close cell polyethylene foam.

Cavity Furring:

- cedar or pressure-treated Hem-Fir.

Grab-Bar and Railing Blocking:

- 38x235mm (2x10) typical. See BC Building Code and City of Richmond Accessibility Standards for locations of grab bars. Provide blocking or backing for all fixtures and fittings, in addition to that for grab bars and railings.

Wood Preservatives:

- ACQ preservative typical for all exterior wood locations in contact with concrete, masonry, or where moisture may occur, at roof upstands in flat roofs, planters, heavy timber construction, fence posts and cavity furring. Important: Treat all field cut surfaces of pressure-treated wood with two brush coats of ACQ preservative.

Specification Reference - Section 06 10 00 - Rough Carpentry

4.5.11 Finish Carpentry

Workmanship must conform to the Quality Standards for Architectural Woodwork as published by the Architectural Woodwork Manufacturers Association of Canada [AWMAC], latest edition.

For Child Care Facility millwork, refer to City of Richmond Child Care Design Guidelines and Technical Specifications.

Minimum standards for Finish Carpentry Products:

Baseboards, Trims and Window Sills:

- typically these are to be solid wood, pre-primed. No MDF products allowed for these installations.

Casework

AWMAC custom grade typical:

- Wood cabinets for Transparent Finish–Grade A face veneer, with adjustable shelving veneer plywood core.
- Plastic Laminate Cabinets–all surfaces P.Lam, with adjustable shelving veneer plywood core.

Countertops

- Composite acrylic polymer type non-porous countertops, with integral monolithic splash (e.g. “Corian”)

Cabinet Hardware

- D-pulls, polished or brushed chrome finish.

Wall Protection:

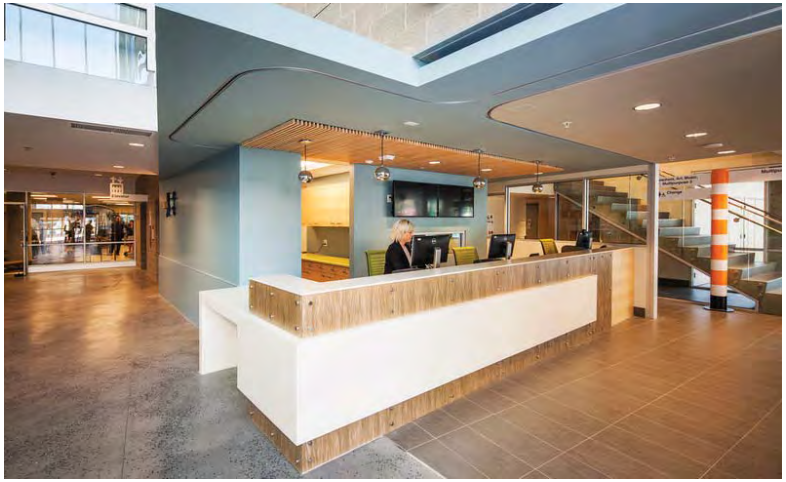
- 9mm (3/8”) veneer face plywood with solid wood trims and battens is acceptable, as is plastic laminate or PVC wainscoting.

Shelving:

- typically veneer finish plywood similar to cabinet gable and cabinet door finishes for office millwork. In selected storage closets, plastic-coated wire shelving, full width between walls, with wall and intermediate supports is acceptable.

Specification Reference - Section 06 20 00 - Finish Carpentry
Section 06 20 11 - Landscape Finish Carpentry
Section 06 40 00 - Architectural Woodwork
Section 06 42 00 - Restoration of Existing Architectural Woodwork [Existing Buildings]

Finish carpentry and exposed wood structure should be detailed and finished to provide for long-term resilience, as well as add to the aesthetic appeal of the building.



Resilient and wipeable, easily cleaned finish surfaces are required for architectural millwork. Note the lower counter with knee space for wheelchair users.

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4.5.12 Dampproofing and Waterproofing

Refer to the Geotechnical Report regarding subsurface drainage requirements and requirements for waterproofing below finish grade habitable spaces.

All dampproofing and waterproofing products and detailing to be reviewed by the Building Envelope Consultant, who will also review installations of same in the field, including (but not limited to):

- waterproofing materials for suspended parkade slabs and decks over habitable spaces.
- waterproofing for balconies over non-habitable spaces.
- dampproofing, composite drainage mats and protection board.

Specification Reference - Section 07 11 13 - Bituminous Dampproofing
Section 07 14 00 - Fluid-Applied Waterproofing
Section 07 16 16 - Crystalline Waterproofing

4.5.13 Insulation

Insulation, thermal bridging and air-tightness construction assemblies and values must be engineered to meet the minimum requirements of Level 3 of the BC Energy Step Code. Energy modeling and Building Envelope Consultants to verify that proposed construction assembly details meet all requirements.

For existing buildings, ensure that insulation upgrades are not deleterious to the integrity of the existing building assemblies in the long term. Modify and relax energy utilization upgrades as required in order not to negatively impact the longevity of the existing building structure or exterior or interior finishes.

Acoustic insulation to be included in wall and floor assemblies in order to meet code-required STC ratings. [In existing heritage buildings, maximize meeting STC requirements while respecting the integrity of existing heritage interior and exterior finishes that are to be retained].

Specification Reference - Section 07 21 00 - Thermal Insulation and Poly Vapour Barrier
Section 07 21 29 - Foamed-In-Place Insulation
Section 07 26 00 - Vapour Retarders
Section 07 27 00 - Self Adhesive Air-Vapour Barrier / Membrane Flashing
Section 07 27 10 - Sheathing Membrane

4.5.14 Exterior Finishes

Select exterior building finishes and provide appropriate detailing to achieve long term durability, and functional and aesthetic design quality for the civic building asset. Consider neighbourhood context and overall community character when selecting exterior finishes. Refer to any applicable design or heritage conservation area guidelines for guidance on exterior bushes and landscaping.

Specification References - Division 04 Masonry
Section 07 42 13 - Metal Composite Material Wall Panels
Section 07 44 53 - Fibre Reinforced Cementitious Panels
Section 07 46 23 - Wood Siding and Shingles

Select exterior finishes that will provide long-term building resilience.

4.5.15 Roofing, including Roof Hatch

Acceptable Products - dependent on design objectives and building resilience goals (all to be reviewed with the Building Envelope Consultant):

- Asphalt or Wood Shingles
- Low slope membrane roofing
- Sheet metal roofing

All material and workmanship standards must conform to the guarantee standards of the Roofing Contractors Association of BC [RCABC], as published in the RCABC Roofing Practices Manual, latest edition.

- provide a minimum 5 year Roofing Warranty from the RCABC
- provide roof edge safety barriers, fall protection and fall arrest as per the BC Building Code and WCB requirements.
- provide roof drain, rainwater leader and gutter and downspout systems that effectively shed the weather without creating undue wear or staining on adjacent finish materials.
- provide roof hatches with high performance insulation values.

Specification References - Section 07 31 13 - Asphalt Shingles
Section 07 31 14 - Wood Shingles
Section 07 52 11 - SBS Modified Bituminous Roofing and Waterproofing Membrane
Section 07 61 00 - Sheet Metal Roofing
Section 07 62 00 - Sheet Metal Flashing, Trims, Gutters and Downspouts
Section 07 72 33 - Roof Hatches

RCABC ROOFING CONTRACTORS ASSOCIATION OF BRITISH COLUMBIA | RoofStar GUARANTEED. BETTER.

4.5.16 Fire-Stopping and Smoke Seals

- Furnish and install all required fire-stopping and smoke seals within fire resistive wall and floor assemblies.
- All fire-stopping and smoke seals should be listed by Underwriters' Laboratories of Canada [ULC], and should form a draft tight barrier to retard the passage of smoke, flame and hose stream, as noted in the appropriate ULC classification.
- Mechanical and electrical penetrations through rated floor, roof and wall assemblies are to be fully coordinated with the Mechanical and Electrical Divisions, and all penetrations will be fire-stopped with the appropriate ULC-listed fire-stopping system, to the satisfaction of the consultant and the authority having jurisdiction.
- Strict sequencing protocols for the installation of fire-stopping should be followed:
  - no installation is to proceed unless review and return of fire-stopping shop drawings has been completed.
  - fire-stopping to floor and roof slab penetrations must precede drywall track installation.
  - fire-stopping must precede fireproofing installations.
  - fire-stopping at slab edge detail to exterior wall panels and at window panels must be done with all panel installations.
  - fire-stopping must precede mechanical pipe insulation (ensure air and vapour barriers are continuous also).

Specification References - Section 07 81 16 - Cementitious Spray Fireproofing
Section 07 84 00 - Fire-stopping

ULC c UL US LISTED c UL

Underwriters Laboratories of Canada (ULC) is an independent product safety testing, certification and inspection organization that is accredited by the Standards Council of Canada (SCC), and which supports governmental product safety initiatives.

4.5.17 Joint Sealants

Install as required by the BC Building Code, the Building Envelope Sections of these Guidelines, or as directed by the Building Envelope Consultant.

Select the type of joint sealant, or tape sealant, to suit the requirements of the specific construction assembly.

Colour of the joint sealant to be selected by the consultant, from the manufacturer's complete range of available colours.

Install acoustic sealant in sound-rated gypsum wallboard assemblies. Seal all lapped and end joints in polyethylene vapour barriers.

Pay strict attention to workmanship aspects of sealant installations:

- establish correct depth to width relationships for installation of backer materials and sealants. Control the depth of the joint to the sealant manufacturer's recommended thickness.
- apply sealant in continuous beads, without open joints, voids, air pockets or embedded impurities.
- finished caulking must be smooth, free from ridges, wrinkles, sags and air pockets, and have a slightly concave shape.
- remove excess caulking promptly as work progresses, and do not damage adjacent finished surfaces.

Specification References - Section 07 92 00 - Joint Sealing

Joint sealants are an important part of the building envelope, in particular at the juncture of dissimilar exterior finishing materials.

There are a wide variety of different sealant systems available, and care must be taken to specify the appropriate system for the particular building condition.

4.5.18 Doors

Install doors as required by the BC Building Code and as directed by the Building Envelope Consultant for exterior doors.
To maximize building resilience and service longevity, select doors and hardware to suit function and location.

4.5.18.1 Metal Doors and Frames

Steel Doors and Frames

- doors and frames to exit stairs, service rooms and suite entrance frames from public corridors must conform to the Canadian Steel Door and Frame Manufacturer's Association's Specifications.
- fire-rated doors should be fabricated in accordance with underwriter's requirements, labeled as required.
- for corridor fire doors, provide smoke seal and maximum area of wired glass permitted by code.
- doors in elevator vestibules and stairs at parking garages should provide maximum glazing allowed by code.
- for exterior doors provide flush panel design with polyurethane core insulation, extruded aluminum low profile (accessible) sills with width to match frame depth, and mechanically fastened, extruded aluminum weatherstripping with neoprene inserts, and an adjustable sweep at the sill.

Exterior Steel Glazed Panel (Swing) Doors in Wood Frames

- double-glazed stile and rail insulated door with prefinished baked enamel sheet steel. Low profile (accessible) aluminum sill, door weatherproofing and adjustable door sweep at the sill.

Exterior Aluminum Entrances and Storefront Doors [and Curtain Wall]

- sealed glazing thermal aluminum fabrications meeting all best practices for quality assurance.
- main building entries should be equipped with automatic door openers with operating devices located in accessible locations. Sliding doors with "electric eye" are preferred, but double swing doors are acceptable. Automatic, power-operated doors should be provided and serviced by local installers.

Overhead Doors and Gates

- electrically operated overhead metal doors and gates with heavy-duty hardware and high security and safety features.

4.5.18.2 Wood Doors and Frames

Wood doors must conform to the Quality Standards for Architectural Woodwork as published by AWMAC, commercial grade.

- wood doors with clear finish should be solid core, with solid wood frames for matching clear finish.
- painted wood doors should be solid core, and typically have flush tempered hardboard faces, pre-primed. Frames will be finger-jointed PSF frames, pre-primed for paint.
- avoid bi-fold and sliding bypass doors.

4.5.18.3 Stacking Partition Systems, Security Grilles and Acoustic Folding Doors

These door systems should be locally sourced and maintained. Provide for all door clearances and structural supports to ensure doors operate freely and are resilient in operation for the long term.
Provide good one side 13mm (1/2") plywood as the wall finish in door recess pockets.
Acoustic Folding [Accordion] doors will have a minimum STC rating of 35.

Specification Reference -
Section 08 11 13 - Hollow Metal Doors and Frames
Section 08 14 00 - Wood Doors
Section 08 21 00 - Restoration of Existing Wood Doors [Renovations]
Section 08 32 13 - Sliding Glass Doors
Section 08 33 23 - Overhead Doors and Gates
Section 08 35 00 - Stacking Partition System and Security Grilles
Section 08 35 13 - Acoustic Folding Doors
Section 08 41 13 - Aluminum-Framed Thermal Entrance Doors
Section 08 43 13 - Aluminum-Framed Storefronts
Section 08 44 13 - Glazed Aluminum Curtain Wall
Section 08 81 00 - Glass and Glazing

4.5.19 Windows

In specifying windows and the ratings for air and water tightness and wind load resistance, the Consultant will refer to energy utilization and Step Code design standards that deliver required performance levels, as well as conforming to the following minimum ratings as noted in CSA A440-98:

- Air Tightness: A-3
- Water Tightness: B-3
- Wind load resistance: C-3

Confirm all requirements with the energy modeling and building envelope consultants.

- Operable windows should meet or exceed the requirements for sash strength stiffness, and ease of operation noted in CAN/CSA A440. Opening windows should be equipped with glass fibre mesh screens in an aluminum frame.
- Windows should be EnergyStar rated for the local BC climate zone.
- Detail window installations to maintain the continuity of the air barrier at rough openings, as well as at junctions with other structural assemblies or at entrances and storefronts.
- Correctly locate and install flashings, deflectors and weep holes to ensure proper drainage of moisture to the building exterior.
- Provide flashing with end dams over window heads and sill flashing with end dams at window sills.
- All installations to be field tested to confirm compliance with CSA A440 required ratings.

High performance windows are becoming more readily available, and can greatly enhance achievement of a building's energy utilization objectives.

Products:

Vinyl Window Assemblies

- awning or casement windows only; sliders are not acceptable.
- provide a certification for required performance levels for U-factor, SHGC and air leakage.
- the PVC frames should be continuous multi-chambered tubular vinyl extrusions with internal steel reinforcement.

Wood Windows

- typically will be specified only when new windows are installed in a building with existing wood windows.
- perform work in accordance with AWMAC Quality Standards, custom grade.

Metal Windows and Curtain Wall

- typically, vinyl frames are preferred over metal for energy utilization reasons.
- provide a certification for required performance levels for U-factor, SHGC and air leakage.

Glass and Glazing

- install heat strengthened and tempered glass where required for fire and life safety.
- install sealed units in accordance with Insulating Glass Manufacturers of Canada guidelines and CAN/CGSB guidelines.

Specification References - Section 08 44 13 - Glazed Aluminum Curtain Walls
Section 08 51 13 - Aluminum Windows
Section 08 52 00 - Wood Windows
Section 08 53 10 - Plastic (PVC) Windows
Section 08 61 00 - Restoration of Existing Wood Windows [Renovations]
Section 08 80 50 - Glass and Glazing

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4.5.20 Finish Hardware, Architectural and Security

Architectural Hardware

Provide a detailed finish hardware schedule prepared by an Architectural Hardware Consultant [AHC] showing each separate type of hardware item, including make, model, material, function, size, finish, or other pertinent information.

The Schedule should also include a door by door description of all hardware items to be supplied with each door specified for the project. This Schedule will also incorporate all security door hardware items specified in the Security specification.

Typical Products:

- lever handles
- Schlage locking devices with C1, C2, or C3 cylinders.
- no mag-locks.

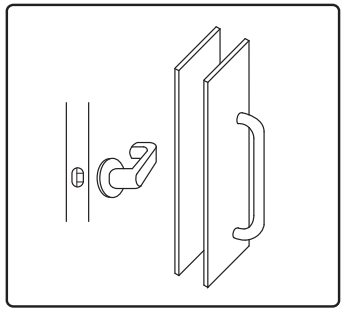
Security System and Hardware

Engage a Security Consultant to delineate security requirements for the building, including door security items.

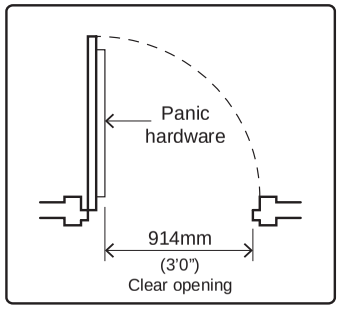
The Security Contractor must be provincially licensed by the Security Programs Division of the Ministry of Public Safety and the Solicitor General, to install and provide commissioning for security systems.

SNGL-178

Specification References - Division 08 - Openings
Section 08 70 00 - Door Hardware
Section 08 70 01 - Door Hardware Schedule
Division 27 - Communications
Division 28 - Electronic Safety and Security



Example of accessible hardware.



Minimum clear opening at doors.

Extensive glazing at doorways into interior lobbies enhances wayfinding and building security. Install security hardware with ease of use and accessibility in mind.

4.5.21 Interior Finishes

Floors

- provide resilient flooring typically in general use and wet areas. High durability flooring is required at entries and high traffic areas. All work to be installed as per the National floor Covering Association Specification Standards Manual, current edition.
- vinyl tile or sheet vinyl floor goods with welded seams are acceptable. With sheet vinyl, install flash coving in wet areas, in lieu of standard vinyl base. Avoid natural fibre “linoleum” type products in wet areas.
- if ceramic floor tile is used, a larger tile size is preferred, with a darker colour of grout. Provide ceramic tile base.
- provide walk-off mats at entries.
- carpet tile is a preferred product compared to wall-to-wall carpet.
- avoid carpet with underlay.

Specification References - Section 09 30 13 - Ceramic Tiling
Section 09 65 10 - Resilient Flooring
Section 09 65 16 - Athletic Flooring
Section 09 68 00 - Carpeting
Section 10 90 00 - Miscellaneous Specialties (Walk-Off Mats)

Flooring materials in new builds and renovations should be resilient and highly durable. Vinyl tiles and carpet tiles are preferred to sheet goods, to facilitate replacement and repair. Ensure that 5% extra stock of the total flooring area material is supplied and retained for maintenance purposes.

Walls and Ceilings

Walls and Partitions

- painted drywall is the typical finish.
- consider acoustic requirements and fire-rated assemblies and shaftwalls.
- in lieu of abuse-resistance drywall, install wall protection board or wainscoting. Provide corner guards in high traffic areas.
- provide for water-resistant drywall or cementitious panel board behind ceramic wall tile.
- provide all required access panels. Coordinate with mechanical and electrical consultants and contractors to ensure access panels locations allow for all required maintenance operations.
- where sound absorptive panels are fixed to walls, integrate these so as not to conflict with service access requirements.

Ceilings

- commercial quality T-Bar acoustic ceilings are required in lieu of finished drywall ceilings. Provide an acoustical NRC rating of 70 or better.
- in order to access services in ceiling areas, ensure the acoustical tile ceiling systems are designed for ease of removal and replacement without damage to the ceiling tile.
- provide washable ceiling tiles in kitchens and washrooms.
- provide fire-taped gypsum wallboard assemblies as required above T-bar ceilings.

Specification References - Section 09 21 16 - Gypsum Board Assemblies
Section 09 22 16 - Metal Stud Framing
Section 09 30 13 - Ceramic Tiling
Section 09 51 13 - Acoustic Panel Ceilings
Section 09 84 13 - Fixed Sound Absorptive Panels
Section 10 90 00 - Miscellaneous Specialties
(Corner Guards, Wall Protection)

CNCL - 180

Painting

- all work should conform to the latest edition of the Architectural Painting Specification Manual of the Master Painters Institute [MPI]. All painting and decorating work should be inspected by a Paint Inspection Agency (inspector) acceptable to the specifying authority and the local MPI Accredited Quality Assurance Association.
- the painting work will include surface preparation of substrates as required for the acceptance of painting, including cleaning, small crack repair, patching, caulking, making good surfaces and areas of existing assemblies, priming and back-priming as required under MPI Manual preparation procedures.
  Note: It will be the general contractor or construction manager's responsibility to ensure that all trades preparing finished surfaces and materials, do so in a workmanlike manner that does not unduly add scope to preparation work of the painting trade.
- all surfaces requiring painting should be inspected by the Paint Inspection Agency prior to commencing painting. The inspector will notify the Consultant of any defects or problems requiring additional preparation work.
- all drywall areas will receive a coat of sealing primer.
- in addition, if defects in the substrate become apparent after a prime coat is applied, the inspector will advise in writing what additional preparation work is required, before the go-ahead to apply finish coatings is provided.

General Paint Product Notes:

- use low VOC paints and sealants.
- gloss levels:
  - G5 (semi-gloss) - Kitchen, Washrooms, Laundry, Janitor's Room and all doors, door frames and interior trims.
  - G3 (eggshell) - typical for walls [Matte finishes not acceptable)
- refer to City of Richmond Corporate Standards for City Colour Palette requirements.

Specification References - Section 09 21 16 - Gypsum Board Assemblies
Section 09 91 10 - Painting
Section 07 92 11 - Joint Sealants

For acceptable colour palettes for City buildings' exteriors and interiors, refer to the Corporate Colours Memorandum included in the Appendices section of this document.

4.5.22 Washrooms and Accessories

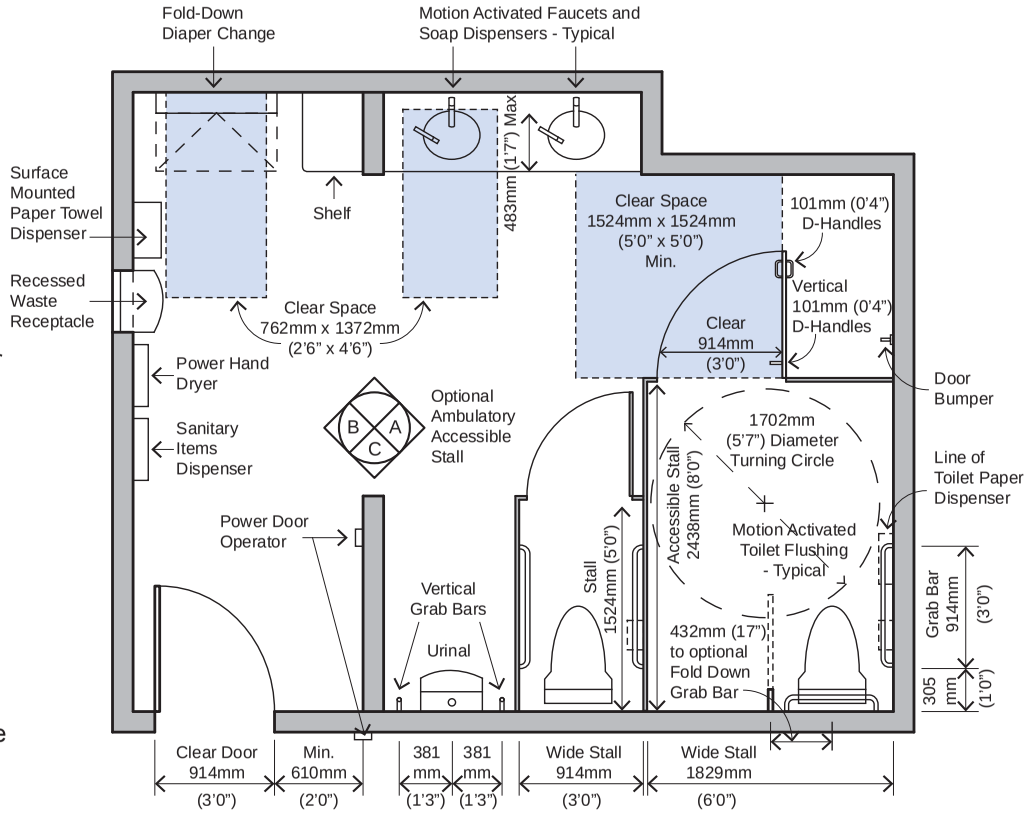
Common and Accessible Washrooms

Refer to BC Building Code and City of Richmond Enhanced Accessibility Standards

- Plumbing Fixtures
  - accessible height wall-hung or tank style WC's with bolted tops.
  - self-rimming drop-in sinks in accessible vanities with accessible type plumbing brass preferred to single wall-hung sinks.
  - wheel-in showers where required rather than bathtubs.
- Washroom Accessories
  - grab bars (or future adaptability for same in housing units to accommodate aging-in-place).
  - hand dryers are preferred to paper towel dispensers.
  - if paper towels are used, accommodate requirements for outside paper towel contractors.
  - Include recessed refuse containers, or under-counter receptacle with opening in washroom countertop.
  - provide toilet paper dispensers, soap dispensers and wall mirrors rated for use by people with disabilities.
  - provide a dry counter area, or separate shelf, for temporary storage of purses or books.
- Lighting should be installed at sufficient levels to accommodate use by individuals with lower vision. Combine over mirror lighting over vanities with general room lighting.
- Toilet Partitions - should be ceiling-hung, with no supports to floor level.
  - Acceptable products
    - plastic laminate covered high density particle board
    - metal with baked enamel finish
  - Hardware - heavy duty polished chrome or brushed nickel with tamper-proof screws.
- Diaper change table are typical in Washrooms.

Note: Common Washrooms should also incorporate Accessibility features to promote Enhanced Accessibility and Visitability.

Typical Accessible Washroom Plan



Washrooms in Child Care Facilities

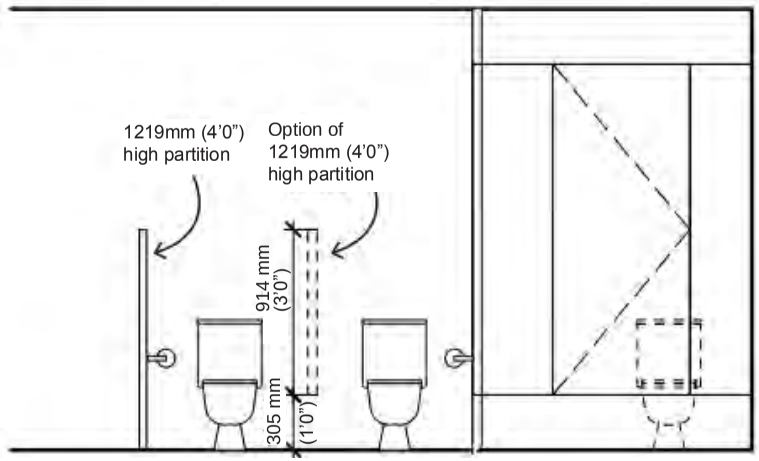
Refer to City of Richmond Child Care Design Guidelines and Technical Specifications

- Toilets - tank style WC's with round bowls. Remove lids from toilet seats.
- Sinks - wall-mounted sinks preferred, or self-rimming drop in vanity sinks.
  - faucets to have temperature control (120 degree F maximum).

Generally, for Washroom Specifications

Specification References - Section 10 21 14 - Toilet Compartments
Section 10 28 14 - Toilet and Bath Accessories
Division 22 - Plumbing
Division 25 - Lighting

Washroom for Group Child Care 30 Months to School Age



Source: City of Richmond Child Care Design Guidelines and Technical Specifications
Review all design details with City of Richmond Child Care Coordinator.

4.5.23 Staff and Common Area Kitchens and Kitchenettes.

Millwork - see 4.5.11 Finish Carpentry

- for staff and common area kitchens - millwork standards:
  - accessible design standards required.
  - plywood carcass construction.
  - "corian" countertop with all outside corners eased.
  - AWMAC requirements.

Plumbing fixtures

- double bowl stainless steel kitchen sink preferred.
- accessible design standards required.
- provide an additional stainless steel hand sink in community serving kitchens

Appliances

- Provide an "Energy Star" rating
- Dishwasher
  - residential quality typical
  - for community serving kitchens consider a commercial style under-counter dishwasher with a sani-cycle.
- Refrigerator
  - 21.5 cu. ft. refrigerator preferred.
  - pull-out bottom freezer type is preferred for enhanced accessibility.
  - consider separate refrigerator only and freezer for serving the community.
- Microwave–countertop unit is preferred for accessibility.
  - 2.0 cu.ft. 1100 watt.
- Range [typically not required; microwave is satisfactory unless noted otherwise] 30 inch wide 4 burner stove with oven, with controls out of reach of children in child care facilities or where children might be present. Where children will not be users (e.g. Staff Kitchenettes), provide a cooktop set in a counter with knee space under, and with front of counter range controls, for enhanced accessibility.
  - range hood.

Note: for Affordable Housing Units - see City of Richmond Affordable Housing Resource Guide

Specification References - Section 06 40 00 - Architectural Woodwork
Section 11 31 00 - Residential and Commercial Appliances
Division 22 - Plumbing

4.5.24 Laundry Room

- for Child Care Facilities in City-Owned buildings
  - see City of Richmond Child Care Design Guidelines and Technical Specifications.
- other City-owned buildings
  - provide all required clearances for wheelchair users.

Specification References - Section 06 40 00 - Architectural Woodwork
Section 11 31 00 - Residential and Commercial Appliances
Division 22 - Plumbing

4.5.25 Staff Areas in City-Owned Buildings

Staff Office

Millwork - See 4.5.11 - Finish Carpentry

- provide desk/work table.
- countertop has room for photocopier, if stand-alone photocopier not provided.

Staff Room

- provide kitchenette as per 4.5.24 over.
- provide lockers for staff.
- accessible washroom for staff-use is preffered. Confirm if low-threshold accessible wheel-in shower is required.

Specification References - Section 06 40 00 - Architectural Woodwork
Section 10 90 00 - Miscellaneous Specialties (Metal Lockers)
Division 22 - Plumbing

4.5.26 Janitorial, Maintenance, and Storage Areas

Janitor's and Maintenance Rooms

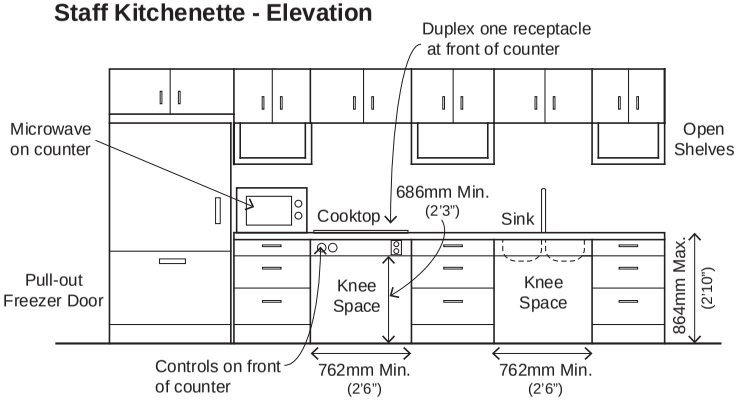
- provide resilient flooring and consider flash coving
- provide mop sink with splash protection on walls
- provide maintenance equipment racks for mops, etc., and storage shelves

General Storage in City-Owned Facilities

- configure as per specific program requirements.
  - provide storage racks - "Interlok" no-bolt shelving as the design standard.

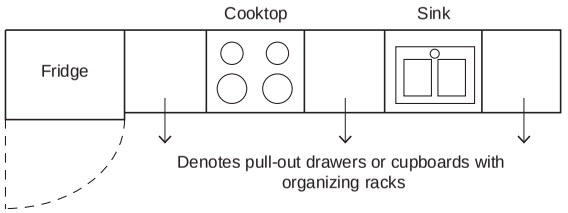
Specification References - Section 06 20 00 - Rough Carpentry
Section 06 40 00 - Architectural Woodwork
Section 10 90 00 - Miscellaneous Specialties

Staff Kitchenette - Elevation



Staff Kitchenette - Plan

Note: Cooktop may not be required. Review with staff.



4.5.27 Additional Interior Design Considerations

General Finish Requirements
- no rough surfaces and corners eased.

Mirrors
- see Section 08 80 50 - Glass and Glazing.
- unframed type fixed to walls using concealed clips (number as recommended by the mirror manufacturer).
- use low VOC Mirror adhesive.

Window Blinds
- see Section 12 21 00 - Window Coverings.
- determine requirements and window blind preferences from City Facilities staff for the specific building installation.
  [Note safety requirements for Child Care Facilities - see City of Richmond Child Care Design Guidelines].
- supply and install horizontal and vertical louvre blinds, or draperies, as required.

Mailboxes
- provide front-loading gang type mail boxes, aluminum finish.
- confirm capacity requirements for mailbox design, and acceptability with Canada Post, and meet requirements for enhanced accessibility.

Notice Boards and Tackboards
- tack boards with hardwood backing typical.
- provide all backing in walls as required to install boards.

Signage
- see Section 10 14 19 - Signage.
- includes (unless programmed otherwise):
  - exterior wall-mounted and free-standing building signage.
  - emergency exit and fire plan signage.
  - wall-mounted acrylic room identification signage, including Building Accessibility-related signage.
    (Note: do not use peelable lettering).

Typical Specification Reference is Section 10 90 00 - Miscellaneous Specialties, Unless noted otherwise.

Elevator Design Considerations
- see Section 14 24 23 - Hydraulic Passenger Elevators
- select an elevator installation and maintenance company with a good history of service with the City of Richmond. Consult with City of Richmond facilities staff.
- elevator and accessory design must comply with Building Code mandated standards for accessibility, as well as for enhanced accessibility, as per the City Richmond Design Guidelines for Enhanced Accessibility.
- consider acoustic separation requirements to minimize perceived elevator noise concerns.

Seismic Bracing
- provide seismic bracing as required for all fixtures, furniture and equipment.
- provide letters of assurance for seismic bracing of mechanical and electrical items.

Garbage and Recycling Area Specifications - Refer to City of Richmond Waste Management Design Guidelines
- for general building facilities, locate in a functionally appropriate location, near an elevator, and also easily accessible for pick-up by garbage and recycling vehicles and trucks.
- base required garbage and recycling handing areas on anticipated loads, and numbers of required bins and totes.
- provide for interior recycling and trash receptacles at recycling stations. Provide appropriate signage to guide separation of recyclables and trash by the visiting public and by staff.
- review all environmental program requirements as identified by City staff.

Bird Control
- see Section 10 81 13 - Bird Control Devices
- provide devices to prevent birds from landing and roosting on specified surfaces, like roof edges and under roof eaves.
- bird spike strips is the preferred device.

Fall Arrest and Restraint
- see Section 11 24 10 - Fall Arrest and Restraint Devices.
- custom design, supply and installation of a roof and building mounted safety tie back and lifeline anchor system incorporating a fall arrest and fall restraint safety system.
- comply with Workers Compensation Board [WCB] requirements.
- allow for any additional structural members in the building framing to enable the structural system to accept the additional load.

Food Service Equipment
- see Section 11 40 00 - Food Service Equipment.
- consult with a Kitchen Consultant to determine requirements.
- coordinate with the Mechanical Sections for supply and exhaust fans, exhaust ductwork and fire-rating of same, service rough-ins and fittings, fire-suppression systems, and other items required to complete the food service installation.
- coordinate with the Electrical Sections for connections to fire alarm systems, service requirements, wiring, disconnects, and other electrical materials required to complete the food service equipment installation.
- coordinate with Section 06 40 00 - Architectural Woodwork for kitchen millwork requirements.

4.5.28 Additional Exterior Design and Landscaping Considerations

Refer to any applicable design guidelines for guidance on exterior design and landscaping (note: Landscape Plan is required as per of a Development Permit).
- see Section 12 93 00 - Exterior Site Furnishings
- materials and installation of standard manufactured catalog items including but not limited to waste containers, benches, and bike racks.
- consult with City of Richmond Facilities and Parks staff regarding models and requirements for exterior site furnishings.

Bike Racks
- comply with City of Richmond's Zoning Bylaw 8500, Section 7 Parking and Loading regarding requirements for bicycle parking.
- install bike racks under cover if feasible.

Scooters and Strollers
- provide space in City buildings inside front entries for scooter and stroller storage
- provide a scooter changing station.

Public Art
- review public art requirements with City staff.

Consider integrating public art into public landscaping.

4.5.29 General Mechanical Considerations

Refer to City Administrative Procedures in the Appendix of this Document

- ***City of Richmond Building Equipment, Monitoring, and Integration Requirements (15 pages)***
- ***Sustainable "High Performance" Building Policy - City-Owned Facilities [Policy 2307, adopted by Council 24 February 2014] (2 pages)***

4.5.29.1 Incorporation of Best Practices in Design and Construction to Optimize Building Performance

- follow sustainable design, and operation and maintenance best practices in the design and delivery of mechanical systems for new and existing buildings, in the context of approved budgets.
- emphasize conservation, optimized building performance, and continued improvement in energy use, water efficiency, and indoor environmental quality.
- maximize efficiency of mechanical systems by providing a system of controls and building automation system for optimal programming capability of the mechanical system. Allow for measurement and verification systems that provide for continuous optimization.
- provide an Operations Plan that maximizes the operational efficiency of the mechanical system. Ensure that all servicing, maintenance, and replacement parts can be installed in a functional and workmanlike manner. Demonstrate on the Mechanical Consultant's drawings, and on the As-Built Project Record drawings, that all maintenance procedures can be undertaken without extraordinary or costly effort.

City of Richmond		
Page 1 of 15	**ADMINISTRATIVE PROCEDURE**	
File Ref:	City of Richmond Building Equipment, Monitoring, and Integration Requirements	

City of Richmond Administrative Procedures for integrating mechanical and electrical requirements in City-owned buildings are included in the Appendices of this document.

4.5.29.2 General Mechanical Sections

Availability of Equipment, Servicing and Replacement Parts.

- all equipment, devices and controls require support from a knowledgeable local technical support staff, including local sales representatives and local field service/factory trained representatives, especially regarding servicing of all equipment.
- all replacement parts and components need to be readily available (preferred less than 10 day delivery wait time), and cost effective.

Fire Suppression

- see Division 21 - Fire Suppression.
- provide fire suppression systems throughout the Building including:
  - wet sprinkler systems in heated areas.
  - dry sprinklers in exterior and unheated areas including covered parking, attics, concealed spaces, balconies, and other similar locations.
  - standpipe systems.
  - portable fire extinguishers. [Typically, locate these in recessed cabinets in corridor locations].

Plumbing

- see Division 22 - Plumbing.
- for piping requirements see Section 22 11 00 - Facility Water Distribution and Equipment.
  - City preference is for ball valves at piping terminations. Provide valve tags.
  - City preference is for clear lamacoid labeling on all piping, identifying piping function and flow direction.
    Refer to City "Equipment Naming" protocols [See Appendix]
  - provide floor drains in all wet areas.
  - City preference is for hard-wired touchless wash-basin faucets and automatic toilet flushing mechanisms. Sinks should be of the drop-in, self-rimming variety (no trough sinks). Plumbing brass should be polished chrome. City preference is for wall-hung WC's.
  - for Child Cares, provide for reduced hot water temperatures at all child accessible faucets.
  - for special uses, such as Art Studios and Firehalls, include separate hot and cold water controls.
  - provide Grease Traps to reduce the discharge of fats, oils and grease [FOG] into the City's sanitary systems. Fully automatic "grease recovery devices" are a preferred product.

Heating, Ventilation and Air Conditioning [HVAC]
- see Division 23 - HVAC
- for acoustic issues also refer to:
  - Section 06 20 00 - Rough Carpentry (Acoustic Control Framing)
  - Section 07 21 00 - Insulation (Noise Stop)
  - Section 07 92 00 - Joint Sealants (Acoustic Sealant)
- if not a stand-alone facility, the City-owned facility should have its own HVAC systems, separate from the rest of the building of which it is a part.

Controls
- see Division 25 - Integrated Automation

Refer to the following City of Richmond Administrative Procedures in the Appendix of this Document:
- Direct Digital Control (for Buildings) and Energy Monitoring Guidelines [Appendix 6.3]
- Direct Digital Control (for Buildings) and Energy Monitoring Guidelines.
  - non City managed new construction for City maintained spaces [Appendix 6.2].

Mechanical and electrical equipment should be installed to facilitate ease of long-term maintenance. Avoid installing equipment in confined spaces or configurations, or in locations that have access problems. All City facilities must have a detailed Operations and Maintenance Plan detailed on the Consultants' Project Documents and on the Contractor's As-Built Documents, that demonstrates that all mechanical and electrical equipment can be accessed and maintained in a functional and workmanlike manner.

4.5.30 General Electrical Considerations

Refer to City Administrative Procedures in the Appendix of this Document
- ***City of Richmond Building Equipment, Monitoring and Integration Requirements [Appendix 6.4]***
- ***Sustainable "High Performance" Building Policy - City-Owned Facilities [Policy 2307, adopted by Council 24 February 2014] [Appendix 6.1]***

4.5.30.1 Incorporation of Best Practices in Design and Construction to Optimize Building Performance
- as for mechanical systems design, follow sustainable design, and operation and maintenance best practices for electrical systems in new and existing buildings, in the context of approved budgets.
- emphasize conservation, optimized building performance and continued improvement id energy use, building systems efficiency and indoor environmental quality.
- provide a system of controls and building automation that allows for optimal programming capability for all building systems, electrical and mechanical. Include measurement and verification systems that allow for continuous optimization.
- provide and Operations Plan that allows for the maximum operational efficiency of the electrical system.

4.5.30.2 General Electrical Sections

Coordination with Mechanical HVAC Systems [See Division 23]
- specify equipment with Energy Star certification whenever possible.
- use high efficiency motors and pumps.

Availability of Equipment, Servicing and Replacement Parts
- all equipment, devices and controls require support from a knowledgeable local technical support staff, including local sales representatives and local field service/factory trained representatives, especially regarding servicing of all equipment.
- all replacement parts and components need to be readily available (preferred less than 10 day delivery wait time), and cost effective.

Integrated Automation [See Division 24]

- optimize the City's building control and energy monitoring capacity to maximize maintenance and operational efficiency.
- only City-prequalified Supply and Installation Contractors for Direct Digital Controls [DDC] systems will be contracted for this work.
- meet City requirements for DDC graphics and operator interface (which will run on the City's web servers).
- Coordinate all work through the City's IT department to arrange loading of graphics, databases, and security requirements.

Power and Distribution [See Division 26]

- lighting, mechanical and plug loads need to be segregated on separate electrical panels for energy monitoring purposes.

Optimize Building Lighting Systems [See Division 26]

lighting design should incorporate sustainability principles and products and systems should be energy conserving, long life, have a low cost of ownership and be accessible for service and maintenance.

daylight harvesting opportunities should be implemented in areas where natural daylight is available.

all lighting should be designed to suit the task and location.

in general, where feasible and economical, LED lighting is preferred, and is the typical project standard.

[See City of Richmond Administrative Procedures for lighting system Requirements.]

Maintenance of Lighting Fixtures and Electrical Equipment

- consideration must be given to ensure access for maintenance activities. Luminaires and equipment should be accessible from ladders on flat surfaces such as floors or stair landings, or from powered lifts with a maximum lift of 6.1m [20 feet].
  [Note: Building access, floor construction, and elevators should be designed to permit entry and use of standard lift equipment for proper and safe maintenance.]

Fire Detection and Alarm [See Division 28]

- all battery pack lighting, remote heads and exit lights should be LED type and manufactured by an approved local supplier [e.g. "Ready-Lite" or approved equal].

Electronic Safety and Security [See Division 27 - Communications]

- review requirements with operations and maintenance, and City IT staff, for access, surveillance, and after-hours security.

5.0 Checklists

5.1 Preliminary Design Stage Checklist for an Integrated Design Process and Schematic Design

Design Action Component	*Implementation Detail*
1. Functional Program	- city representatives identify building areas and functional components that are to be included. - identify functional inter-relationships for the proposed spaces, along with area requirements. - identify project goals and project budget targets.
2. Pre-Design	- architect / Coordinating Consultant meets with City representatives to establish project goals, including site opportunities and constraints, and energy utilization and high performance building targets, as well as working within budget constraints. - architect / Coordinating Consultant creates sketch plans to inform the Integrated Design Process, including preliminary exterior wall assemblies that locate thermal and air barrier locations in principle.
3. Integrated Design Process	- engage experienced consultants for the work. - have all consultant roles clearly identified. - ensure that consultants are familiar with City requirements for high performance buildings, especially mechanical and electrical systems. - ensure all consultants are fully involved in the integrated design process. - respond to site constraints and site orientation issues to inform the schematic design. - engage stakeholders
4. Schematic Design	- define building areas and functional inter-relationships. - identify building structure and cladding systems. - identify glazing percentages and window shading, and bird-friendly design strategies. - identify possible thermal bridging conditions.

	- create an energy model to inform the design process. - identify options for heating and cooling and domestic hot water systems. - create a short-list of all building components, including all assemblies and junctions. - confirm all schematic design strategies by means of a design charrette with all city representatives and consultants. - confirm the schematic design meets project budget targets.

5.2 Design Development / Pre-Development Permit Application Checklist

Design Action Component	*Implementation Detail*
2. Detailing	- detail all building assemblies and components, including all building systems. Identify mechanical equipment and controls and lighting selections.
Modeling	- model all assemblies and thermal bridges, utilizing standard program models. Model environmental conditions, such as internal heat gains, over-heating and moisture path issues. - confirm all proposed assemblies or required revisions. - confirm energy utilization standards are on target.
3. Cost Control	- engage a cost consultant, or a construction manager to provide a detail costing. - confirm project budgeting is on target.
4. Drawings and Outline Specification	- prepare the Design Development Documents package.
5. Certification Submission	- if required, submit the Design Development package to the certifying authority or consultant. - incorporate required design adjustments in the Design Development package.

5.3 Final Detail Design and Pre-Building Permit Application and Construction Tender Drawings Checklist

Design Action Component	*Implementation Detail*
1. Finalize Detailing	- confirm all building assemblies and systems, and finishing material schedules and equipment schedules. - refer to City of Richmond Design Guidelines for Enhanced Accessibility, and for Housing Projects to the Affordable Housing Resource Guide. For Child Cares, refer to the Child Care Design Guidelines.
2. Quality Control	- confirm detailing and equipment incorporates City of Richmond materials and systems requirements. [These Design Guidelines and Technical Specifications]. - confirm energy utilization, and building performance requirements.
3. Confirm Consistency between Consultants' Documents	- confirm that Architectural documents are consistent with the document packages of the other consultants work, especially the Structural, Mechanical and Electrical packages. [Note: ensure that the consultants' work does not incorporate standard details that do not reflect the designed construction assemblies for the project. Check all dimensional requirements for specified products and systems, and ensure there is consistency between all of the consultants' drawings and specifications].
4. Cost Control	- with the assistance of a cost consultant or construction manager, confirm that budget targets are being met, before the project is issued for tender.

6.0 Appendices

6.1 Sustainable “High Performance” Building Policy - City-Owned Facilities [Policy 2307, adopted by Council 24 February 2014]

6.2 City of Richmond Direct Digital Control (for Buildings) and Energy Monitoring Guidelines - Non-City managed new construction for City maintained spaces. [January 2016]

6.3 City of Richmond Direct Digital Control for Buildings) and Energy Monitoring Guidelines

6.4 City of Richmond Building Equipment Monitoring and Integration Requirements [July 2018]

6.5 City of Richmond General Lighting Guidelines [January 2016]

6.6 City of Richmond Entrance, Intercom/Video Systems Specifications for City of Richmond Buildings [28 January 2016]

6.7 City of Richmond Security, Fire Alarm, Access and Video Systems Specifications for City of Richmond Buildings [January 2018]

6.8 City of Richmond Waste Management [January 2016]

6.9 City of Richmond Roof-Top Playground Design Guidelines [August 2016]

6.10 City of Richmond Irrigation Design Guidelines for Roof-Top and Grade Related City Owned Projects [November 2016]

6.11 City of Richmond Mechanical Systems Naming Protocol

6.12 City of Richmond Standard Colour Palette

6.1 Sustainable "High Performance" Building Policy - City-Owned Facilities

[Policy 2307, adopted by Council 24 February 2014]

POLICY 2307:

It is Council policy to:

1. Ensure that newly constructed civic buildings or spaces are built with consideration of occupant safety, comfort and indoor environmental quality, in the context of approved budgets.
2. Ensure effective internal stakeholder engagement is carried out through an integrated design process during the planning, design, implementation, and completion of new facilities or spaces and associated outdoor areas. An integrated design process utilizes a collaborative design approach, involving consultants, staff and user group representatives, to set a well-defined vision and performance objectives for new building or spaces, and to identify strategies for achieving the desired outcomes.
3. Incorporate high performance attributes into new civic facility or space design and construction to the maximum extent that relate to:
   - The most current Leadership in Energy and Environmental Design (LEED®) New Construction (NC) classification will be used as the standard by which to assess new facility construction. LEED® Gold certification be set as the desired target of building performance for new City buildings.
   - That at a minimum score of 10 points be targeted from LEED® Optimize Energy Performance criteria where a lifecycle assessment demonstrates reductions in operational costs and/or payback periods are within acceptable levels.
   - For other criteria of LEED® for NC, consideration will be given to measures that reduce energy and water use, reduce maintenance and operational costs, reduce greenhouse gas emissions, and optimize indoor environmental quality.
4. Follow sustainable operation and maintenance best practices guidelines for new and existing buildings, which emphasize conservation, optimized building performance, and continued improvement in energy use, water efficiency, and indoor environmental quality.
5. Maximize energy and operational efficiency through the selective re-commissioning of civic facilities on an on-going basis. Re-commissioning is a form of quality assurance testing that is carried out to ensure that building physical plant systems operate as effectively as possible given occupancy patterns and building function.
6. Target no net increase in corporate building energy use and related greenhouse gas emissions, as compared to 2012 levels by:
   - Aiming to not increase energy demand or GHG emissions when constructing replacement infrastructure; and/or
   - Striving to offset increased energy demand and GHG emissions through reductions at other civic facilities.
7. Aim to construct net zero energy and carbon neutral corporate buildings by 2030.

6.2 City of Richmond Direct Digital Control (for Buildings) and Energy Monitoring Guidelines - Non-City managed new construction for City maintained spaces. [January 2016]

1. REQUIREMENTS:

i. One of the City's two prequalified Supply and Installation Contractors for Direct Digital Controls (DDC) Systems must be used for the mechanical and lighting control of City owned and/or operated space – currently either ESC Automation or Control Solutions.

ii. Lighting control is to be tied into separate DDC controllers, which will be provided by one of the prequalified contractors, with the location and number to be specified by the Electrical Design Consultant as part of the electrical design tender package.

iii. Graphics for the operator interface must be prepared to meet City requirements, which highlight energy efficiency and comfort. Graphic functionality for energy use monitoring will include, but is not limited to, energy use breakdown between electricity and natural gas, further segregation of each fuel type into energy use of separate end uses, to further segregation of energy use of specific systems and equipment. The operator interface for City will run on the City's web-servers.

iv. The DDC system will be remotely accessed by the City's web based operator interface. Data will be collected at a maximum of 15 second intervals for all points during the commissioning process to ensure system stability and tuning. VPN network connectivity will be provided by the Supply and Installation Contractor for secure access of sufficient bandwidth to support this.

v. Any energy use monitoring and billing of a City space, which is located within a building that is not City owned and managed, will be done through sub-meters that are BACnet enabled and not on a pro-rated basis.

vi. A water meter that is BACnet enabled is required to monitor use of any mechanical makeup water system such as cooling tower, chill water system, heating water system, heat pump system, Geo/ground loop and Solar system.

vii. A BTU meter that is BACnet enabled is required for the heat pump loop to monitor the energy usage of City space.

viii. Once the mechanical and lighting DDC points list for the space has been initially defined, the City requests that they are provided to the City along with the mechanical and electrical specifications, to allow for the timely opportunity to review and comment before finalization.

ix. Lighting, mechanical, and plug loads need to be segregated on separate electrical panels for energy monitoring purposes.

x. Once the preliminary electrical directories for each electrical panel have been defined, the City requests that they are provided to the City, to allow for a timely opportunity to review and comment before finalization.

xi. City personnel or the City's DDC consultant will conduct its own inspections of the system design, installation and functionality, and will prepare its own deficiency lists during the construction process and final inspection. The deficiency lists will need to be corrected prior to City sign off on completion.

6.3 City of Richmond Direct Digital Control for Buildings) and Energy Monitoring Guidelines

1. DEFINITIONS:

ARCNet:
- Attached Resource Computer Network (ARCNet) is a communications protocol for local area network of mechanism, through coaxial cabling.

ASHRAE:
- The American Society of Heating, Refrigerating and Air-Conditioning (ASHRAE) is an international standards organization for numerous building related systems. It is the organization's mission to advance the arts and sciences of heating, ventilating, air conditioning and refrigerating to serve humanity and promote a sustainable world. The Society and its members focus on building systems, energy efficiency, indoor air quality, refrigeration and sustainability within the industry.

ANSI:
- The American National Standards Institute (ANSI) is a standards organization that oversees the development of voluntary consensus standards for a large variety of products, services, systems, and personnel in the United States. In addition, the organization coordinates U.S. standards with international standards to try to ensure consistency.

BACNet:
- Is an ANSI/ASHRAE standard communication protocol for direct digital control networks and automated building mechanisms. It was designed to be used for applications such as heating, ventilation, and air-conditioning control, lighting, access control, and fire detection systems and their associated equipment.

Block Programming:
- Block programming, is a pre-programmed set of instructions (block) that can be used in a Direct Digital Control (DDC) system to control a specific action or transfer function. To understand the specific action that the block programming can accomplish, it is crucial that the pre-programmed instructions are able to be interpreted.

DDC:
- Direct Digital Control (DDC), refers to the automation system that will typically be used to control lighting and HVAC mechanical systems in a building.

Front End Software:
- Typically refers to a direct digital control graphical package and user interface that the building operator will usually interact with to review operating building systems, change scheduling, and access system use data.

Gateways:
- Are pre-programmed hardware devices in a direct digital control system that act as communication protocol translators for different protocols, such as from BACNet to ARCNet and Tridium.

General Control Language:
- Refers to a direct digital control system programming language that is textual and is somewhat straightforward to use.

IP:
- Internet Protocol (IP) is the principal communications protocol in the Internet protocol suite for relaying datagrams across network boundaries.

MSTP:
- Multiple Spanning Tree Protocol (MSTP) is an open source communication protocol language connecting terminal controllers to main direct digital control processing system, and is defined by the applicable networking standard IEEE 802.1Q.

Virtual Metering:
- Refers to the function of monitoring energy use of specific systems or pieces of equipment, based on demand and run time, through a building's direct digital control system and analog current transducers.

6.3 Continued

2. DIRECT DIGITAL CONTROL KEY REQUIREMENT STRATEGIES:

The City of Richmond has identified fundamental key requirements that should act as an overarching strategy for its direct digital control systems at existing and new facilities. These requirements will allow for the increased optimization of maintenance time and funding, more effective integration of new facilities to the City's existing building control systems, and increased capacity to monitor building equipment and system run time and energy use.

The following key requirements are to be applied when replacing existing DDC systems or installing new DDC systems:

i. Ensure interoperability of DDC products through a non-proprietary communication protocol:

Utilize the communication protocol standard BACNet, as currently defined in the ANSI/ASHRAE Standard 135 – 2010, to ensure that DDC products from various manufacturers can be used throughout the City's DDC system, and the City is not bound to use a specific manufacturer's proprietary systems.

ii. Eliminate the need for DDC gateway infrastructure:

Generally DDC systems consist of the groups of primary controls and terminal unit controls, which are connected through high and low speed networks to the user interface computer and management system. Utilizing the non-proprietary communication protocol BACNet to connect controls to the interface computer, removes the need for gateway hardware to be installed as part of a DDC system when various products with different communication protocols are used.

iii. Reduce the use of proprietary programming languages:

The City prefers the use of basic textual languages, such as General Control Language, for the programming of its DDC systems. Block programming would be considered if the internal operation of each block was easily obtained when necessary and effective training was provided by the manufacturer as needed.

iv. Ensure user interface graphics are customizable:

The City prefers the use of user interface graphics that can be customized to the needs of the City and its operators, and can allow for some level of consistency between different DDC systems.

v. Enable effective in-house programming:

The City prefers to have trained and knowledgeable in-house staff and operators complete desired changes to DDC systems programming, such as equipment scheduling and set point adjustments, in all DDC equipped City facilities.

vi. Ensure the equipment and energy use can be monitored effectively through the DDC system:

The ability to track energy use of each DDC equipped facility should be enabled through the DDC system. The energy use profile of each facility needs to be able to be broken down to its end use, e.g. electricity, gas, lighting, space heating, cooling, ventilation, plug loads, domestic hot water heating, building processes, etc., and will be specific to the facility and its function. The monitoring of energy usage needs to also be able to be provided on an equipment by equipment basis, e.g. HVAC Unit #1, lighting for the multipurpose room, etc.

vii. Enable the opportunity for data analytics and fault detection and diagnostics:

The City's DDC systems need to allow for future incorporation of data analytic software tools, and fault detection and diagnostic programs. These tools and programs, if established carefully, will allow for the quick assessment and diagnosis of mechanical system anomalies and/or failures.

6.3 Continued

3. DDC REPLACEMENT OR NEW INSTALLATION GUIDELINES:

This section is intended to provide more specific requirement guidelines when considering the replacement of an existing DDC system, designing a new facility, or the City is taking ownership of a new facility. These guidelines highlight key interoperability, energy use monitoring and basic operation aspects of a DDC system, and are not meant to cover all aspects of a DDC system's functionality.

1. General

1.1. DDC systems comprise of all aspects of monitoring and control of the specified systems and must include an operator control language which is either textual (TCL) or block (BPL) as specified.

2. Communication Protocol

2.1. The DDC System panels shall consist of native BACnet, microprocessor based, peer to peer, networked devices with the BACnet stack embedded in every controller. The controller connected to the input or output device shall deliver the associated BACnet point directly to the BACnet network without passing through any other device. Gateways are not permitted.

2.2. The control system shall consist of a high-speed, peer-to-peer network of DDC System panels and a web-based operator interface. Depict each mechanical system, lighting system, and building floor plan on a system graphic accessible by mouse click. A web server with a network interface shall gather data from this system and generate web pages accessible through a conventional web browser on any PC connected to the local network or through VPN over the Internet. Operators shall be able to perform all operator functions through the web browser interface.

2.3. System shall use the BACnet protocol for communication to the operator workstation, web server and for communication between control panels and modules. Schedules, setpoints, trends, multipoint trends, alarms and other required data shall be BACnet objects. Controller and operator interface communications shall conform to the latest BACnet ANSI/ASHRAE Standard (Current ANSI/ASHRAE Standard 135).

2.4. Complete DDC system programming language, programming tools and sequence of operation development environment will be provided to the City so that the City operators are able to write their own Sequences of Operation and load the programs into the controllers in the future. All programming tools and software available to an installing contractor shall be provided to the Owner.

3. DDC System Data

3.1. City DDC systems should be able to stream all data at five second intervals for short term storage and dynamic tuning, and at 5 minute intervals for permanent storage and later analysis.

3.2. DDC system data that is stored should be easily transferable to all common databases and cloud database services, and should support data tagging.

3.3. DDC system data that is stored should be easily exportable in CSV, Excel and XML format.

3.4. DDC system data should be stored and structured to allow interrogation by queries running on third party tools.

4. Installation

4.1. All installations shall conform both to manufacturer's recommended procedures and all applicable codes and regulations to the approval of authorities having jurisdiction including but not limited to the Canadian Electrical Code.

4.2. All equipment installed shall be mechanically stable and, as necessary, fixed to wall, ceiling or floor. Seismic restraint and anti-vibration mounts to be provided, if required, for the proper securing and isolation of the equipment.

4.3. All panels, enclosures and components shall be positioned to provide easy access for maintenance, replacement or expansion. All devices shall be neatly aligned vertically and horizontally. Wiring shall be concealed within Panduit in the enclosure. All terminations shall be made on labelled termination blocks. Each cover of any gutter box or electrical box containing terminations shall have a laminated photograph showing the interior of the box affixed to the outside of the box. Transducers and other accessory items shall not be mounted in the field. They shall be mounted in groups in centrally located control enclosures for ease of maintenance.

4.4. Equipment shall be installed in locations providing proper ambient conditions for its specified functioning, including adequate ventilation.

5. Wiring

5.1. All conduit, wiring, and cabling shall be installed to the applicable Codes and Regulations including the Canadian Electrical Code, and specified class, size, and type shall be approved by the City.

5.2. All wiring and cables shall be rated for the environment they are used in.

6. Labeling

6.1. All labeling identifying hardware and/or wiring throughout the project must match the as-built drawings.

6.2. Manufacturers' nameplates and UL or CSA labels shall be visible and legible after equipment is installed.

6.3 Continued

6.3. At every power supply serving a control panel, electronic actuator or other device, provide a lamacoid label that identifies the panel and breaker serving it. At the breaker panel mark each breaker that serves a power supply for the DDC system and indicate which DDC panel that breaker serves.

7. Field Devices

7.1. All sensors provided under this contract shall be installed in accordance with the manufacturer's prescribed procedure in addition to the specified requirements.

7.2. Pipe mounted sensors shall be rigidly mounted and mountings shall be adequate for the environment within which the sensor operates. Electrical boxes shall be properly tightened down on top of wells so that they cannot be spun by hand.

7.3. Temperature wells shall of the appropriate size and type for sensing water temperatures, as required in the graphics and/or points list.

7.4. All conduits attached to sensors shall be sealed to stop air transmitted from other areas affecting sensor readings. Wire penetration to wall mounted sensors shall also be sealed.

7.5. Locate all ductwork point type sensors 6 (six) feet down stream of coil if possible and at least 6 (six) inches from edge of duct. Point sensors shall only be used in return air plenums, and in ducts under 2.0 square feet in cross-section.

7.6. Averaging duct sensors shall be suspended on laminated aircraft cable or similar strung across the duct to prevent stress on the sensing element or as prescribed by the sensor manufacturer's best practice.

7.7. Install room temperature sensors at 5 (five) foot heights.

7.8. Locate all ductwork point type sensors 6 (six) feet down stream of coil if possible and at least 6 (six) inches from edge of duct. Point sensors shall only be used in return air plenums, and in ducts under 2.0 square feet in cross-section.

7.9. The location of all devices and panels require approval of the City prior to installation. The north outdoor air sensor shall be located on the north side of a facility in an area that is always shaded, away from the influence of exhaust air or other sources of heat. The south outdoor air sensor shall be located on the south side of a facility in an area exposed to the sun. The south sensor shall have a metal housing which shall be painted flat black. Where a facility has two sections, such as a high rise and low rise, the north and south sensors shall be installed for each of the two sections.

7.10. All conduits attached to sensors shall be sealed to stop air transmitted from other areas affecting sensor readings. Wire penetration to wall mounted sensors shall also be sealed.

7.11. All conduits attached to sensors shall be sealed to stop air transmitted from other areas affecting sensor readings. Wire penetration to wall mounted sensors shall also be sealed.

7.12. Freeze stats shall be installed in strict accordance with manufacturer's best practice and supported on laminated aircraft cable or similar, without stress on any portion of the sensing element. Observe relative mounting height of vapour tension element to control box.

7.13. All panel mounted devices shall be neatly aligned and secured.

7.14. Field electrical boxes shall be mounted securely and parallel or perpendicular to building lines

8. As-Built Drawings

8.1. As-Built drawings shall be self-contained and shall not reference other legacy control drawings.

9. DDC Panel Programmability

9.1. The following features shall be included to support the creation and maintenance of the system database. The features shall be intrinsic to each panel and manipulated through the operator interface.

9.1.1. Database

- Provide means for adding, deleting, defining and modifying points and point types through the operator interface.
- Provide user definable scale ranges for analog points including non-linear relationships.
- Provide user definable units for analog and digital points.
- Provide ability to assign normal position of digital points.
- Provide links in the database such that if a point name is changed in the database, all database occurrences of that point will change automatically.

9.1.2. Trend Logs and Graphs

- Provide trend log reporting of user selected points (any input, output or virtual point), with adjustable sample time and sample period. Provide capability and implement the display of four or more points simultaneously on one graph. Provide automatic and manual scaling capability of horizontal and vertical axes. Provide normalized time base on the abscissa of all trend graphs so that hour and minute grid marks fall on normal time based intervals of 5, 10, 15, 30 and 60.

6.3 Continued

- All controllers shall sample and store trend data locally at the panel level, and transmit the trend data in bursts over the BACNet network for central storage. The DDC panel buffering and periodic burst transmission is a requirement to prevent network congestion and to meet the network performance specifications.

9.1.3. User Configurable Trend Logs

- The system shall allow the operator to configure trend sample or change of value (COV) interval, start time, and stop time for each system data object and shall be able to retrieve data for use in spread sheets and SQL database programs.
- The operator interface shall allow review of trend information stored at the controller level as well as in the central storage. Provide a means to seamlessly include controller stored trend data with centrally stored trend data. This means shall not require additional effort by the operator.

9.1.4. Alarm Processing

- Operator defined alarms for all real and virtual points with adjustable alarm entry and exit limits, custom messages and graphics links.
- Automatic logging of alarms and acknowledgements.
- User definable routing of alarms to printer, screen and email.
- Alarms to process within 10 seconds regardless of system states.
- Any critical alarm which may be specified for items such as generator, sump level alarm, freeze protection, high domestic hot water temperature, high transformer room temperature, primary equipment failures or alarms and other critical alarms shall be emailed to designated individuals.

9.1.5. Totalization

- Provide ability to count digital occurrences and totalize analog values through time.

9.1.6. Scheduling

- Provide scheduling feature for creation of start / stop schedules.

Weekly

- Minimum 20 schedules per system panel type BC, three schedules schedule per AAC.
- 8 start stops per day on each weekly schedule

Annually

- Provide annual schedule to define holidays

Extended Hours

- Provide over-ride schedule to permit extended operation on a particular date. When this schedule is used there shall be no need for the operator to undo the extended hours schedule as it is scheduled for a particular date.

9.1.7. (Proportional-Integral-Derivative) PID Controllers

- Provide resident 3 mode software controllers in each DDC panel and include the following tuning parameters:
  - Setpoint
  - Measured variable
  - Control Action - direct or reverse
  - Proportional Gain
  - Integral Gain
  - Derivative Gain
  - Bias
  - Sampling Time
  - Output from 0 to 100%
  - Dead-band
- Provide the ability to modify the values of the above attributes from the TCL or BPL as well as through PID setup template.

9.1.8. TCL and BPL Functions

- Provide the programming language and user interface to allow programming of the DDC panel sequence of operations. Each panel shall have resident and proven TCL or BPL which shall be capable of reading the value and/or status of all system points and initiating both digital and analog control actions from any user defined combination of calculations and logical expressions which shall at a minimum include:
  - Addition, subtraction, multiplication and division.
  - Square roots, summations, absolute differences.
  - Logical “and”, “or”, “less than” and “greater than”.
  - Time delays, in seconds, minutes or hours.
  - Ability to embed comments in system generated documentation.
  - Ability to use time of day and day of year in algebraic calculations.
  - Ability for nested “If-then-else” logic statements.
  - Efficient method of discarding a number of highest or lowest readings from a group of samples.

<u>10. Operator Interface</u>

10.1. Provide a BACnet Advanced Operator Workstation B-AOWS to be installed on site or as directed by the Owner. Provide a web server to allow operator interface through their web browsers. Internet connectivity will be provided by the Owner. Coordinate with the Owner’s IT group for provisioning of secure connections. The web server shall be accessible using a standard Internet Explorer, Netscape, Chrome, Firefox and Safari browser.

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6.3 Continued

10.2. If any Flash, Multimedia or third party plug-ins or similar are required for the browser, then the system shall be compatible with the most up to date versions of these plug-ins to ensure compatibility with other browser functions, and to satisfy security updates of plug-ins. Future releases of the software required to maintain compatibility with these plug-ins shall be provided free of charge for 5 years from Total Completion. Programming of the system sequences of operation through the browser is not a requirement of this specification but is desirable. Provide full details in your proposal.

10.3. Web server shall reside on the Ethernet network with peer building controllers. Each standard browser connected to server via the Ethernet LAN, Internet or through VPN shall be able to access all system information and graphic functionality from the complete BACNet LAN including Ethernet and MS/TP sections.

10.4. Web server and BC controllers shall communicate using BACnet IP protocol. Web server or workstation and control network backbone shall communicate using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol and BACnet/IP addressing as specified in the most current ANSI/ASHRAE 135, BACnet Annex J.

10.5. The workstation environment may reside on the web browser physical computer providing best practice performance standards are achieved as defined in the performance specification.

10.6. The software interface shall allow each authorized operator to execute the typical best practice functions as defined in the performance specification.

10.7. In addition to the capabilities of the B-OWS the Advanced Operator Workstation shall provide the typical best practice functions as defined in the performance specification.

10.8. DDC Panels, Addressable Sensors and Actuators: Provide Building Controllers (BC) and Advanced Application Controllers (AAC). Application Specific Controllers (ASC) are not permitted. Provide Smart Actuators (SA), and Smart Sensors (SS) as required to achieve specified performance or interface with existing actuators. Every device in the system which executes control logic and controls HVAC equipment must conform to a standard BACnet Device profile as specified in the most current ANSI/ASHRAE 135, BACnet Annex L standard. All BCs and AACs shall have hand-off-auto switches on binary outputs.

10.9. Building Controllers (BCs): Each BC shall conform to BACnet Building Controller (B-BC) device profile as specified in the most current ANSI/ASHRAE 135, BACnet Annex L and shall be listed as a certified B-BC in the BACnet Testing Laboratories (BTL) Product Listing. Provide BCs for each piece or group of mechanical equipment with high point count or where memory and programming capacity is required for complex or global sequences of operation.

10.10. Advanced Application Controllers (AACs): Each AAC shall conform to BACnet Advanced Application Controller (B-AAC) device profile as specified in the most current ANSI/ASHRAE 135, BACnet Annex L and shall be listed as a certified B-AAC in the BACnet Testing Laboratories (BTL) Product Listing. Provide AACs for pieces of mechanical equipment such as unitary air handlers, heat pumps, fan coil units, variable air volume boxes and induction units.

10.11. Application Specific Controllers (ASCs): ASCs are not permitted.

10.12. Smart Actuators (SAs): Each SA shall conform to BACnet Smart Actuator (B-SA) device profile as specified in the most current ANSI/ASHRAE 135, BACnet Annex L and shall be listed as a certified B-SA in the BACnet Testing Laboratories (BTL) Product Listing.

10.13. Smart Sensors (SSs): Each SS shall conform to BACnet Smart Sensor (B-SS) device profile as specified in the most current ANSI/ASHRAE 135, BACnet Annex L and shall be listed as a certified B-SS in the BACnet Testing Laboratories (BTL) Product Listing.

10.14. BACNet Communication

10.14.1. Each BC shall reside on or be connected to a BACnet network using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol and BACnet/IP addressing.

10.14.2. BACnet routing shall be performed by BCs or other BACnet device routers as necessary to connect BCs to networks of AACs over MS/TP or Ethernet.

10.14.3. Each AAC shall reside on a BACnet network using ISO 8802-3 (Ethernet) Data Link/ Physical layer protocol with BACnet/IP addressing, or it shall reside on a BACnet network using the MS/TP Data Link/Physical layer protocol.

10.14.4. Each SA shall reside on a BACnet network using the ARCNET or MS/TP Data Link/ Physical layer protocol.

10.14.5. Each SS shall reside on a BACnet network using ISO 8802-3 (Ethernet) Data Link/ Physical layer protocol with BACnet/IP addressing, or it shall reside on a BACnet network using MS/TP Data Link/Physical layer protocol.

10.14.6. Select BACnet addressing so as to be compatible and fully interoperable with any existing BACnet systems in the facility.

10.14.7. Data Sharing. All controller firmware shall allow distributed controllers to share real and virtual object information seamlessly across networks.

6.3 Continued

10.15. Stand-Alone Operation: Each controller shall operate independently from the network and other controllers in the event communication is lost. Global variables shared from other panels shall be maintained at their last value until communication is resumed. Each BC and AAC shall have its own time clock synchronized to the others but capable of maintaining correct time in the event of network communication loss. All I/O points specified for a piece of equipment shall be integral to its controller and associated expansion I/O. Loops shall not be closed across the network.

10.16. Environment:

10.16.1. Electronic hardware shall be suitable for anticipated ambient conditions.

10.16.2. Electronic hardware used outdoors or in wet ambient conditions shall be mounted in waterproof enclosures and shall be rated for operation at -29°C to 60°C (-20°F to 140°F).

10.16.3. Electronic hardware used in conditioned space shall be mounted in dust-protective enclosures and shall be rated for operation at 0°C to 50°C (32°F to 120°F) and 0 – 95% RH non-condensing.

10.17. Real-Time Clock: BCs and AACs shall have a real-time clock.

10.18. Serviceability:

10.18.1. Controllers shall have diagnostic LEDs for power, communication, and processor.

10.18.2. Wires shall be connected to a field-removable modular terminal strip or to a termination card connected by a ribbon cable.

10.18.3. Each BC and AAC shall continually check its processor and memory circuit status and shall generate an alarm on abnormal operation. System shall continuously check controller network and generate alarm for each controller that fails to respond.

10.19. Memory:

10.19.1. Controller memory shall support operating system, database, trend log storage and programming requirements.

10.19.2. Each BC and AAC shall retain BIOS and application programming for at least 72 hours in the event of power loss.

10.19.3. Trend Logs – Provide enough controller memory to handle the specified trend logs in addition to all other memory requirements while meeting specified performance.

10.19.4. PID Controllers – One controller CO for each output point connected to the panel.

10.19.5. Software Points - Three variables for each output point connected to the panel.

10.19.6. Textual Control Language – 60 (sixty) lines with 4 operators each, for each output point connected to the panel; or the equivalent using BPL.

10.19.7. Descriptors - Provide 1 (one) descriptor for each real or virtual point.

10.19.8. Totalizers - Provide 1 (one) Totalizer TZ for each digital input, output or binary virtual point in the panel.

10.20. Immunity to Power and Noise: Controllers shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shutdown below 80% nominal voltage. Operation shall be protected against electrical noise, RFI, EMI and specifically and from keyed radios up to 5 W at 1 m (3 ft.).

10.21. Backup and Restore: Provide a means of automated system backup and restore so that all control language, databases, system state and trend log information is backed up to long term storage. Provide means of system restore so that a panel or entire system can be restored from the backup without operator intervention beyond initiation of the restore. Include any backup for databases supporting any gateways to legacy systems.

11. Effective Execution Time

11.1. The maximum permissible execution time is 1 (one) seconds and is defined as follows:

11.1.1. The time required for the CPU in the controller to execute all application software in the panel, from a point in the software back to the same point, assuming full memory usage, as defined in these specifications while simultaneously responding to normal operator or terminal display requests and carrying on normal inter-panel communications averaged over a 1 (one) minute period.

11.1.2. The execution time may be verified by setting up a counter in each panel and monitoring the counting rate. The counter will not be interrupt driven but shall count each scan.

12. Effective System Speed Testing

- This test is intended to address overall data throughput including inter-panel communications and display and will be monitored by evaluating system display response. The test will be carried out with the system fully commissioned and implemented including all specified trend logs. A complex graphic with 30 (thirty) points comprised of inputs and outputs from different panels will be assembled onto a single graphic.

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6.3 Continued

- The system will pass the performance test if the screen display of the graphic fully displays the graphics and all real time point values within 6 (six) seconds of clicking the selection button for the graphic. The contractor will take whatever steps are required including installing additional equipment, bandwidth and software to meet the performance requirements specified. The installation and project may be considered incomplete unless this performance standard is reasonably met. The web browser cache will be cleared prior to the test.

13. Spare Capacity Identification
- Identify spare point capacity by type for each panel on the network diagram to be submitted with the proposal. The system configuration shall be described in the network diagram provided with the proposal, and the spare point capacity shall be noted on a panel by panel basis for each point type by identifying the quantity of used points compared to total point capacity for that point type expressed as a fraction, e.g. 7/12 AI, 7/8 AO.

14. System Expansion Capabilities
- The system shall have expansion capabilities to accommodate 3000 hardware points plus 6,000 software points without requiring additional licensing. It is anticipated that the terminal equipment will be added to the system over time with the potential for integrated lighting control.

15. Power Supplies and Line Filtering

15.1. Power Supplies
- Control transformers shall be ULC listed. Furnish Class 2 current-limiting type or furnish over-current protection in primary and secondary circuits for Class 2 service in accordance with CEC requirements. Limit connected loads to 80% of rated capacity.
- Transformers shall be contained inside separate electrical box enclosures adjacent to or below the DDC electronics and ancillary device panels.
- DC power supply output shall exceed the output current and voltage requirements by 10% to allow for expansion of output devices. Unit shall not exceed output ripple of 5.0 mV maximum peak-to-peak. Regulation shall be 1.0% line and load combined, with 100-microsecond response time for 50% load changes. Unit shall have built-in over-voltage and over-current protection and shall be able to withstand 150% current overload for at least three seconds without trip-out or failure.
- Unit shall operate between 0°C and 50°C (32°F and 120°F). EM/RF shall meet FCC Class B and VDE 0871 for Class B and MILSTD 810C for shock and vibration.
- Line voltage units shall be ULC recognized and CSA listed.

15.2. Power Line Filtering

Provide internal or external transient voltage and surge suppression for workstations and controllers. Surge protection shall have
- Dielectric strength of 1000 V minimum.
- Response time of 10 nanoseconds or less.
- Transverse mode noise attenuation of 65 dB or greater.
- Common mode noise attenuation of 150 dB or greater at 40-100 Hz.

16. Field Devices

16.1. General

16.1.1. Sensors, relays, current transducers and other input/output devices shall be neatly labelled at the time of installation with a durable tag as specified elsewhere.

16.1.2. All field devices shall be selected to have full compatibility with the DDC panels.

16.1.3. Any field device proposed for use which is not one of the products listed under “Standard of Acceptance” in the design specifications will be evaluated by the Consultant against the specified technical performance and the quality and characteristics of the products which are listed. If any proposed field device is deemed not equivalent to the specification, then the Contractor shall provide another device which does meet specification.

16.1.4. Devices shall meet the specific requirements listed, and shall be compatible with respect to power supply, signal characteristics, and other factors with the DDC system being proposed. Power supplies shall be provided as required for all devices.

17. Hardware Point Type Definition

The nomenclature for Hardware Point types needs to adhere to the project design specifications.

18. Hardware Point Requirements

The DDC system shall include all DDC hardware points specified in the points lists and graphics, and shall include all virtual points necessary to carry out the sequences of operation to be provided by the Owner.

19. Software Point Definitions

The nomenclature for Software Point types needs to adhere to the project design specifications.

20. Point Tags

Luggage tag style identification of field points shall be provided as per the project design specifications.

21. Sequence of Operation

The sequence of operations shall adhere to the project design objectives, and shall be commissioned at the time of installation and maintained and fine-tuned during the Warranty year.

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6.4 City of Richmond Building Equipment Monitoring and Integration Requirements

[July 2016]

1. DEFINITIONS:

ASHRAE:

- The American Society of Heating, Refrigerating and Air-Conditioning (ASHRAE) is an international standards organization for numerous building related systems. It is the organization's mission to advance the arts and sciences of heating, ventilating, air conditioning and refrigerating to serve humanity and promote a sustainable world. The Society and its members focus on building systems, energy efficiency, indoor air quality, refrigeration and sustainability within the industry.

BACNet:

- Is an ANSI/ASHRAE standard communication protocol for direct digital control networks and automated building mechanisms. It was designed to be used for applications such as heating, ventilation, and air-conditioning control, lighting, access control, and fire detection systems and their associated equipment.

Canadian 2017 NECB:

- The National Energy Code of Canada for Buildings (NECB) 2017 provides minimum requirements for the design and construction of energy-efficient buildings and covers the building envelope, systems and equipment for heating, ventilating and air-conditioning, service water heating, lighting, and the provision of electrical power systems and motors.

Energy Star®:

- Is an international standard for energy efficient consumer products. The Energy Star ® name and symbol are administered and promoted in Canada by Natural Resources Canada. Energy Star® qualified products meet strict technical specifications for energy performance—tested and certified. Devices carrying the Energy Star® identification, such as computer products and peripherals, kitchen appliances, buildings and other products, generally use 15–30% less energy than required by federal standards.

Energy Star® Certified:

- Refers to Energy Star ® certified products and buildings that meet strict North American energy performance standards. Typically these products and buildings use 15–30% less energy and cause fewer greenhouse gas emissions than comparable products and buildings.

Energy Star® Portfolio ManagerTM:

- Is an online tool you can use to measure and track energy use, water consumption, and greenhouse gas emissions, and benchmark your building's performance against similar type buildings in Canada. Portfolio ManagerTM uses a 1-100 Energy Star® performance scale: a score of 50 indicates average energy performance (50th percentile) while a score of 75 or more indicates top performance (75th percentile). A score of 75 or more in a particular year allows for the facility to be Energy Star® Certified. The Canadian version of the benchmarking tool is applicable to Financial Office, K-12 school, Hospitals, Ice/Curling Rink, Medical office, office, Residential Care Facility, Senior Care Community, Supermarket/Grocery Store.

HVAC:

- Heating Ventilation and Air Condition (HVAC) is the technology of indoor environmental comfort. HVAC system design is a subdiscipline of mechanical engineering, based on the principles of thermodynamics, fluid mechanics, and heat transfer.

HVI:

- Home Ventilating Institute (HVI) is a nonprofit association offering a variety of services for manufacturers including, but not limited to, test procedures, certification and verification programs for airflow, sound and energy performance, and market support. Its mission is to serve consumers and members by advancing residential ventilation for healthy, energy-efficient homes.

IESNA:

- The Illuminating Engineering Society of North America (IESNA) is a non-profit organization that publishes standards for the lighting industry. The mission of the organization is to advance knowledge and disseminate information for the improvement of the lighted environment to the benefit of society. The IESNA lighting standards are developed through technical committees that include hundreds of qualified individuals from the lighting and user communities.

MERV:

- The minimum efficiency reporting value (MERV), is an ASHRAE measurement scale designed to rate the effectiveness of air filters. The scale is designed to represent the worst case performance of a filter when dealing with particles in the range of 0.3 to 10 micrometers. The MERV rating is from 1 to 16. Higher MERV ratings correspond to a greater percentage of particles captured on each pass, with a MERV 16 filter capturing more than 95% of particles over the full range.

MSTP:

- Multiple Spanning Tree Protocol (MSTP) is an open source communication protocol language connecting terminal controllers to main direct digital control processing system, and is defined by the applicable networking standard IEEE 802.1Q.

6.4 Continued

NRCan:

- Natural Resources Canada (NRCan) works with other government departments, the provinces and territories, and other Canadian and international partners to address energy needs and potential while considering new policies, practices, and technologies.

- NRCan's expertise in the areas of energy efficiency, and energy sources and distribution allows us to provide useful energy resources and help Canadians benefit economically, environmentally, and socially from the secure and sustainable production and use of Canada's energy resources.

SEER:

- The Seasonal Energy Efficiency Ratio (SEER) rating of a unit is the cooling output during a typical cooling-season divided by the total electric energy input during the same period. The higher the unit's SEER rating the more energy efficient it is. In North America, the SEER is the ratio of cooling in British thermal unit (BTU) to the energy consumed in watt-hours.

TCP/IP:

- Transmission Control Protocol/Internet Protocol (TCP/IP) is the principal communications protocol in the Internet protocol suite for relaying datagrams across network boundaries.

Virtual Metering:

- Refers to the function of monitoring energy use of specific systems or pieces of equipment, based on demand and run time, through a building's direct digital control system and analog current transducers.

2. OPTIMIZE MAINTENANCE AND ENERGY PERFORMANCE:

This section is intended to provide a basis by which corporate facilities can be maintained and monitored to maximize efficient resource use, and reduced maintenance and operational costs.

i. Operation Plan: Each facility should have an operational plan developed that at a minimum includes an occupancy schedule, equipment run-time schedule, design set points for HVAC equipment, and design lighting levels. This plan should be regularly reviewed and optimized as needed.

ii. Measuring Energy Efficiency: Two options can be used to measure energy efficiency performance in comparison to typical buildings of similar type and function:

a. Option 1: Target an Energy Star® rating of 75% or higher, if eligible to receive an energy performance rating using the U.S. EPA's Energy Star® Portfolio Manager Tool (Canadian edition).
b. Option 2: If a building is not eligible to receive an energy performance rating using the U.S. EPA's Energy Star® Portfolio Manager Tool (Canadian edition), target increased energy efficiency of 20% as compared to typical buildings of similar type and function using national average energy data (National Resources Canada, Energy Star, et al).

iii. Measurement and Verification: Track the energy and water use of specific systems, end uses (i.e. lighting, HVAC, plug loads, etc.), and the building overall, to allow for continuous optimization. If possible, accomplish this requirement using the building automation system.

iv. Benchmarking and Tracking Building Energy Consumption: Regularly compare energy performance data with previous years' energy performance data, to ensure operational energy efficiency is being maintained.

v. Ongoing Commissioning: Complete re-commissioning activities on an approximately five year cycle to address changes in facility occupancy, use, maintenance and repair. Make periodic adjustments and review of building operating systems and procedures essential for optimal energy efficiency and service provision.

vi. Building Automation System: Employ full building automation system for increased control and programming capability of mechanical system and lighting systems. It is required that City of Richmond pre-qualified building automation system supply and install contractors be used for new and replacement installations. Please see Section 5.0 for more details.

vii. Local Thermostat: If applicable, use programmable thermostat that include energy efficient options including but not limited to; night set back, programmability for each day, optimal start, and zones separated by function.

6.4 Continued

viii. Heat Recovery Ventilation Systems: Heat recovery ventilation systems used in corporate facilities need to be Home Ventilating Institute (HVI) certified with 85% efficiency.

ix. Air or Ground Source Heat Pumps: Air or ground source heat pumps used in corporate facilities should be Energy Star® certified with a minimum target for energy efficiency of SEER 16.

x. Gas Fired Rooftop unit: Gas fired rooftop units used in corporate facilities will target a minimum energy efficiency rating of SEER 13.

xi. Heat Pump Rooftop units: Heat Pump rooftop units used in corporate facilities will target a minimum energy efficiency rating of SEER 15.

xii. Roof top units: Economizer should be used for all rooftop units 5 tons or greater. All rooftop units, air handling units, Energy recovery ventilators (ERV), Heat recovery ventilators (HRV) and makeup air units, and shall use industry standard sized filters.

xiii. Natural Gas Boiler: Natural gas boilers used in corporate facilities will target a minimum efficiency rating of 95%.

xiv. Air Compressor: All pneumatic air compressors should be equipped utilizing automatic condensate drain system. Air compressors for corporate truck maintenance activities, require a minimum of 200 PSI operating pressure.

xv. Domestic Hot Water: Domestic natural gas hot water boilers used in corporate facilities and Domestic electric hot water boilers used in corporate facilities should be Energy Star® certified with a target minimum efficiency rating of 90%.

xvi. Appliances: Appliances (Air purifiers, , Laundry machines, Dishwashers, Freezers, Refrigerators, Pool pumps, Water coolers, Commercial food service equipment) used in corporate facilities should be Energy Star® certified.

xvii. Ozone Depleting Compounds: Refrain from using Ozone Depleting Substances. Ozone Depleting Substances include CFCs, HCGCs, halons and others used in refrigerants, fire extinguishing systems and chemicals (sterilants and solvents).

xviii. Electric motor and pump: Use high efficiency motors and pumps, whenever possible. Targeting 25% better than Canadian 2011 NECB performance curves for motors and pumps.

xix. Improved Lighting Efficiency: As budgets allow, high efficiency lighting technology and controls is preferred for all new installations, please refer to Section 6.0 Optimize Lighting System for further guidance on lighting guidelines.

xx. Lighting Levels: Refer to the IESNA standards for target lighting levels depending on building type and room function. In addition, please refer to Section 6.0 Optimize Lighting System for further guidance on lighting guidelines.

xxi. On-Site Renewable Energy: Implement renewable energy generation project, when lifecycle costs are effective at facilities to further reduce conventional energy purchases. Refer to NRCan website.

xxii. Equipment: All equipment, devices, controls needs be well supported by a knowledgeable local technical support staff, local sales representatives and local field service/factory trained representatives to assist in the selection, application and servicing of all equipment. All replacement parts and components need to be readily available (preferred less than 5 day delivery wait time) and cost effective.

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6.4 Continued

OPTIMIZE WATER EFFICIENCY:

This section is intended to provide a basis by which corporate facilities can reduce indoor potable water use, reducing the burden on local water supply and wastewater.

i. Water metering: New corporate facilities will include water meters. Where feasible, these meters will be remotely monitored by the building's automation and monitoring system. Where possible, it is preferred that an additional water meter is installed to monitor the water consumption for outdoor activities, and that this meter also be monitored through the building's automation system.

ii. Indoor plumbing fixture and fitting efficiency: The following table outlines the targeted water fixture efficiency flush/flow rates for civic facilities for both new construction and replacement projects, and the maximum flush/flow rates as per current BC building codes. Where feasible, it is preferred that purchased fixture products water usage is on the lower end of the range to maximize water conservation.

Table 1 – Targeted Fixture Flush/Flow rates for the City of Richmond

Fixture Type	Flow Rate
	(Litres per minute [LPM] or Litres per flush [LPF])
Dual-flush toilets	High flush = 6.0 LPF Low flush = 3.4 to 4.1 LPF
Urinals	1.9 LPF
Lavatory faucet	1.9 to 8.3 LPM
Kitchen faucet	5.7 to 8.3 LPM
Showers	5.7 to 7.6 LPM

iii. Water-Efficient Products: Where applicable reduce the use of potable water through the use of fixtures with automatic controls. In addition, for water using appliances it is required that Energy Star® certified products are used where ever possible.

iv. Water Harvesting: Whenever possible and practicable re-use storm water for landscaping and irrigation.

ENHANCE INDOOR ENVIRONMENTAL QUALITY:

The intent of this section is to provide a basis for optimizing indoor environments to promote occupant comfort, health, and enjoyment of the space.

i. Minimum IAQ Performance. Meet or exceed most current ASHRAE Standard 62.1, Ventilation for Acceptable Indoor Air Quality.

ii. Ventilation and Thermal Comfort. Meet or exceed most current ASHRAE Standard 55, Thermal Environmental Conditions for Human Occupancy.

iii. Filtration Media. Utilize Minimum Efficiency Reporting Value (MERV) of at least 11 for equipment that requires filtration material. Where applicable, GeoPleat or Mini-Pleat filter with MERV 13 must be used. Filter media used in all HVAC equipment needs to be of standard sizing.

iv. Day lighting and lighting Controls. Automated lighting controls (occupancy/vacancy sensors with manual-off capability) are provided for appropriate spaces including restrooms, conference and meeting rooms, employee lunch room, training rooms and offices. Where ever possible and feasible there should be no on schedule for DDC controlled lighting and occupancy sensors should be used to solely recognize inactivity, with switches used to turn lights on.

v. Low-Emitting Materials. Use low emitting materials for building modifications, maintenance, and cleaning. In particular, specify the following materials and products to have low pollutant emissions: composite wood products, adhesives, sealants, interior paints and finishes, solvents, carpet systems, janitorial supplies and furnishings.

vi. Environmental Tobacco Smoke Control. Prohibit smoking within and in the vicinity of the building as per the City of Richmond Public Health Protection Bylaw, Worker Compensation Board (WCB) Occupational Health and Safety Regulations, and Vancouver Costal Health Authority regulations.

6.4 Continued

INTEGRATE BUILDING AUTOMATION SYSTEMS:

The intent of this section is to provide a basis for optimizing the City's building control and energy monitoring capacity to maximize maintenance and operational efficiency, and efficient building resource use. In addition, this section will be used to standardize the City's DDC systems and graphic interface in new and existing buildings.

i. Prequalified Supply and Installation Contractors: One of the City's prequalified Supply and Installation Contractors for Direct Digital Controls (DDC) Systems must be used for the mechanical and lighting control of City owned and/or operated space.

ii. Lighting Control: Lighting control is to be tied into separate DDC controllers (unless exempted by the City where in they may be tied in to HVAC DDC controllers), which will be provided by one of the prequalified contractors, with the location and number to be specified by the Electrical Design Consultant as part of the electrical design tender package. The electrical engineer will specify exact model numbers of luminaires and physically test the control interface prior to tender to ensure that the luminaires are compatible with the prequalified DDC systems.

iii. DDC Graphics and Monitoring: Graphics for the operator interface must be prepared to meet City requirements, which highlight energy efficiency and comfort. Graphic functionality for energy use monitoring will include, but is not limited to, energy use breakdown between electricity and natural gas, further segregation of each fuel type by each functional end use (e.g. ventilation, cooling, heating, pumping, lighting, plug loads, etc. – note that this requires tagging of end use into multiple categories), and by specific systems and equipment. The operator interface for the City will run on the City's web-servers. This work must be coordinated through the City's IT group to arrange loading of graphics, databases, and for security requirements.

iv. Energy Data: All energy data collected will be stored on the City's Sequel Server. The City will provide connection credentials so that the supplied system can store the data. The system must also be capable of delivering this data using BACnet over Ethernet, BACnet over MSTP and BACnet over TCP/IP to third party data repositories capable of accepting BACnet data.

v. DDC Access and Data points: The DDC system will be remotely accessed by the City's web based operator interface. Data will be collected at intervals not to exceed 15 seconds for all points during the commissioning process to ensure system capacity, stability and control loop tuning. These data points must include measurable variable, manipulated variable, and setpoint variable for each loop, as well as other variables, measurements and outputs as required to demonstrate the performance of the system. VPN network connectivity will be provided by the Supply and Installation Contractor for secure access of sufficient bandwidth to support this.

vi. Energy Use Monitoring: Any energy use monitoring shall be done through sub-meters that are BACnet enabled, or through virtual metering.

vii. Water Metering and Monitoring: A water meter will provide instantaneous and aggregated water consumption information of each mechanical makeup water system such as cooling tower, chilled water system, heating water system, heat pump system, Geo/ground loop and Solar system. The information will be delivered using BACnet over MSTP, BACnet over Ethernet, or BACnet over TCP/IP.

viii. Hydronic Energy Monitoring: All hydronic that introduce or extract energy flows to the subject premises will be monitored. These will include measurement of flow and differential temperature. The calculation of energy and power will be performed at the meter or within the DDC system. The supply and return temperatures will be transmitted along with the flow information to the DDC system. The information will be delivered using BACNet over MSTP, BACNet over Ethernet, or BACNet over TCP/IP.

ix. Points List Review: Once the mechanical and lighting DDC points list has been initially defined, the City requests that they are provided to the City along with the mechanical and electrical specifications, to allow for the timely opportunity to review and comment before finalization.

x. Segregated Electrical Panels: Lighting, mechanical, and plug loads need to be segregated on separate electrical panels for energy monitoring purposes.

xi. Electrical Directory Review: Once the preliminary electrical directories for each electrical panel have been defined, the City requests that they are provided to the City, to allow for a timely opportunity to review and comment before finalization.

xii. Inspections: City personnel or the City's DDC consultant will conduct its own inspections of the system design, installation and functionality, and will prepare its own deficiency lists during the construction process and final inspection. The deficiency lists will need to be corrected prior to City sign off on completion.

xiii. Documentation: In addition to hard copies of documents that may be specified, electronic copies of system documentation in PDF format are required.

6.4 Continued

OPTIMIZE BUILDING LIGHTING SYSTEMS:

Corporate lighting guidelines and requirements are intended to provide the basis for optimizing building interior and exterior lighting controls and associated electrical use, and to standardize the type of lighting used depending on its function.

General Guidelines

i. All interior building lighting shall be supplied from 120 volt power systems.
ii. Lighting design shall incorporate the principles of sustainability and its products and systems shall be energy conserving, long life, have a low cost of ownership and be accessible for service and maintenance.
iii. For interior building lighting solutions, Light Emitting Diode (LED) lighting is preferred.
iv. For exterior lighting applications (wall mounted fixtures, low mast light fixtures in parking lot), LED lighting is preferred.
v. Daylight harvesting opportunities shall be implemented in areas where natural daylight is available.
vi. Uniformity and low brightness contrast shall be achieved by judicious use of luminaires and their locations.
vii. All lighting shall be designed to suit the task and task location rather than the general lighting. The most current NECB1 or ASHRAE 90.1 , IESNA and WorkSafeBC standards shall be taken into consideration and photometric calculations submitted where requested. The light loss factor (LLF) which is used in these calculations, shall take into consideration the lamp lumen depreciation factor and dirt depreciation factors associated with the light source and environment.
viii. When mounting luminaires in high ceiling spaces, consideration must be given to ensure access for maintenance activities. Indoor lighting shall be accessible either from ladders on flat surfaces such as floors or stair landings or from powered lifts with a maximum lift of 6.1 m. Building access, floor construction, and elevators shall permit entry and use of existing standard lift equipment for proper and safe maintenance. If special equipment is required for lighting maintenance, then the consultant shall, prior to tender, prepare and submit a Lighting System Maintainability Plan to the City of Richmond for review and approval and it shall contain documentation describing the special equipment, access arrangements for special equipment, and a maintenance schedule and spare parts list.
ix. The lighting design proposed for all public areas such as corridors and stairways shall ensure the life safety of building occupants at all times and shall also minimize lighting energy required to zero, if possible, when the building is un-occupied. (i.e. lights off until occupancy has been detected or an emergency has occurred). A portion of the lighting fixtures shall be wired to an emergency power panel if an emergency generator is available. Lighting circuits fed from emergency power panels shall be arranged so that they may be switched or dimmed.
x. In general, where feasible and economical LED lighting is preferred for all interior spaces. It is preferred for interior LED luminaires, such as troffers, that the driver be mounted in an easily accessible location i.e. not behind the luminaire, so as to reduce maintenance time if replacement is needed.
If there is not a strong business case for interior LED lighting, then linear fluorescent lighting is preferred. Linear fluorescent luminaires shall be equipped with 120 volt electronic ballasts and T8-25 watt lamps or with T8-32 watt lamps in low temperature locations. Bent 'U' tube fluorescent luminaires are not acceptable. Lighting solution proposals using T5 linear fluorescent systems are not acceptable.
xi. Non-linear specialty fixtures such as pot lights, cylinders, wall sconces, wall washers and other decorative lighting shall be minimized. If using fluorescent fixtures, a maximum of 10% of the total quantity of fixtures in the building project is recommended.
xii. HID fixtures such as Metal Halide (MH) or High Pressure Sodium (HPS) are not acceptable

Lamp, Ballast/Driver & Fixture Guidelines

i. 2700º K to 3000º K shall be the typical color temperature range used for theatrical applications or highlighting any artwork.
ii. 3500º K shall be the typical color temperature used for all interior applications.
iii. 4000º K shall be the typical color temperature used for all exterior applications.
iv. The use of LED lamps is encouraged and as substitutes for traditional applications involving CFL, MR-16, PAR 20, PAR 30, BR30, PAR 38 lamps, and linear fluorescent lamps. LED lamps shall be Energy Star rated.
v. The use of LED fixtures is encouraged, and shall be DLC (Design Lighting Consortium) listed. The drivers shall have either 0-10V or phase dimming capability (for buildings where it is not practical to run low voltage wiring).
vi. Lamps shall be the longest life available. Preference will be given to lamps and lighting containing the lowest amount of mercury and other toxic components.
vii. If applicable, it is preferred that T5HO and T8 fluorescent lamps be extra-long life or extended life lamps rated for 40,000+ hours operation with 3 hours per start
viii. Where T5 HO lamps are used in enclosed fixtures, lamps rated for higher temperatures shall be used.
i. All fluorescent lighting ballasts shall operate from 120 volt input voltage and shall be either instant start (when used with LED lamps) or program start electronic type (when used with fluorescent lamps) with normal ballast factor. All ballasts shall have parallel lamp operation. Acceptable manufacturers are Philips Advance, GE Lighting, Sylvania Lighting and Universal Lighting.
ii. Ballast output frequency shall be greater than 42 kHz.
iii. Dimming ballasts shall be program start with either line voltage or 0-10 volt control.
iv. Ballasts shall have lamp end-of-life detection and shutdown circuitry that meets the most current ANSI standards.

6.4 Continued

Energy Allowances

i. All interior lighting shall not exceed the energy density limits as defined in the most current NECB or ASHRAE 90.12 lighting power densities standard, using either the whole building area method or the space by space evaluation method. For the whole building area evaluation method, the standard is currently 0.90 watt per square foot.
ii. All exterior building lighting shall not exceed the lighting power density limits as defined in the most current NECB2 or ASHRAE 90.12 standard.

Lighting Controls

i. All interior lighting (including stairwells) shall have controls such that when the lighting is not needed, it will automatically be either turned off or dimmed to a low output condition, and shall conform to the most current relevant NECB2 or ASHRAE 90.12 standard.
ii. All lighting control systems shall be fully tested and commissioned and a Lighting System Commissioning Report shall be prepared and certified by a responsible professional as per the most current relevant NECB2 or ASHRAE 90.12 standard.
iii. As per the DDC integration requirements, where low voltage relay controls are provided for new building projects they shall include a BACnet compatible DDC interface device to allow for all scheduling functions related for the lighting systems to be controlled by the building's DDC system.
iv. All exterior building mounted lighting and exterior building area lighting shall be controlled by photocell or astronomical time clock. Lighting which is powered from the building electrical system shall be controlled by the building's DDC system.
v. Occupancy sensors shall be dual technology type with both Passive Infrared (PIR) and acoustic/ultra-sonic sensors, and may be either line voltage or low voltage types. Low voltage occupancy sensors with 1 or 2 poles and local power packs are preferred. Slave power packs are not acceptable.
vi. Offices shall have light control switches at all entrances, exits and vestibules. These interior spaces shall also have occupancy sensors integrated with the control switch or mounted at a high level in a corner and arranged for semi-automatic operation such that manual operation of the local switches is required to energize the lighting while occupancy sensors and local switches will de-energize the lighting. Large spaces may need more than one sensor.
vii. Corridors, lobbies, washrooms and similar public spaces shall have occupancy sensors, mounted at high levels, and arranged for full automatic operation to dim the light fixtures to a level which meets the minimum requirements for emergency egress during periods of vacancy.
viii. Occupancy sensors are not permitted in interior spaces that may be or may become hazardous, such as electrical and mechanical service rooms.
ix. Where feasible, all offices, corridors, stairways and other public spaces shall incorporate daylight harvesting via use of interior mounted photocells and arranged to take advantage of free illumination while maintaining acceptable minimum illumination levels within the space.
x. LED dimmers shall be compatible with the LED lamps used and their drivers.

Exit Signage

i. Exit lighting shall be provided in accordance with the BC Building Code and the Canadian Electrical Code as amended by BC Electrical Safety regulations.
ii. All exit signs shall be illuminated by LED light sources and shall have an emergency power NiCad battery.
iii. Exit signs shall be powered at 120 volts from emergency power panels, if available.
iv. The "Running Man" style EXIT sign that conforms to the CAN/ULC-S572 standard is required as set out by the BC Building Code.

Emergency Lighting

i. Emergency lighting must be installed in accordance with the latest revision of the B.C. Building Code and City of Richmond's Bylaw No. 8306 (Fire Protection and Life Safety).
ii. Provide standby emergency generator if motor loads require emergency power.
iii. All battery pack lighting, remote heads and exit lights shall be LED type and manufactured by 'Ready-Lite' or an approved equal. 'Ready-Lite' products are available from local suppliers and shall be stocked by City of Richmond. It is important that City of Richmond have stock so that repairs can be done quickly and effectively as required for the life safety system.
iv. The battery packs shall be long life type and either 12 volts DC or 24 volts DC and shall be in accordance with CSA C22.2 No. 141.
v. All battery packs shall be mounted on the wall using anchors capable of supporting the weight, or mounted on an appropriately sized shelf, supplied from 'Ready-Lite' or an approved equal.
vi. Generator and Electrical rooms shall be provided with an emergency battery lighting pack.
vii. If a 12 volt DC battery lighting pack is used for emergency lighting power, it shall be rated for 36 watt to 360 watt and should not be self-testing.
viii. If a 24 volt DC battery lighting pack is used for emergency lighting power, it shall be either a 360 watt unit or a 720 watt unit, and should not be self-testing.
ix. For both 12 volt DC and 24 volt DC systems, the heads and remote heads shall be 9 watts each.
x. Battery packs that are fed from a 120 volt AC. source shall have a 120 volt duplex receptacle mounted adjacent so that the battery pack can be plugged into the receptacle, to facilitate testing and replacement when needed.

6.5 City of Richmond General Lighting Guidelines

[January 2016]

1.0 GENERAL

1.1 Related City of Richmond Guidelines
- .1 High Performance Building Policy
- .2 City of Richmond Sustainable Operation and Maintenance Requirements

1.2 Coordination Requirements
- .1 City of Richmond Facilities
- .2 City of Richmond Project Development
- .3 City of Richmond Information Technology

2.0 MATERIAL AND DESIGN REQUIREMENTS

2.1 General

.1 All interior building lighting shall be supplied from 120 volt power systems.

.2 Lighting design shall incorporate the principles of sustainability and its products and systems shall be energy conserving, long life, have a low cost of ownership and be accessible for service and maintenance.

.3 For interior building lighting solutions, preference shall be given to Light Emitting Diode (LED) and linear fluorescent light sources.

.4 For exterior lighting applications (wall mounted fixtures, low mast light fixtures in parking lot), preference shall be given to LED light sources. Fluorescent light sources may be used selectively.

.5 Daylight harvesting opportunities shall be implemented in areas where natural daylight is available.

.6 Uniformity and low brightness contrast shall be achieved by judicious use of luminaires and their locations.

.7 All lighting shall be designed to suit the task and task location rather than the general lighting. ASHRAE 90.1-2010, IESNA and WorkSafeBC guidelines shall be taken into consideration and photometric calculations submitted where requested.

.8 The designer shall take into account 4 to 5 year fluorescent lighting group re¬lamping program. All maintenance factors shall be maximized because of the expected clean environment in the facilities.

.9 When mounting luminaires in high ceiling spaces, consideration must be given to ensure access for maintenance such as lamp and ballast changing. Indoor lighting shall be accessible either from ladders on flat surfaces such as floors or stair landings or from powered lifts with a maximum lift of 6.1 m. Building access, floor construction, and elevators shall permit entry and use of existing standard lift equipment for proper and safe maintenance. If special equipment is required for lighting maintenance, then the consultant shall, prior to tender, prepare and submit a Lighting System Maintainability Plan to the City of Richmond for review and approval and it shall contain documentation describing the special equipment, access arrangements for special equipment, and a maintenance schedule and spare parts list.

.10 The lighting design proposed for all public areas such as corridors and stairways shall ensure the life safety of building occupants at all times and shall also minimize lighting energy required to zero, if possible, when the building is un-occupied. (I.e. lights off until occupancy has been detected or an emergency has occurred). A portion of the lighting fixtures shall be wired to an emergency power panel if an emergency generator is available. Lighting circuits fed from emergency power panels shall be arranged so that they may be switched or dimmed.

.11 In general, where feasible and economical LED lighting is preferred for interior spaces. It is preferred for interior LED luminaires, such as troffers, that the driver be mounted in an easily accessible location i.e. not behind the luminaire, so as to reduce maintenance time if replacement is needed.

.12 If there is not a strong business case for interior LED lighting, then linear fluorescent lighting is preferred. Linear fluorescent luminaires shall be equipped with 120 volt program start electronic ballasts and T8-25 watt lamps or with T8-32 watt lamps in low temperature locations. Bent 'U' tube fluorescent luminaires are not acceptable. Lighting solution proposals using T5 linear fluorescent systems are not acceptable. When required in high ceiling areas, T5 High Output (HO) solutions are acceptable. Suspended luminaires shall be direct/indirect. Full indirect suspended luminaires are not acceptable.

.13 Non-linear specialty fixtures such as pot lights, cylinders, wall sconces, wall washers and other decorative lighting shall be minimized and shall not exceed 10% of the total quantity of fixtures in the building project. When used, it is preferred that these luminaires not be enclosed and incorporate vertically aligned medium base screw-in LED lamps.

.14 HID fixtures such as Metal Halide (MH) or High Pressure Sodium (HPS) are not acceptable.

6.5 Continued

2.2 Lamps

.1 Lamps shall be the longest life available. Preference will be given to fluorescent lamps containing the lowest amount of mercury.

.2 It is preferred that T8 fluorescent lamps be Extra Long Life or Extended Life lamps rated for 40,000 hours operation with 3 hours per start.

Preferred manufacturers are: General Electric, Osram Sylvania, or Philips

.3 T8 - 25 watt lamps with 3500º K color temperature shall be the typical lamp used for linear fluorescent lighting.

.4 T8 – 32 watt High Lumen fluorescent or LED lamps shall be the typical lamp used in low temperature locations.

.5 T5 HO fluorescent lamps shall be Extra Long Life or Extended Life lamps. Preferred manufacturers are: General Electric, Osram Sylvania, or Philips.

.6 Where T5 HO lamps are used in enclosed fixtures, lamps rated for higher temperatures shall be used.

Preferred manufacturers are Philips Extreme Temperature series or Sylvania Constant series.

.7 Use of LED lamps is encouraged and as substitutes for traditional applications involving CFL, MR-16, PAR 20, PAR 30, BR30, PAR 38 lamps, and linear fluorescent lamps when economical. LED lamps shall be Energy Star rated.

2.3 Ballasts

.1 All fluorescent lighting ballasts shall operate from 120 volt input voltage and shall be program start electronic type with standard ballast factor. Ballasts shall have parallel lamp operation. Acceptable manufacturers are: General Electric, Osram Sylvania, Philips/Advance or Universal.

.2 Ballast output frequency shall be greater than 42 kHz.

.3 Dimming ballasts shall be program start with either line voltage or 0-10 volt control.

.4 Ballasts shall have lamp end-of-life detection and shutdown circuitry that meets ANSI standards.

2.4 Energy Allowances

.1 All interior lighting shall not exceed the energy density limits as defined in ASHRAE 90.1-2010 section 9.5 (Building Area Method) or 9.6 (Space by Space Method).

For the Building Area Method, the energy density limit is 0.90 watt per square foot.

.2 All exterior building lighting shall not exceed the energy density limits as defined in ASHRAE 90.1-2010 section 9.4.3.

2.5 Lighting Controls

.1 All interior lighting (including stairwells) shall have controls such that when the lighting is not needed, it will automatically be either turned off or dimmed to a low output condition, and shall conform to the new ASHRAE 90.1-2010 standard (sections 9.4.1, 9.4.2).

.2 All lighting control systems shall be fully tested and commissioned and a Lighting System Commissioning Report shall be prepared and certified by a responsible professional as per ASHRAE 90.1-2010 standard (section 9.4.4)

.3 Where low voltage relay controls are provided for new building projects they shall include a BACnet compatible Building Management System (BMS) interface device which shall be wired to the local BMS control panel. This will ensure that all scheduling functions related to lighting systems will be under the control of the BMS system.

.4 All exterior building mounted lighting and exterior building area lighting shall be controlled by photocell or astronomical time clock. Lighting which may be powered from the building project electrical system shall be under the control of the BMS scheduling system.

.5 Occupancy sensors shall be dual technology type with both Passive Infrared (PIR) and acoustic/ultra-sonic sensors, and may be either line voltage or low voltage types. Low voltage occupancy sensors with 1 or 2 poles and local power packs are preferred. Slave power packs are not acceptable.

Preferred manufacturers are Watt stopper, Sensor Switch, Leviton, or Hubbell

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6.5 Continued

.6 Offices shall have light control switches at all entrances, exits and vestibules. These interior spaces shall also have occupancy sensors integrated with the control switch or mounted at a high level in a corner and arranged for semi-automatic operation such that manual operation of the local switches is required to energize the lighting while occupancy sensors and local switches will de-energize the lighting. Large spaces may need more than one sensor.

.7 Corridors, lobbies and similar public spaces shall have occupancy sensors, mounted at high levels, and arranged for full automatic operation.

.8 Occupancy sensors are not permitted in interior spaces that may be or may become hazardous, such as electrical and mechanical service rooms.

.9 All, offices, corridors, stairways and other public spaces shall incorporate daylight harvesting via use of interior mounted photocells and arranged to take advantage of free illumination while maintaining acceptable minimum illumination levels within the space.

.10 LED dimmers shall be compatible with the LED lamps used and their drivers.

Exit Signage

.1 Exit lighting shall be provided in accordance with the BC Building Code and the Canadian Electrical Code as amended by BC Electrical Safety regulations.

.2 All exit signs shall be illuminated by LED light sources and shall have an emergency power NiCad battery.

.3 Exit signs shall be powered at 120 volts from emergency power panels, if available.

.4 The “Running Man” style EXIT sign which conforms to the CAN/ULC-S572 standard shall be used.

2.7 Emergency Lighting

.1 Emergency lighting must be installed in accordance with the latest revision of the B.C. Building Code and City of Richmond’s Bylaw No. 8306 (Fire Protection and Life Safety).

.2 Provide standby emergency generator if motor loads require emergency power.

.3 All battery pack lighting, remote heads and exit lights shall be LED type and manufactured by ‘Ready-Lite’ or approved equal. ‘Ready-Lite’ is available from local suppliers and shall be stocked by City of Richmond. It is important that City of Richmond have stock in standard sizes so that repairs can be done quickly and effectively as required for the life safety system.

.4 The battery packs shall be long life type and either 12 volts DC or 24 volts DC and shall be in accordance with CSA C22.2 No. 141.

.5 All battery packs shall be mounted on the wall using anchors capable of supporting the weight, or mounted on an appropriately sized shelf, supplied from ‘Ready-Lite’ or approved equal.

.6 Generator and Electrical rooms shall be provided with an emergency battery lighting pack.

.7 If 12 volt DC is used they shall be rated for 36 watt to 360 watt and should not be self testing as clients do not understand the self test and call in a trouble call unnecessarily.

.8 If 24 volts DC are used they shall be either a 360 watt unit or a 720 watt unit only. They shall also be a basic model without meters or self testing.

.9 For both 12 volt DC and 24 volt DC systems, the heads and remote heads shall be 9 watts each.

.10 Battery packs that are fed from a 120 volt AC. source shall have a 120 volt duplex receptacle mounted adjacent so that the battery pack can be plugged into the receptacle. This is to facilitate testing and replacement when needed.

6.6 City of Richmond Entrance, Intercom/Video Systems Specifications for City of Richmond Buildings

[28 January 2016] [1 page]

1. ENTRANCE/VIDEO SYSTEMS SPECIFICATIONS

1.1 All specified entry doors shall be controlled by an entry audio intercom which will communicate via a supplied phone line, existing phone line may be used if one exists.

Acceptable part numbers are Viking K-1200 or K-1200EWP, no exceptions allowed.

All entry door stations will require a home run, minimum 1" conduit from the K1200 unit to a predetermined location as per the specified drawings.

The entry door unit will require a single gang box flush mount at a height of no higher that 44".

In applications where flush mounting is not an option, then a surface mount conduit stubbed to the top of the surface mount K1200 unit will suffice.

The system will be programmed to allow communication to staff via locals or specified phone number as per instructions from location coordinator.

1.2 All required entry door locations shall have a 12-volt electric strike installed to release the door. Accepted brands are RCI S6514 series and/or Von Dupron, model number will be determined by the type of door installed and hardware operating such door and code requirements.

All strikes will require a home run, via a minimum ½" conduit supplied to a predetermined location as per the specified drawings. All conduit for strikes must terminate in the frame that houses the strike or directly to the device.

1.3 The video monitoring system for each entry door will consist of a camera at the entry door location. Acceptable brand and part numbers will be Hikvision DC-2CD2122FWD-IS Armored Dome cameras, if using IP cameras or Hikvision DS-2CE55C2N if using Analogue camera. All cameras will be home run via a minimum ¾" conduit to a determined location as per specified drawings.

1.4 All cameras shall terminate to a Hikvision NVR or similar distribution hub located in an acceptable location for the project. **The NVR will not contain a hard drive or allow recording of any images, unless proper procedures and authority is given by the City of Richmond, and all Guidelines of the Privacy Impact Assessment are met.**

All video camera installations must adhere to the specifications of the personal information protection act, regarding video camera installations.

1.5 A video monitor shall be supplied at the locations determined by the specified drawings. The acceptable brand and part numbers of the monitors will be Wbox 19 or 22led or similar brand CSA approved led monitor.

1.6 Each monitor must be wall mounted with an approved monitor wall bracket, model shall be determined by the size and weight of the monitor at the specified location and height in drawing. A mounting plate of no less the 19mm plywood or similar product must be supplied at the monitor locations, sufficient in size to support the weight and size of supplied monitor, drywall anchors not permitted. All monitors will require a home via a minimum ¾" conduit to the determined location as per the specified drawings.

1.7 No wiring may be exposed to the outside of a building unless in approved conduit for outdoor use.

1.8 A 120 VAC circuit must be supplied at each monitor location, all outdoor locations must have a GFI circuit installed as per electrical code.

1.9 A 120 VAC circuit must be supplied at the determined hub or home run location as determined by the specified drawings.

6.7 City of Richmond Security, Fire Alarm, Access and Video Systems Specifications for City of Richmond Buildings

[January 2018]

1. SECURITY ALARM SYSTEMS

1.1 All external doors shall be hardwired with a single, station Z 22AWG 4 conductor wire, or a minimum ½" conduit from each location to the security panel termination point.

1.2 The Security system must be a Napco brand, model number will depend on size of building and location requirements, no substitutions. Gem1632, Gem3200, Gem9600, GemX255.

1.3 All buildings will require a minimum of one Napco RP1CAE2 keypad at or near a specified entry door or doors, each keypad will require a minimum Cat V 24AWG 8 conductor wire to that location to at the security panel termination point, and/or a minimum ½" conduit connecting to that location.

1.4 All rooms exposed to outer windows, or doors or rooms of sensitive nature shall require a commercial grade motion sensor, a Bosch PPR1-W16 or similar detector mounted at a maximum of 8 feet. Each of these locations shall require a minimum station Z 22AWG 4 conductor or preferably a CAT V 24AWG or a ½" conduit if required and shall be terminated at the security panel termination point.

1.5 All cabling and /or conduit shall be home run to the security panel termination point and conduit runs can be combined as long as size as conduit is increased based on size an amount of cable does not exceed the maximum allowed.

1.6 A minimum of 24" X 24" space is required for the security alarm panels at the wiring termination point, this may increase in size depending on the with size of building and equipment required.

1.7 No wiring may be exposed to the outside of a building unless in approved conduit, all access points must be supervised for tampering.

1.8 A 120 VAC circuit, with an individual breaker and a double gang box shall be required to allow hardwiring of transformers. Plug in transformers/power bars are not accepted.

1.9 A minimum of 1 dedicated telephone line shall be required at the panel termination point for communications to the monitoring station.

2. ULC FIRE ALARM MONITORING SYSTEMS FOR CITY OF RICHMOND BUILDINGS

2.1 All fire alarm panels must be monitored for Alarm, Supervisory/Trouble & Tamper.

2.2 The Fire alarm monitoring system panel must be a DSC ULC Fire alarm monitoring panel, no substitutions. proprietary equipment not accepted.

2.3 Alarm monitoring panel must be mounted at a height of no higher than 72" and have unobstructed access to the panel at all times.

2.4 All cabling shall be home run to the monitoring panel termination point and must be in conduit no exposed wiring shall be allowed; conduit runs can be combined as long as size as conduit is increased depending on how many conduit runs are combined. The use of Cat 5 or 6 cabling is prohibited as per ULC specifications.

2.5 A 24" X 30" approximate space is required for the alarm monitoring panels at the wiring termination point

2.6 No wiring may be exposed to the outside of a building unless in approved conduit, all exposed panels must be tamper proof. All conduit must run into the monitoring panel through the designates conduit knockouts.

2.7 A 120 VAC circuit, with an individual marked breaker must be directly wired to the panel, with either Bx or conduit. No plug-in transformers/power bars are allowed.

2.8 A minimum of 1 dedicated telephone line phone line shall be required at the panel termination point for communications. All telephone lines must be in conduit and must be a direct line that does not connect to PBX or phone switch, the line cannot be shared with a burglar alarm panel or other device.

2.9 System must meet or exceed current ULC specifications

2.10 Monitoring station must be ULC AA approved.

6.7 Continued

3. ACCESS SYSTEMS SPECIFICATIONS FOR CITY OF RICHMOND BUILDINGS

3.1 All specified entry doors shall be controlled via a HID proximity card reader mounted outside the specified entry door or doors.

3.2 The Access system must be a Honeywell Webs AX System consisting of a minimum 1 controller and expansion devices as deemed necessary to complete the system. This is the only system that can be specified for the COR access system, no substitutions Allowed.

3.3 Each controlled door shall require the following:

3.4 Door contact mounted at the top of each opening on the opening edge of each door, a hinged controlled contact is acceptable, 1 station Z 22AWG wire to each door contact.

3.5 Honeywell IS310 request to exit sensor mounted at the top of each door, station z 22AWG or Cat V to each sensor.

3.6 Hid brand RP40 or similar Proximity card reader on the outside of each door controlled, at a height of the strike mechanism or no higher than 36”, a minimum of 1 - 22 AWG shielded 6 conductors to each card reader in the system, no substitutions.

3.7 12 or 24-volt DC electronic strikes, or similar locking hardware acceptable, no mag-locks will be approved, minimum 18AWG gauge 2 conductors to every electronic door lock in the system, wire size may increase with cable length.

3.8 A 24” X 48” space is required for the access panels at the wiring termination point, this could change depending on size of building or system required.

3.9 No wiring may be exposed to the outside of a building unless in approved conduit, all outer access points must be tamper proof.

3.10 A 120 VAC circuit, with an individual breaker and a double gang box shall be required to allow hardwiring of transformers. Plug in transformers and or power bars are not allowed.

3.11 A network drop with a specified static IP address on the City intranet network is required at the Access panel location. This connection will be supplied by the City of Richmond IT Dept.

4. VIDEO SYSTEM SPECIFICATIONS FOR CITY OF RICHMOND BUILDINGS

4.1 All digital video cameras must be a Hikvision or similar, no proprietary equipment or devices allowed.

4.2 All analogue video cameras must be non-proprietary devices.

4.3 All video cameras must be designated for their appropriate application, outdoor cameras for outdoor applications, indoor cameras for indoor applications etc.

4.4 All recording devices must be Hikvision or Milestone, selection of equipment will be determined on scope of work and size of project, no proprietary equipment or software allowed.

4.5 No Cameras can view sensitive or private areas and all installations must adhere to the strict provisions of the privacy act.

4.6 All equipment must have factory default password removed and changed to specified password determined by City of Richmond.

4.7 No access to the video playback files is allowed by City Staff unless special authorization from the City of Richmond Legal Dept. and access to these files must always be locked out.

4.8 All video equipment installations must have the authorization by the City of Richmond Facilities dept. No installations to any City buildings is allowed without this written authorization, No exception to this rule.

4.9 All installations must be done by a licensed contractor, licensed in the Province of BC. for the installations and servicing of Video surveillance systems, no exceptions allowed.

4.10 A 120-vac. circuit must be supplied at the NVR or DVR head end location.

4.11 A network drop with a specified static IP address on the City intranet network is required at the Access panel location, and will be supplied by the City of Richmond IT Dept.

6.8 City of Richmond Waste Management

"Let's Trim Our Waste" – Waste Management Design Guidelines

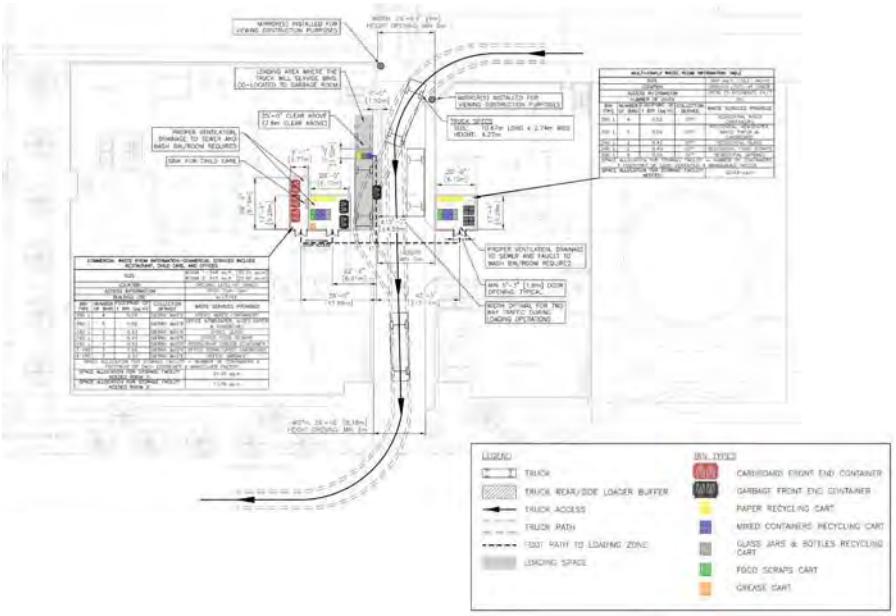
The Guidelines present key strategies and general advice for meeting the City's requirements for garbage and recycling management, and provides recommendations and formulas for calculating space needs for collection bins and loading areas.

Guide to Estimating the Recycling and Garbage Bins Your Complex Needs for Weekly Collection

OFFICE

FLOOR AREA (M²)	MIXED CONTAINERS	MIXED PAPER (including newspaper)	FOOD SCRAPS & YARD TRIMMINGS	CARDBOARD BIN	GARBAGE
	360 LITRE BINS (#)		240 LITRE BINS (#)	CUBIC YARD BINS (# x SIZE)	
500	1	1	1	1 x 3 yd³	1 x 3 yd³
501-600	1	1	2	1 x 3 yd³	1 x 3 yd³
601-900	1	2	2	1 x 3 yd³	1 x 3 yd³
901-1,000	1	2	3	1 x 3 yd³	1 x 3 yd³
1,001-2,000	2	4	5*	1 x 3 yd³	1 x 3 yd³
2,001-3,000	3	6*	7*	1 x 3 yd³	1 x 4 yd³
3,001-4,000	4	7*	10*	1 x 3 yd³	2 x 3 yd³
4,001-5,000	5*	9*	12*	1 x 4 yd³	2 x 3 yd³

* It is more space efficient to use bins at this point. Please consult with a waste services provider to discuss which containers are suitable.



6.9 City of Richmond Roof-Top Playground Design Guidelines

[August 2016]

Below are notes for the developer and consultant team for guidance in designing the outdoor play areas on slab. Note that these are intended to supplement, and should be read in conjunction with the City of Richmond Child Care Design Guideline.

1) Minimum Growing Medium Depths on slab:
   a. 900mm for trees
   b. 450mm for shrubs and perennials
   c. 300mm for lawn

   Note: Wherever possible, the slab should be dropped in order to achieve the above required minimum soil depths as a means to minimize use of retaining walls. All planters should be a minimum of 900mm width and include high efficiency irrigation. Soil loading to be reviewed by and co-ordinated with the project Structural Engineer. Inspection chambers are to be included at all slab drains located within planters. Ensure that all planters include drainage through inclusion of planter drains or block outs in planter walls located at the drainage layer below finished grade.

2) Growing media to meet the current BC Landscape Standard for Level 2 “Groomed” and Level 3 “Moderate” Areas. A soil analysis report is to be provided to the Landscape Consultant and City for review prior to placement on site. Soil analysis report to be performed on the proposed growing medium from samples taken at the supply source within three weeks prior to placement on site.

3) The top of slab should be a minimum of 250-300mm below the proposed finished grade in order to accommodate landscape build up (drainage and paving materials). The proposed exterior finished grade should match the proposed interior finished floor elevation i.e. there should not be a step up or down to the exterior spaces from the building interior.

4) Wherever possible, bi-level drains should be used. Sand interceptors are to be included at all drains.

5) Preferred resilient surfacing on slab:
   a. Pour in Place Rubber Surfacing. Dark colours such as black, red, or dark tinted colours should not be used.
   b. Artificial turf.
   c. Sand is recommended for play value, but not permitted for use as a resilient surface at play or climbing structures.

   Note: All resilient surfacing to meet CAN/CSA-Z614-14 guidelines. Engineered wood fibre and pea gravel are not permitted for use on slab.

6) Play equipment / elements to be fastened to a housekeeping slab(s) in order to protect the structural slab and membrane.

7) A raised edge that is 100mm minimum and 300mm maximum height is to be provided around sand play areas in order retain the sand. The raised edge should be either rounded concrete, or logs on side or end (peeled and free of splinters), or a combination of the two. Access to the sand area for the age group that is servicing should be considered.

8) All exposed edges on hardscape and furnishings to be rounded or eased.

9) Landscape to be maintained at Level 4 “Open Space / Play” as outlined in the current version of the BC Landscape Standard.

6.10 City of Richmond Irrigation Design Guidelines for Roof-Top and Grade Related City Owned Projects

[November 2016] [10 pages]

1.1 The requirements for both roof top and grade related details are that the:

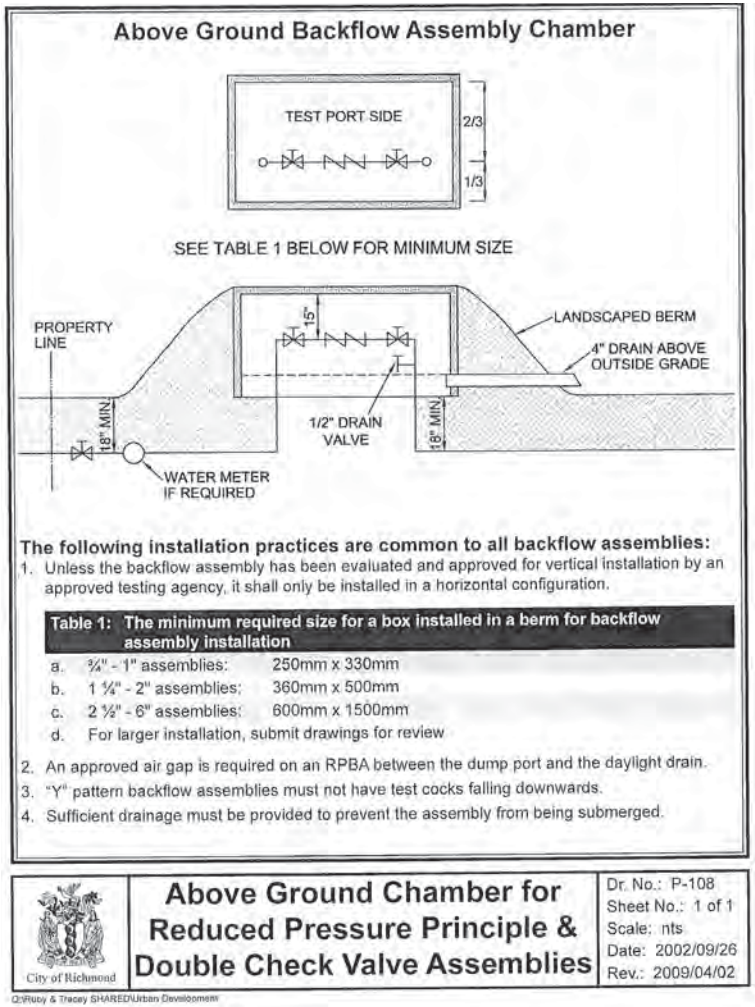
- Controller to be Toro Sentinel Satellite SSAK-12-XXX-6-N-S (Note that the XXX is a placeholder for wall mounted vs. pedestal Developer / Consultant to determine mounting based on project).
- Developer / Consultant to provide irrigation shop drawings to the City for review.

1.2 The following irrigation value and sprinkler details are applicable for grade applications.

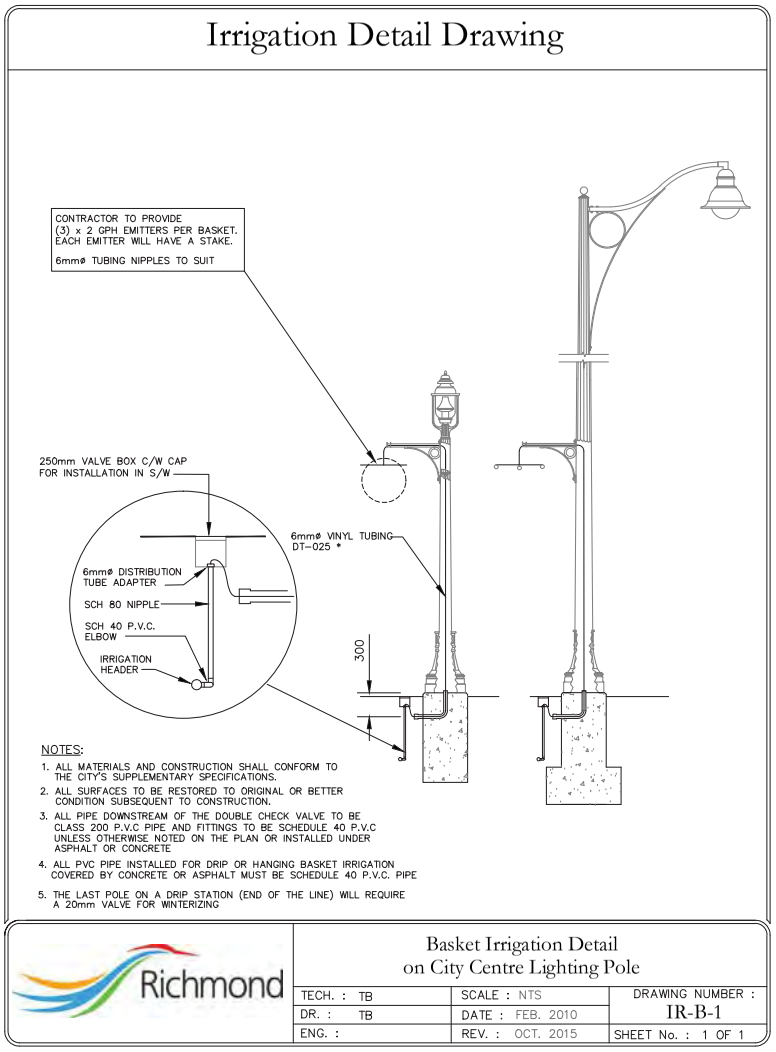
- Above Ground Chamber for Reduced Pressure & Double Check Valve Assemblies
- IR-B-1
- IR-C-1
- IR-C-3
- IR-C-4
- IR-S-1
- IR-S-2
- IR-S-3

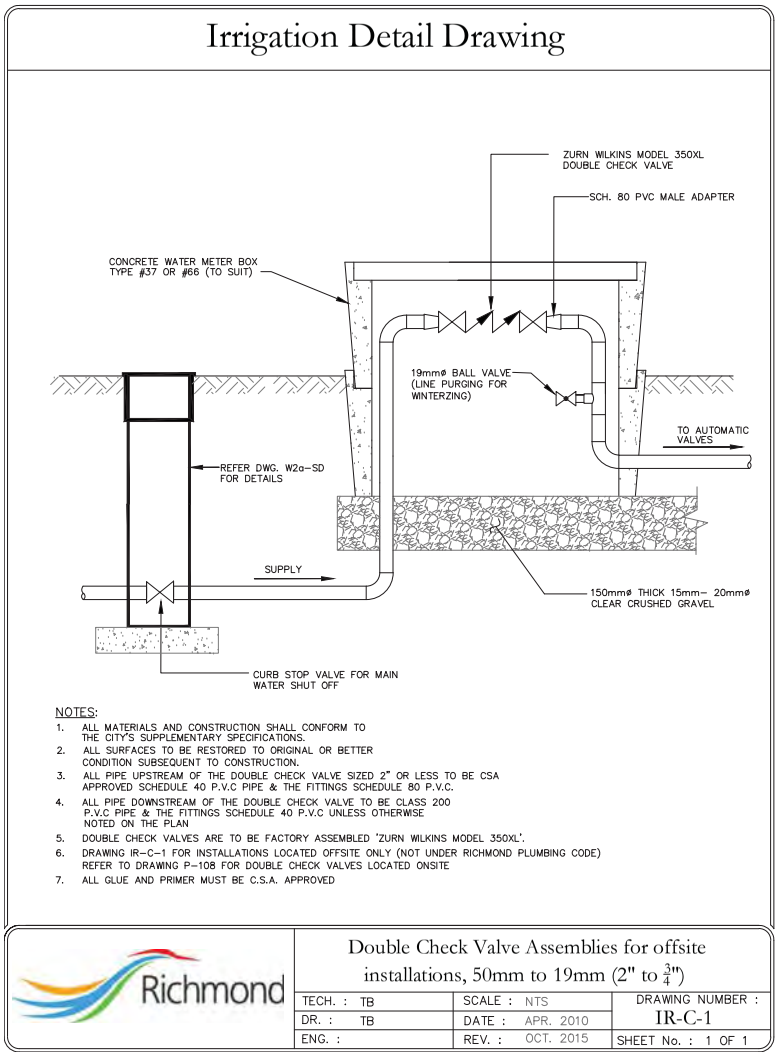
1.3 Only the following irrigation valve and sprinkler details are applicable in roof top applications.

- IR-C-2
- IR-C-3
- IR-C-4
- IR-S-2



6.10 Continued





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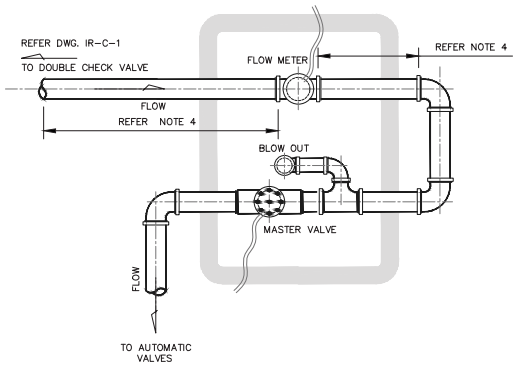
6.10 Continued

Irrigation Detail Drawing



Plan

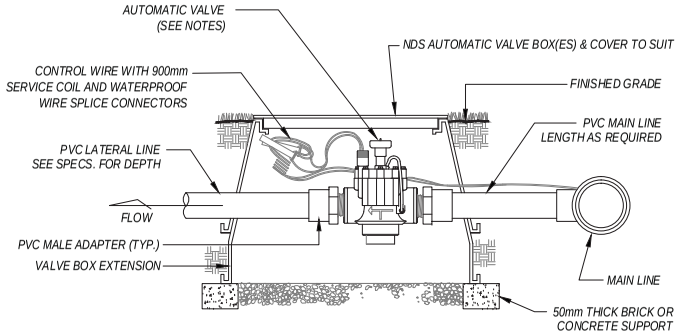
NOT TO SCALE

NOTES:
1. ALL MATERIALS AND CONSTRUCTION SHALL CONFORM TO THE CITY'S SUPPLEMENTARY SPECIFICATIONS.
2. ALL SURFACE TO BE RESTORED TO ORIGINAL OR BETTER CONDITION SUBSEQUENT TO CONSTRUCTION.
3. FLOW METER MODEL IS DATA INDUSTRIAL SERIES 228PV PLASTIC TEE FLOW SENSOR
4. INSTALL ALONG THE PIPE WHERE TEN (10) PIPE DIAMETERS UPSTREAM AND FIVE (5) PIPE DIAMETERS DOWNSTREAM OF THE SENSOR PROVIDE NO FLOW RESTRICTIONS OR DISTURBANCE. PIPE BENDS, VALVES, OTHER FITTINGS, PIPE ENLARGEMENTS OR REDUCTIONS WILL NOT BE PRESENT IN THIS LENGTH OF PIPE. (EXAMPLE : 50mm (2") FLOW SENSOR REQUIRES A MINIMUM OF 500mm (20") BEFORE AND 250mm (10") AFTER SENSOR)
5. FLOW METER TO BE DISASSEMBLED (REMOVED) PRIOR TO GLUING PIPING.

Richmond

Typical Master Valve & Flow Meter Detail		
TECH. : TB	SCALE : NTS	DRAWING NUMBER : IR-C-2
DR. : TB	DATE : FEB. 2009	
ENG. :	REV. : OCT. 2015	SHEET No. : 1 OF 1

Irrigation Detail Drawing



SECTION/ELEVATION

NOT TO SCALE

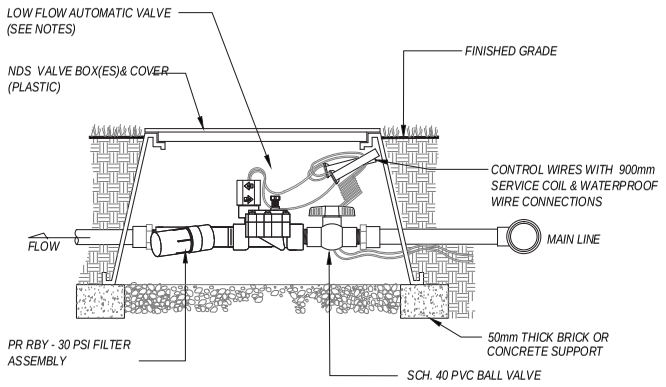
NOTES:
1. ALL MATERIALS AND CONSTRUCTION SHALL CONFORM TO THE CITY'S SUPPLEMENTARY SPECIFICATIONS.
2. ALL SURFACES TO BE RESTORED TO ORIGINAL OR BETTER CONDITION SUBSEQUENT TO CONSTRUCTION.
3. AUTOMATIC VALVES TO BE 'RAIN BIRD PEB' SERIES
4. 9 V BATTERY OPERATED SYSTEMS: USE 9V 'TBOS POTTED LATCHING SOLENOIDS' WITH 'RAIN BIRD PEB' AUTOMATIC VALVES.
5. LOW FLOW DRIP STATIONS USE 'RAIN BIRD XCZ-100-PRF' INLINE VALVE KIT.
6. ALL PIPE DOWNSTREAM OF THE DOUBLE CHECK VALVE TO BE CLASS 200 PVC AND FITTINGS TO BE SCHEDULE 40 PVC UNLESS OTHERWISE NOTED ON THE PLAN.

Richmond

Automatic Valve Detail		
TECH. : TB	SCALE : NTS	DRAWING NUMBER : IR-C-3
DR. : TB	DATE : FEB. 2010	
ENG. :	REV. : OCT. 2015	SHEET No. : 1 OF 1

6.10 Continued

Irrigation Detail Drawing

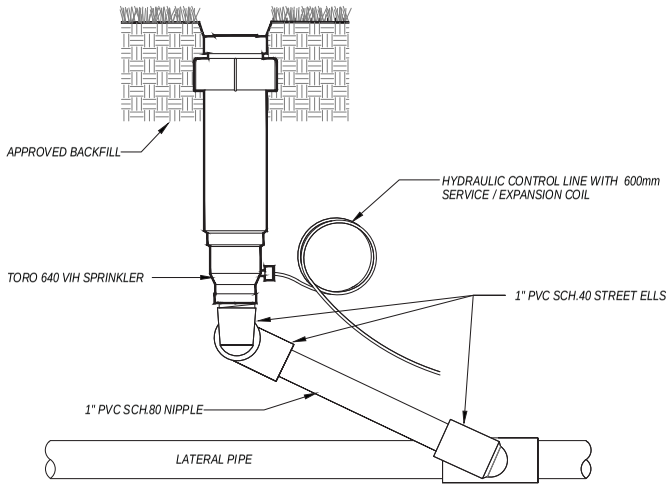


SECTION / ELEVATION
NOT TO SCALE

NOTES:
1. ALL MATERIALS AND CONSTRUCTION SHALL CONFORM TO THE CITY'S SUPPLEMENTARY SPECIFICATIONS.
2. ALL SURFACES TO BE RESTORED TO ORIGINAL OR BETTER CONDITION SUBSEQUENT TO CONSTRUCTION.
3. 9 V BATTERY OPERATED SYSTEMS: USE 9V 'TBOS POTTED LATCHING SOLENOIDS' WITH 'RAIN BIRD PEB' AUTOMATIC VALVES.
4. AUTOMATIC VALVES FOR LOW FLOW SYSTEMS USE 'RAIN BIRD XCZ-100-PRF' INLINE VALVE KIT.
5. ALL PIPE DOWNSTREAM OF THE DOUBLE CHECK VALVE TO BE CLASS 200 PVC AND FITTINGS TO BE SCHEDULE 40 PVC UNLESS OTHERWISE NOTED ON THE PLAN.

Richmond	Low Flow Automatic Valve Filter & Pressure Regulator Detail		
TECH. : TB	SCALE : NTS	DRAWING NUMBER : IR-C-4	
DR. : TB	DATE : OCT. 2015		
ENG. :	REV. : OCT. 2015	SHEET No. : 1 OF 1	

Irrigation Detail Drawing

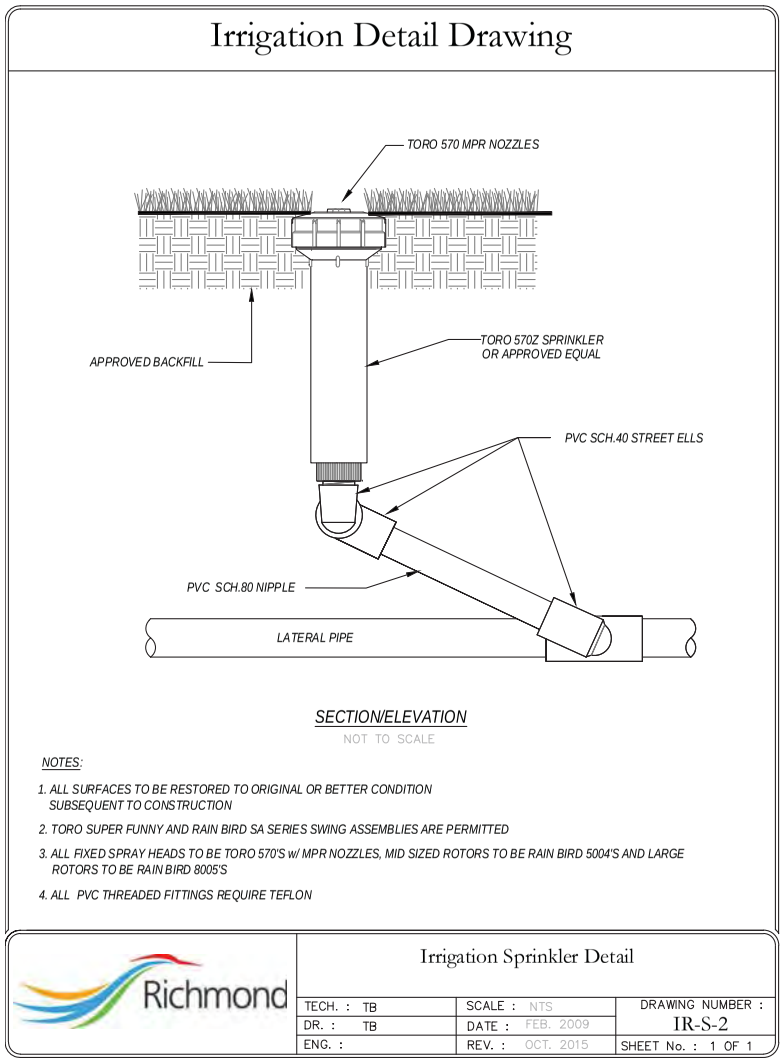


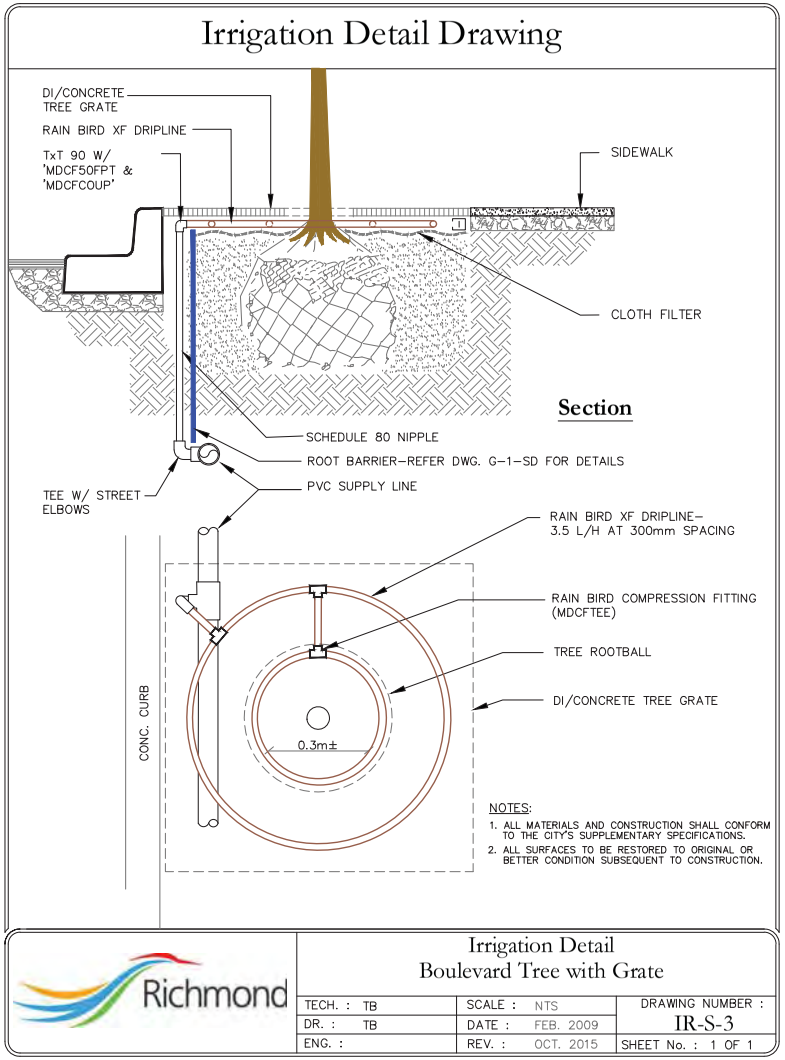
SECTION / ELEVATION
NOT TO SCALE

NOTES:
1. ALL SURFACES TO BE RESTORED TO ORIGINAL OR BETTER CONDITION SUBSEQUENT TO CONSTRUCTION
2. ALL PVC IRRIGATION PIPE TO BE CLASS 200 & FITTINGS TO BE SCHEDULE 40 PVC (ALL EXCEPT FOR SPRINKLER SWING JOINTS WHICH SHALL BE 3 SCHEDULE 40 STREET ELLS AND 1 SCHEDULE 80 NIPPLE)
3. ALL THREADED FITTINGS REQUIRE TEFLON

Richmond	Hydraulic Rotor Sprinkler Detail		
TECH. : TB	SCALE : NTS	DRAWING NUMBER : IR-S-1	
DR. : TB	DATE : FEB. 2010		
ENG. :	REV. : OCT. 2015	SHEET No. : 1 OF 1	

6.10 Continued





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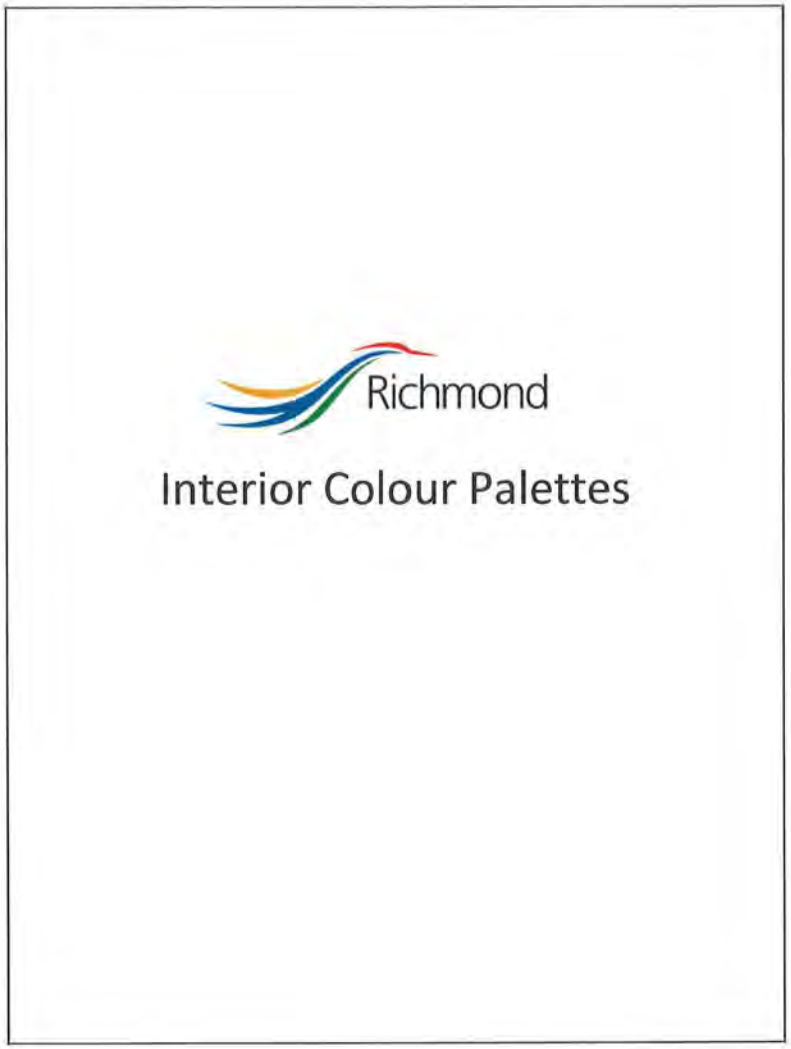
6.11 City of Richmond Mechanical Systems Naming Protocol

City of Richmond Labelling Standard Example	Notes
If there are 4 Air Conditioners, 2 on the first floor of a building and 2 on the second floor of a building, they will be labelled as follows: AC-1.001.000 AC-1.002.000 AC-2.001.000 AC-2.002.000 If there are 4 Air Handling Units located on the roof, they will be labelled as follows: AHU-R.001.000 AHU-R.002.000 AHU-R.003.000 AHU-R.004.000	***This indicates the level the unit is on (e.g. Level 1; Level 2; Level 3; Roof; Basement)** ***This number refers to the number of units on the specific Level/Floor** *** This indicates how many times the unit has been replaced. "000" indicates that the unit is new and has not yet been replaced.**

System	Label
Air Compressor	ACOM
Air Conditioner	AC
Air Handler	AHU
Air Separator	AS
Ammonia Detector	AD
Backflow Preventer	BP
Baseboard Heater	BBH
Boiler System	BLR
Boiler System Modulating	BLRC
Boiler System One Stage	(BLRA)
Boiler System Two Stage	(BLRB)
Buffer Tank	BT
Cabinet Unit Heater	CAB
Ceiling Fan	CF
Chilled Water System	CLR
Chiller	CH
Circulation Pump	CP
Combustion Air Supply	CAS
Compressed Air System - Controls	CMPC
Compressed Air System - Medical	CMPM
Compressed Air System - Process	CMPP
Condenser Cold Water System	DCW
Condenser Water System	CWS
Constant Air Volume	CAV
Cooling System	CLG
Cooling Tower	CT
Dehumidifier	DEH
Direct Expansion Cooling	DX
Domestic Cold Water System	DCW
Domestic Hot Water Storage Tank	DHWST
Domestic Hot Water Tank	DHW
Dry Cooler	DC
Dual Duct Air System	DD
Electric Coil	EC
Electric Duct Heater	EDH
Electric Entrance Heater	EEH
Electric Heating System	EH
Electric Meter	KWH
Electric Unit Heater	EUH
Energy Recovery Ventilator	ERV
Entrance Heater	EH
Exhaust Fan	EF
Expansion Tank	ET
Fan Coil System	FC
Fluid Cooler	
Forced Flow Convector	FF
Forced Flow Heater	FFH
Furnace Single Zone	FUR
Generator	GEN
Geo-exchange System	GEOX
Glycol System	GLY
Heat Exchanger	HE
Heat Pump System	HP
Heat Recovery Ventilator	HRV
Heating Coils	HC
Heating Water System	HTG
Hot Water Heating System	HW
Humidifier	HUM
Infrared Heater	IFR
Make-up Air System	MAU
Mixing System	MB
Multi-Zone Air System	MZ
Outdoor Air (Ambient) Temperature	OA
Pool Equipment	PE
Preheat System	PHT
Pressurized Fans	PFAN
Pump	P
Radiant Panel System	HRP
Radiation System	
Reheat System	
Roof Top Unit	RTU
Single Zone System	SZ
Snow Detector	SD
Solar System	SOL
Split AC	
Steam Generator	SG
Storage Tank	ST
Temperature Predictor	TP
Terminal Reheat System	TR
Unit Heater (Gas)	UH
Unit Heater (Infrared)	UHI
Variable Air Volume Systems	VAV
Variable Air Volume Temperature Systems	VVT
Variable Frequency Drive	VFD
Variable Exhaust System	VES
Ventilation Systems	VTL
Water Metering System	H20
Water to Water Heater	WWH

6.12 City of Richmond Standard Colour Palette



Corporate Colours
City Of Richmond

Interior Colour Palette #1

Main Walls	OC-9 Ballet White	Ballet White OC-9
Accent Walls	HC-105 Rockport Gray	Rockport Gray HC-105
Doors & Trim	HC-164 Puritan Gray	Puritan Gray HC-164

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6.12 Continued

Corporate Colours
City Of Richmond

Interior Colour Palette #2

Main Walls	OC-52 Gray Owl	Gray Owl OC-52
Accent Walls	2140-50 Gray Horse	Gray Horse 2140-50
Doors & Trim	2140-40 Storm Cloud Gray	Storm Cloud Gray 2140-40

Corporate Colours
City Of Richmond

Interior Colour Palette #3

Main Walls	HC-173 Edgecomb Gray	Edgecomb Gray HC-173
Accent Walls	2140-50 Gray Horse	Gray Horse 2140-50
Doors & Trim	CC-810 Hudson Bay	Hudson Bay CC-810

6.12 Continued

Corporate Colours
City Of Richmond

Interior Colour Palette #4

Main Walls	CC-80 Gray Mist	Gray Mist CC-80
Accent Walls	AF-100 Pashmina	Pashmina AF-100
Doors & Trim	CC-810 Hudson Bay	Hudson Bay CC-810

Corporate Colours
City Of Richmond

Interior Colour Palette #5

Main Walls	OC-12 Muslin	Muslin OC-12
Accent Walls	CC-336 Wild Mushroom	Wild Mushroom CC-336
Doors & Trim	HC-76 Davenport Tan	Davenport Tan HC-76

6.12 Continued

Corporate Colours
City Of Richmond

Interior Colour Palette #6

Main Walls	OC-14 Natural Cream	Natural Cream OC-14
Accent Walls	HC-172 Revere Pewter	Revere Pewter HC-172
Doors & Trim	HC-108 Sandy Hook Gray	Sandy Hook Gray HC-108

Richmond

Exterior Colour Palettes

CNCL - 225

6.12 Continued

Corporate Colours
City Of Richmond

Exterior Colour Palette #1

Main Body	HC-83 Grant Beige	Grant Beige HC-83
Accent 1	HC-107 Gettysburg Gray	Gettysburg Gray HC-107
Accent 2	HC-155 Newburyport Blue	Newburyport Blue HC-155

Corporate Colours
City Of Richmond

Exterior Colour Palette #2

Main Body	AF-680 Wish	Wish AF-680
Accent 1	CC-546 Metropolis	Metropolis CC-546
Accent 2	HC-155 Newburyport Blue	Newburyport Blue HC-155

6.12 Continued

Corporate Colours
City Of Richmond

Exterior Colour Palette #3

Main Body	AF-100 Pashmina	Pashmina AF-100
Accent 1	2135-30 Nocturnal Gray	Nocturnal Gray 2135-30
Accent 2	2134-20 Midsummer Night	Midsummer Night 2134-20

Corporate Colours
City Of Richmond

Exterior Colour Palette #4

Main Body	CC-90 Natural Linen	Natural Linen CC-90
Accent 1	AF-155 Weimaraner	Weimaraner AF-155
Accent 2	2112-10 Mink HC-155 Newburyport Blue	Mink 2112-10 Newburyport Blue HC-155

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6.12 Continued

Corporate Colours
City Of Richmond

Exterior Colour Palette #5

Main Body	HC-108 Sandy Hook Gray	Sandy Hook Gray HC-108
Accent 1	OC-14 Natural Cream	Natural Cream OC-14
Accent 2	HC-100 Gloucester Sage	Gloucester Sage HC-100

Corporate Colours
City Of Richmond

Exterior Colour Palette #6

Main Body	CC-500 Ranchwood	Ranchwood CC-500
Accent 1	138 Mack Green Rust Scat	Mack Green 138
Accent 2	CC-90 Natural Linen	Natural Linen CC-90

City of Richmond
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City of Richmond

Report to Committee

To:	General Purposes Committee	**Date:**	January 9, 2019
From:	John Irving, P.Eng. MPA Director, Engineering	**File:**	06-2050-01/2018-Vol 01
Re:	**City Buildings – Building Facilities Design Guidelines and Technical Specifications**		

Staff Recommendation

That the proposed "City of Richmond Building Facilities Design Guidelines and Technical Specifications" presented as Attachment 1 of this report, and as described in the report dated January 9, 2019, from the Director, Engineering be endorsed and used in planning for future corporate facilities.

John Irving, P.Eng. MPA
Director, Engineering
(604-276-4140)

Att. 1

REPORT CONCURRENCE	
CONCURRENCE OF GENERAL MANAGER	
REVIEWED BY STAFF REPORT / AGENDA REVIEW SUBCOMMITTEE	INITIALS: CJ
APPROVED BY CAO	

Staff Report

Origin

This report proposes to provide the "City of Richmond Building Facility Design Guidelines and Technical Specifications" to City staff, stakeholders, and the general public, presented as Attachment 1.

This report supports Council's 2014-2018 Term Goal #1 A Safe Community:

> *Maintain emphasis on community safety to ensure Richmond continues to be a safe community.*

This report supports Council's 2014-2018 Term Goal #2 A Vibrant, Active and Connected City:

> *Continue the development and implementation of an excellent and accessible system of programs, services, and public spaces that reflect Richmond's demographics, rich heritage, diverse needs, and unique opportunities, and that facilitate active, caring, and connected communities.*

This report supports Council's 2014-2018 Term Goal #3 A Well-Planned Community:

> *Adhere to effective planning and growth management practices to maintain and enhance the livability, sustainability and desirability of our City and its neighbourhoods, and to ensure the results match the intentions of our policies and bylaws.*

This report supports Council's 2014-2018 Term Goal #4 Leadership in Sustainability:

> *Continue advancement of the City's sustainability framework and initiatives to improve the short and long term livability of our City, and that maintain Richmond's position as a leader in sustainable programs, practices and innovations.*

In parallel with the Council adopted Child Care Guidelines, Affordable Housing Guidelines and Enhanced Accessibility Design Guidelines, the Building Facilities Guidelines will assist City staff in providing Contractors, Consultants, Developers and the Public with a better understanding of what City expectations are for the design and construction of City-owned or City-leased buildings.

The proposed Guidelines will be used for future City building projects and renovation of existing City buildings. The preparation of the guidelines was coordinated by the Capital Building Project Development department in consultation with various other City departments.

Analysis

Consultation on Guidelines

The proposed "City of Richmond Building Facilities Design Guidelines and Technical Specifications" were developed to assist the design of new building construction and tenant improvements to existing buildings.

The architectural design, form and character of any given project is not addressed in these Guidelines. The Guidelines address the layer of technical detail that exists below these more recognizable elements.

During the process of developing the guidelines and technical specifications, a number of internal stakeholder meetings were held to solicit input for the consultant's initial and final drafts. An internal Stakeholder Committee was created to lead and endorse the process and was comprised of City staff from the following departments:

- Building Approvals;
- Planning and Development;
- Facility Services;
- Sustainability;
- Public Works Administration;
- Community Services; and
- Transportation

Benefits

The proposed "City of Richmond Building Facilities Design Guidelines and Technical Specifications" will help reduce staff time spent guiding developers, contractors and consultants about what to consider when building new facilities or renovating the existing buildings. The document provides a reference tool that can be used to assist with preparing design elements that are expected by the City and offers direction about how to incorporate these features.

The proposed document supports the City's goals to design and build sustainable buildings and reduce environmental impacts by including features and performance requirements that are leading edge and encourage innovative designs. By referencing the City's High Performance Building Policy, green building techniques and innovative building materials would be incorporated into the design of buildings which would help reduce GHG emissions, create greater efficiencies within buildings, and make them sustainable. As a result, the proposed guidelines would improve building operational efficiencies, reduce the City's total carbon footprint, and increase building resiliency. This would also ensure the City remains a leading municipal government in sustainability and environmental design.

Implementation

Once approved, the "City of Richmond Building Facilities Design Guidelines and Technical Specifications" document will be referenced by City staff to guide the design of all City facilities. The guidelines will be posted on the City's web site, available to developers contemplating making a community amenity contribution as part of a rezoning application.

Next Steps

As a reference document for consultants and contractors, the Guidelines will be distributed to industry and provided through the planning and procurement process. It is expected that the guidelines will need to be revised from time to time based on potential changes to the BC Building Code, sustainable building practices and lessons learned from the various facility

projects. Staff will continue to collect this information and engage external stakeholders in further enhancement of the guidelines which will be brought forward to Council in future revisions as required.

Financial Impact

None.

Conclusion

Staff recommend that the proposed "City of Richmond Building Facilities Design Guidelines and Technical Specifications", be approved and used for future City facilities either constructed or renovated by the City as capital projects or by developers as community amenity contributions.

Martin Younis, B.Eng., M.Eng.
Senior Project Manager
(604-204-8501)
JK-jk

Att. 1: Building Facilities Design Guidelines and Technical Specifications (September 2018)