RS 2.2.3 Feasibility Study

GoCB Windsor
441 University Avenue, Windsor, ON

2016-01-21

PWGSC Project R.076516.002

CONTENTS

1 Executive Summary

The Government of Canada Building (GoCB) at 441 University Avenue West in Windsor, Ontario is a two storey structure with a partial basement that is built of concrete, masonry and wood construction. The building area is approximately 2400 m^2 (60m x 40m) and is classified as a Group D Occupancy. Currently the first and second floor of the GoCB contain various open and closed office areas, predominantly occupied by meeting-training rooms, public waiting areas as well as corridors, service spaces, stairwells and an elevator.

Overall the building is in satisfactory condition, however selective modifications will be required to achieve the project's mandate. The exterior brick walls are a fair to poor condition, with significant cracking of the brick and masonry joints near the stairs on the east and west elevations. It is recommended that measures to repair the existing masonry be undertaken. As the windows are nearing their effective life span, it is recommended that the renovation of the GoCB include a full replacement of the glazing panes and frames with a glass type that has a lower light transmission value and higher reflectance rate. It is also recommended that the glass on the ground level include a laminated film to increase the building security.

The main roof consists of a two ply modified bitumen membrane and rigid insulation on the wood roof deck. It is understood that this roof was replaced in 1999, however it is showing significant deterioration of the membrane, including instances of loose granular wearing surface and delamination of the membrane from the substrate. While it is understood that there are no significant issues with water infiltration into the 2^{nd} floor areas at this time, it is recommended to proceed with an upgrade to the roof system.

It was determined that the building could accommodate 300 full time employees (FTEs) without the necessity for an addition. However, in order to accommodate this mandated population in a Workplace 2.0 compliant arrangement all interior partitions, floor finishes, ceilings, and associated electrical and mechanical services located within the renovation scope are recommended to be fully removed and replaced. This "renovation scope" includes all areas of the ground and second floor apart from the existing Environment Canada Wildlife Enforcement Branch located on the south end of the ground floor, as this area was the most recently renovated and is not suffering from any noted deficiency.

Due to the slightly different areas available for renovation on the ground and second floors, it was determined that the FTEs should be split roughly 47% on the ground floor (142 FTE) and 53% on the upper floor (158 FTE). In determining the workspace types it was assumed that all users would qualify for the 4.5m^2 open workstations. Each floor will receive four 5m^2 quiet/touchdown rooms, two 14m^2 "small" meeting rooms, two 30m^2 "medium" meeting rooms, and one 60m^2 "large" meeting room. Furthermore, each floor will have one 60m^2 kitchenette. Due to the differing populations, the ground floor would qualify for two 15m^2 equipment rooms while the second floor will be allotted three. Similarly, the reduced renovation area of the ground floor results it having only two telecommunication rooms that each serve 1,000m^2, while the second floor would have three telecommunication rooms that would each serve 800m^2. With a rough floor area of 2,400m^2, the most efficient distribution of telecommunication rooms would see three 2.8m^2 x 3.0m^2, each of which can serve a maximum floor area of 800m^2.

Many of the existing rooftop units at the Government of Canada Building (GoCB) are nearing the end of their service life and are recommended for replacement. It is proposed to replace the existing HVAC system at facility with a new, energy efficient, variable refrigerant flow (VRF) system and dedicated outdoor air (DOA) units. The VRF condensing units and DOA units will be located on the building's roof.

The flexibility allowed by a VRF system will suit the HVAC zoning requirements of the Government of Canada Workplace 2.0 Fit-Up Guidelines. It is recommended to install a new building management system to control the new HVAC equipment.

The existing steam boiler is also near the end of its service life. It is recommended to replace the steam boiler with a new high-efficiency hot water condensing boiler. The boiler will be piped to new hot water radiant panels to serve as perimeter heat for building envelop losses. Plumbing fixtures will be revised as required to suit the architectural revisions to the kitchenette and washrooms. The building can be sprinklered, with fire extinguishers placed throughout to satisfy NFPA 10 and the National Fire Code.

The recommended revisions and refurbishments have been grouped into three options. The base option includes all changes deemed necessary to fulfill the building's mandate, and the succeeding two options include additional changes that will further enhance the building's quantitative and qualitative value. Specifically, Option 1 includes all changed noted above, as well as recommendations to improve the code compliance for life safety and accessibility. The most impactful of these recommendations would be the addition of sprinklers throughout the building. Option 2 includes the introduction of a skylight and interconnected floor space to the building's core, which would help increase user access to natural light and reduce the building's electricity usage. Option 3 includes the reconstruction of the centre portion of the building's north façade, a measure meant to ensure the building's main public elevation will reflect the investment being made in the building's extensive renovation, and anchor the building's public presence for the next 25 years.

After consultation with PWGSC on project delivery requirements, a phasing plan was presented to split the project scope into two approximately equal halves. The first phase, which represents 47% ($3,888,295) of the total project costs, would include all demolition work and most exterior base building alterations. The second phase, which comprises the remaining 53% ($4,360,155) of the project costs, includes the installation of all interior partitions, finishes, and associated mechanical and electrical work.

The following is a proposed funding expenditure for the GoCB Windsor based on the options presented.

OPTION 1

1. Base Construction with SPS	$9,519,900
2. SPS Construction	$ 440,000 (To Be Deducted from Base Construction)
3. Base Construction w/o SPS	**$9,079,900**
4. FFE	$ 1,100,000

The following items could be deleted from the Base Construction costs as a saving if required

Roofing:	-$582,300
Replacement Windows:	-$336,000
Elevator Replacement:	-$105,000
Sprinkler:	-$220,500

OPTION 2

1. Base Construction with SPS	$9,900,500
2. SPS Construction	$ 440,000 (To be Deducted from Base Construction)
3. Base Construction w/o SPS	**$9,460,500**
4. FFE	$ 1,100,000

OPTION 3

1. Base Construction with SPS	$10,289,800
2. SPS Construction	$ 440,000 (To be Deducted from Base Construction)
3. Base Construction w/o SPS	**$9,849,800**
4. FFE	$ 1,100,000

2 Introduction and Assignment

2.1 Introduction

DIALOG was engaged by Public Works and Government Services Canada (PWGSC) to undertake a Building Condition Assessment and Feasibility Study to examine options for the existing Crown Owned property at 441 University Avenue W, Windsor, Ontario. The intent was to understand and document defficient conditions in order to implement a design that would provide federal accommodation that meet all current codes, regulations and standards including PWGSC Workplace 2.0 Fit-up Standards. Specifically the mandate was as follows:

1. Survey the entire building including building elements and building systems in order to examine options to correct deficient conditions and provide federal accommodation that meet all current codes, regulations and standards (including PWGSC Workplace 2.0 Fit-up Standard);
2. Submit a Building Condition Report (BCR) that outlines and identifies the current condition of the existing building elements and building systems. The report will also identify when building elements and systems need to be replaced or upgraded;
3. Submit a Feasibility Study (FS) that recommends a cost effective and efficient renovation strategy to the building owner so that the following objectives can be achieved:
    a) Office type occupancy where 300 staff work primarily in an open office layout with a 50 m^2 high density mobile shelving unit, boardrooms, meetings rooms, and enclosed offices.
    b) Separate 1.8m x 1.8m rooftop enclosure that is environmentally controlled and will house a computer terminal, table, and air monitoring equipment.
    c) Separate government tenant with 3-4 workstations, file room with table; meeting space outside of the workstations and a Special Purpose Space (SPS) with large "secure cage" and one "live room" with window, sink table to hold live animals. The SPS is to have separate HVAC, Store Room/lockers/gun cleaning station/gun storage safe/charging station, all located in one small room. LAN Room and direct access to secure compound. This space could be housed within the existing building or a separate addition and have direct access to the secure parking compound.
    d) The building is to have a 25 year life cycle

The Government of Canada Building (GoCB), 441 University Avenue in Windsor, Ontario was constructed in 1953. It is a two storey structure with a partial basement that is built of concrete, masonry and wood construction. The building area is approximately 2,418 m^2 (62m x 39m) and is classified as a Group D Occupancy with a total usable floor area of approximately 4,562 m^2. The building was designed in 1952 by Department of Public Works (DPW) Chief Architect, E.A. Gardner and although it is more than forty years old, it has not been designated by Federal Heritage Building Review Office (FHBRO) as a heritage building. It was constructed specifically for Unemployment Insurance Canada, as the U.I.C. Office Building. Various minor renovations and alterations have been carried out over the years as the facility moved from single to multi-tenant use.

Currently the first and second floor of the GoCB contain various open and closed office areas, meeting-training rooms, public waiting areas as well as corridors, service spaces, stairwells and elevator. The basement consists of service areas, storage spaces and semi- finished office space including the BGIS Facility Manager office. Access to the flat roof is provided by an exterior steel stair which can only be accessed from the secure parking area on the south-east side of the building. The building is currently occupied by various Crown tenants, such as Service Canada, Canada Revenue Agency (CRA), and Environment Canada (EC). Previous tenants have included HRSDC, DND, and EC and several private sector tenants, including BLJC, St. Clair College, and the City of Windsor. The number of occupants in the building has been reduced recently and there are approximately 60 occupants in the building, almost

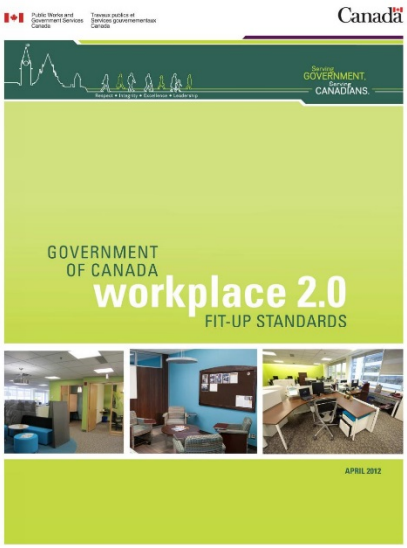
exclusively CRA staff all on the 1st floor. The most recent renovation was the Environment Canada Wildlife Enforcement Branch offices which were completed in 2010 and occupy approximately 120m^2 on the south side of the 1st floor with direct access to the secure parking area.

The building is located close to the downtown core area, fronts on University Avenue West to the north and bounded by a Lane on the east and an Alley on the west. The building has a secure parking compound lot that fronts on Park Street West to the south boundary. The site is an L-shaped property with a three storey masonry apartment building to the south-east. There is a parking lot to the east of the property across the Lane and a series of residences to the west of the property across the Alley. Public Works and Government Services Canada (PWGSC) is the custodial department for this facility, which is managed through an AFD service provider, currently Brookfield Global Integrated Systems (BGIS).

3 Workplace 2.0

3.1 Workplace 2.0 Calculations for GoCB Windsor

The mandate for GoCB Windsor's office fit-up involves accommodating up to 300 full-time employees (FTE) with a design that conforms to the Government of Canada Workplace 2.0 Fit-Up Standards. Workplace 2.0 (WP 2.0) is an office design standard championed by PWGSC to establish modern workplaces that will attract, retain, and enable public servants to work more efficiently and sustainably. The key design implications of conforming to Workplace 2.0 include the use of smaller workstations - generally in an open office arrangement, introducing more office support space, restructuring workflows with modern communication technology, and establishing a more egalitarian physical environment with opportunities for exterior views and access to natural lighting for all.



A variety of metrics are used in WP 2.0 to determine compliancy for support space provisions, workspace type allocation and sizing, and minimum service requirements. The guidelines governing the sizing and type of workspace are established in Section A3.4, which provides a written description of the allowable sizes for the four workspace types (leadership, fixed, flexible, and free address) as well as the conditions that must be met for an FTE to qualify for each. Support space provisions are determined by both allocation tables and written qualifications for each support space type, namely meeting rooms, quiet rooms, kitchenettes, shared equipment, reception areas, undesignated support spaces, collaborative spaces, satellite printer stations, coat storage, and first-aid rooms. Lastly, the minimum telecommunications infrastructure is determined based on allowable areas of coverage within the building footprint. Below is a description of each category as it is applied to the GoCB Windsor office fit-up. Refer to Appendix C for a full break-down of the project's WP 2.0 calculations, and Appendix D for the applicable sections of *Government of Canada Workplace 2.0 Fit-Up Standards*.

Office & Workstation Area

With 300 FTEs established as the design population, it was determined from the area of renovation scope on each floor that the FTEs should be split roughly 47% on the ground floor (142 FTE) and 53% on the upper floor (158 FTE). In determining the workspace types it was assumed that all users would qualify for the 4.5m^2 open workstations in order to provide a 'worst-case scenario' for accommodating the requested 300 FTEs. The maximum height for the workstation panels is 54", a number lower than some open offices in order to allow for increased light distribution and airflow.

It was further assumed that each floor would have 3 FTEs that qualify for an enclosed 10m^2 office, and another 6 FTEs that require a larger leadership workstation with provision for visitor seats. As shown in Section 5.4 *Architectural Layout*, the building is able to accommodate all requested FTEs with the noted assumptions. As the project moves towards the Design Concept stage these assumptions should be confirmed to ensure the design conforms to the tenant's requirements.

Figure 1a *Typical grouping of 4.5m² workstations (Source: Office Works LLC)*

Designated Support Spaces

With the similar design populations between the ground and second floor (142 and 158 FTE respectively), the calculated provision for designated support spaces is nearly identical. Each floor will receive four 5m² Quiet/Touchdown Rooms, two 14m² "small" meeting rooms, two 30m² "medium" meeting rooms, and one 60m² "large" meeting room. Additionally, each floor will have one 60m² kitchenette, and three 8.4m² telecommunication rooms. The only difference is the provision for shared 15m² equipment rooms, as the ground floor would qualify for two and the second floor three.

Undesignated Support Space

For all remaining workplace support functions 10m² "undesignated support spaces" will be provided which are sized, built, and serviced to flexibly accommodate either office, meeting room, or other functions as may be required. Undesignated Support Spaces are intended to be allocated for office functions that don't conform to the listed support spaces, such as storage and file rooms. For GoCB Windsor, both the ground and second floors will be provided with three undesignated support spaces.

Open Area Support Space

With the increasing importance of team-based activities in the workplace, Workplace 2.0 provides for the inclusion of open area support spaces, including collaborative spaces, satellite printer stations, and first-aid stations. Collaborative spaces provide a place for users to go for an informal meeting without having to book a meeting room, thereby increasing the flexibility of the work environment. Furthermore, collaborative spaces can also serve as touch-down spaces for clients and teleworkers. The allocation for collaborative spaces is determined by a minimum of 5% of a floor's area, which would account for approximately 120m² per floor.

Printer stations are to be provided for every 30 FTEs (maximum), which requires each floor to have 5 printer stations. Coat storage can be provided for visitors, however it is understood that the GoCB Windsor tenant will have no visitor reception area, so no coat storage or reception areas have been provided in the architectural layout. First-Aid Rooms are not required in many instances, however the client may wish to consider providing these as part of the final fit-up of the support spaces.

Figure 1b *Example of open collaboration space in a WP 2.0 office environment (Source: DIALOG)*

Telecommunication Room Provisions

The number of telecommunications rooms (TR) is determined by a table that lists the maximum floor area served by a TR and the associated required room size. With a rentable floor area of approximately 2,000m^2 on the ground floor and 2,200m^2 on the second, the most efficient WP 2.0 compliant design would see two (2) 3.3m x 3.0m TR rooms on the ground floor and three (3) 2.8m x 3.0m TR rooms on the second floor. The ground floor TR rooms would serve 1,000m^2 each while the second floor TR rooms would serve 800m^2 each. Refer to Section 5.7.4 Telecommunications for further description of the telecommunications provisions, and section A4.1 in Appendix D for the Workplace 2.0 Fit-Up Standards for telecommunications infrastructure.

PWGSC Building Measurement Terms

Within the Workplace 2.0 Fit-Up Standard Calculations shown in Appendix C, a number of terms are used to describe building areas. Below is a summary of those area terms and descriptions:

ACCESSORY AREA
Common use areas which serve all occupants on the floor or within the building including lavatories, janitor closets, electrical closets, public corridors, elevator lobbies, lunchrooms and common service boardrooms.

BUILDING SERVICE AREA
Those areas that are necessary to the operation of the building, such as main entrance lobbies, public stairs, elevators, boiler and machine rooms, stacks and flues.

OUTSIDE GROSS AREA (CONSTRUCTION GROSS)
That area measured from the outside surface of the outer building wall to the outside surface of the opposite outer building wall, for the area of each floor without any deductions for opening, which occur within the floor area. Where balconies and mezzanine floors occur within the exterior walls of the building, the actual area of these is measured and included.

RENTABLE FLOOR AREA
That area within the outside walls computed by measuring from the inside surface of the outer building wall to the inside surface of the opposite outer building wall, except where the outer building wall

consists of 30% or more glass. In which case, that area is computed by measuring the innermost inside surface of such glass to the inside surface of the opposite outer building wall or glass whichever is applicable. The area includes columns and projections necessary to the building structure but excludes Building Service Area.

USABLE FLOOR AREA
That area within the outside walls measured and computed in the same manner as "Rentable Area" but excluding common use areas which serve the entire floor or building, known as Accessory Areas.

4 Existing Facility

4.1 Context

The building is bounded by University Avenue and sidewalk to the north with an accessible ramp to the north-west entrance. (Fig 2) The rear or south of the building has an asphalt parking lot with a 2m high chain link security fence with motorized gates at the Park Street West entrance. (Fig 3) There is room for approximately 40 vehicles and it is understood that these are generally assigned to Environment Canada Wildlife Enforcement vehicles as well as some other users. The parking area also contains a steel shed which is access from the parking lot and from the west Alley. It is assumed that this is for waste or re-cycling materials. There are two Bell Telephone units at the north-west corner of the Alley, these are believed to be on Crown land. Power to the GoCB is from an overhead pole on the east side, approximately 2/3 of the distance from University Avenue (Fig 3) and it is believed that the Enbridge natural gas line enters the building from the south-west corner. There are no other outbuildings or site features on the property. The overall site area is 6,700m^2 and the parking lot is 800m^2. The north side of the building is close to the property line which is not at right angles to the east and west property lines; it would be assumed that this has some impact on the small setbacks at the north-east corner of the GoCB.

The east side of the building is bounded by a 6m wide asphalt Lane which according to the Survey Plan is on the lot line at this location. The west side of the building has a 1.5m wide concrete walk which is immediately next to the building, a 2m wide grass boulevard and a short retaining wall adjacent to a 3m Alley. The setback from this Lot Line is approximately 3.8m.

Figure 2 N-W Property and Alley (Photo: DIALOG 07-15-15)

Figure 3 South Secure Parking (Photo: DIALOG 07-15-15)

Figure 4 East Lane and Hydro Entr. (Photo: DIALOG 07-15-15)

Figure 5 Parking Area, Areawell & Former U/G tank (Photo: DIALOG 07-15-15)

It is understood that the building may have been designed to have coal fired boilers with coal chutes to the exterior on the south side. It is understood that these were never installed but that an oil fired boiler was installed before the building was completed. It is understood that an underground oil storage tank was located in the south parking area but that this was removed when the natural gas-fired boilers were installed. There is evidence in the surface of the existing asphalt paving to suggest this but it has not been confirmed. (Fig 5). The parking area has two catch basins with cast iron covers, and appears to have a reasonable slope to drains with no evidence of low areas or ponding.

4.2 Building Envelope

The GoCB is a two storey structure with a partial basement constructed of concrete, masonry and wood with a flat roof. The building layout is a fairly simple design with stairwells in each of the four corners of the building with a single passenger elevator in the north-west stair which exits to University Avenue. The building area is approximately 2,418 m^2 with washrooms and similar fixed elements on the rear side of the building and an open layout configuration with columns at approximately 6.86m x 6.4m on center within the space. Floor to floor heights for the 1^{st} to 2^{nd} floor is 4.55m; 2^{nd} floor to roof is 4.5m and the Basement to 1^{st} floor is 4.5m at the highest point. Typical floor and roof framing is a generally wood framing for the 2^{nd} floor and roof with structural cast in place concrete above the basement service rooms on the south end of the building. The building would be classified as combustible. The 1^{st} floor is a concrete slab on grade except for the suspended concrete slab above the basement service rooms.

4.2.1 Exterior Walls

The exterior walls of the building in most locations is comprised of a 90mm x 190 mm face brick, 290 mm load bearing concrete block back-up on the first floor with 190mm concrete block on the second floor, wood strapping and plaster on plaster lathe. As there are no existing drawings to document the construction, this information was determined from earlier reports and historical photographs. The masonry veneer is laid in a running bond pattern with a header course every seventh row of masonry. This may form a tie to the back-up concrete block wall. There is an indication of 25mm insulation on the interior surface of the wall but this has not been confirmed. On the University Avenue elevation the face brick is replaced with granite and limestone panels below the strip windows and the granite trim extends along both the east and west elevations as a base for approximately 20 metres. The punched windows have an exposed steel lintel and limestone sills with this material used as trim in other areas of the building.

There are precast concrete inserts at the upper level of the masonry wall which suggest that the original attic vents to the ceiling void have been replaced. The original brick chimney is located on the south of the building near the west side. This chimney is currently being used to vent boiler flue gasses from the basement to the exterior at roof level. There are several area-wells from the Basement Mechanical Rooms at grade level adjacent to the parking lot. These have steel grated covers.

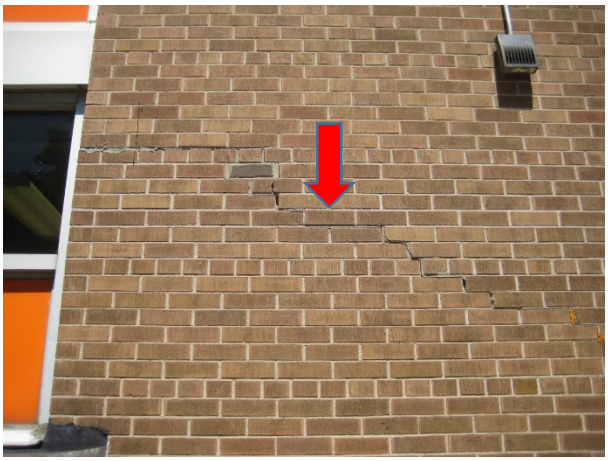


Figure 6 Cracking of Brick Veneer (Photo: DIALOG 07-15-15)

Figure 7 Spalling of Brick Veneer (Photo: DIALOG 07-15-15)

The exterior brick walls are a fair to poor condition. There are some areas adjacent to the stairs on the east and west elevations with significant cracking of the brick and masonry joints (Fig 6). This is believed to be due to a lack of vertical and horizontal expansion joints over the long expanse of brick veneer above the window openings. The 60 metre length of brick does not have any control joints and consequently the expansion and contraction of the brick veneer due to temperature changes has resulted in the cracking close to each end of the building. This is a common occurrence in this type of construction and while the investigators were unable to examine the back-up wall, it is unlikely that it has telegraphed through. There are also a number of areas, especially on the east side adjacent to the sidewalk where the face brick has spalled. (Fig. 7) This is likely due to freezing and thawing from water splashing from the sidewalk or from the ice melting salt used to prevent freezing during the winter.

The limestone lintels below many windows also exhibit some spalling of the surface in the plane of the stone surface. (Fig. 7) The granite and limestone panels and trims used as a veneer as well as a trim in many instances has been displaced and damaged with a significant number of deteriorated joints. The stone and brick surfaces are dirty and stained at a number of locations. There is no indication of any significant changes to the exterior masonry since the building was constructed in the early 1950's and other than some localized repairs above some 1st floor windows with sealants no other repairs appear to have been undertaken on the masonry walls.

4.2.2 Exterior Windows

The original wood windows on the 1st and 2nd floor were replaced with clear anodized aluminum frames with insulating glass units and insulated porcelain enamel spandrel panels in 1978. The majority of window units for the GoCB are similar with an overall size of 2.5m wide x 2.3m high (33 brick courses) (Fig 8) with the punched window unit divided into three equal vertical sections. The upper section with the porcelain enamel panel is approximately 400mm high. The east and west elevations have fourteen of these units on each of the two floors with several similar units on the south elevation. The north or University Avenue elevation has a similar window except that it is arranged as a strip window with eight

units of each separated by a larger aluminum mullion on both floors. The exit stair wells on the east and west side have similar glazing arranged in a curtainwall system above the doors.

The existing windows were installed in the rough opening without any changes to the brick veneer or limestone sill. A small vertical section of aluminum has been installed to make up the difference from the overall window unit to the top of the limestone sill. There is no vertical aluminum flashing at the existing sill. The window unit would be typically secured to the existing substrate at the aluminum head, jambs and sill before the unit was glazed from the inside. The glazed units are wet sealed to the aluminum frames and the perimeter of the window unit is caulked continuously at the exterior brick.

This type of aluminum window framing system is glazed from the inside with a snap on cap and wet sealed. The glazing units used throughout are a 25mm thick with a 5 to 6mm clear float glass for each lite with an aluminum spacer bar. (Fig 9) The aluminum frames from this time were designed with a minimal thermal break between the interior vertical section and the exterior face and can usually be re-glazed with minimal effort. The sealed glazing unit with clear glass on both lites would have a R-Value of 2.0 to 2.3 and a Solar Heat Gain Coefficient (SHGC) of approximately 0.77. By comparison, a sealed glazing unit today would be expected to have an R value of 4.0 or better and a SHGC of 0.40 or better.

Figure 8 Exterior Windows (Photo: DIALOG 07-15-15)

Figure 9 Window Glazing Units (Photo: DIALOG 07-15-15)

The porcelain panels which are installed in the upper sections of the windows typically had a minimal amount of insulation in a sandwich panel configuration to fit the 25mm back section of the aluminum framing. Without any existing drawings there is no way to determine this, but if it is insulated, it could have an effective R-value of R-5. It is understood that while the Environment Canada Wildlife Enforcement Branch windows and entrance on the south side were modified in 2009, this modification only included the addition of the hollow metal door and application of a protective film on the glazing units to reduce the risk of breakage. Furthermore, it is understood that operable sash units were added to a number of existing windows on the north side in 1989 to provide fresh air to the occupants in this area.

4.2.3 Exterior Doors

The exterior doors are clear anodized aluminum frames, with clear glass at the front entrances and wired glass at the side entrances. The doors are a medium duty section with 50-100mm stiles and rails. (Fig 10) The north-west entrance doors which has an exterior ramp is equipped with power door operators for barrier-free access. The south-west door is equipped with an electric strike to allow access

from a fob or security card for staff and users. It is understood that the north-east and north-west entrance windows to University Avenue were replaced in 1992. Some window and door elements to access the Environment Canada space on the south side from the parking lot were renovated in 2009 including solid, hollow metal door and enhanced security film for the windows.(Fig. 11)

Figure 10 Main Entrance Doors (Photo: DIALOG 07-15-15)

Figure 11 EC WEB Entrance (Photo: DIALOG 07-15-15)

4.2.4 Roofing

The main roof consists of a two ply modified bitumen membrane and rigid insulation on the wood roof deck. Perimeter flashings are generally prefinished metal and a number of drains are located throughout the roof. It is understood that this roof was replaced in 1999 and is showing significant deterioration of the membrane including loose of the granular wearing surface and delamination of the membrane from the substrate. The roof insulation is likely a 50mm rigid insulation which may give a thermal resistance value of R-10 to R-14 overall for the roof. There are a number of issues with the existing roofing, foremost is that the long term sag of the laminated timber roof decking has resulted in a number of low spots which do not coincide with the roof drain locations resulting in standing water and ponding (Fig 12).

There are seven roof drains which serve the existing roof; it is believed that six of the roof drains coincide with the existing rain water leaders at columns locations in the building and one may have been added at a later date. The roof drains are conventional drains and it does not appear that any are control flow. There are a number of areas where the membrane is delaminating (Fig 13) from the substrate as well as areas where the granular top surface of the membrane is wearing off. Rooftop mechanical units have been added over time as well as wood duckboards to support air monitoring equipment for Environment Canada.

There is a guardrail system along approximately 75% of the south elevation in proximity to the access stair and Environment Canada equipment. (Fig 14) There is a guardrail system at the north-east and north-west corners of the building to access the façade mounted flagpoles. There are no roof anchor or window washing tie-off bollards on the roof. The exterior parapet is a minimal height above the roof membrane and does not have any roof scuppers to discharge water from the roof in the event of a roof drain becoming blocked. (Fig 15)

Figure 12 Standing Water (Photo: DIALOG 07-15-15)

Figure 13 Delaminating Roof Membr. (Photo: DIALOG 07-15-15)

There are additional roofing elements on the main University Avenue elevation such as canopies over the exterior windows. (Fig 2) It appears that all original flashings have been replaced with prefinished metal. Some areas of the stone cladding which frame both the north-west and north-east entrances are also capped with copper roofing. The canopies above the south-west and south-east entrances have built-up bituminous membranes on wood decking. Flashings are clear anodized aluminum. There is a rooftop storage shed (Fig 14) which has a prefinished metal roof as well as an air intake louvre in a roof top shed to provide intake air to the basement air handling units. The roof has a number of mechanical units as well as remote condensing units and the natural gas lines to roof top units are mounted on wood sleepers. These have all been added over the history of the building and do not appear to have any significant water leakage problems from the units into the spaces below.

Figure 14 Guardrail on South Elevation (Photo: DIALOG 07-15-15)

Figure 15 Typical Roof Curb/Parapet (Photo: DIALOG 07-15-15)

4.2.5 Foundations & Exterior Stairs

Exterior foundations are located around the Basement on the south side of the building and presumed concrete foundations and footings along the rest of the building as well as the area well and former coal chute on the south side, are reinforced, cast-in-place concrete integral with the building structure (Fig 16. The areaways are covered with painted steel gratings and protected with painted steel guards. (Fig 17). The landing at the north-west barrier free entrance is reinforced cast in place concrete with the ramp and stair of poured concrete. Guards and handrails are stainless steel.

The landing, stairs and adjacent planters at the north-east entrance are reinforced cast in place concrete integral with the building structure with granite panel cladding. The centre handrail is stainless steel. The landing and stairs at the south-west entrance are reinforced cast in place concrete integral with the building structure. The guard and wall mounted handrail are painted steel.

Figure 16 Foundation/Sidewalk (Photo: DIALOG 07-15-15)

Figure 17 Areawell & Grating (Photo: DIALOG 07-15-15)

Access to the roof is from an exterior mounted open tread painted steel stair, accessed from within the secure fenced compound. (Fig 18) It is uncertain whether this access stair extends over Crown land or over an adjacent vacant property.

Figure 18 Roof Access Stair (Photo: DIALOG 07-15-15)

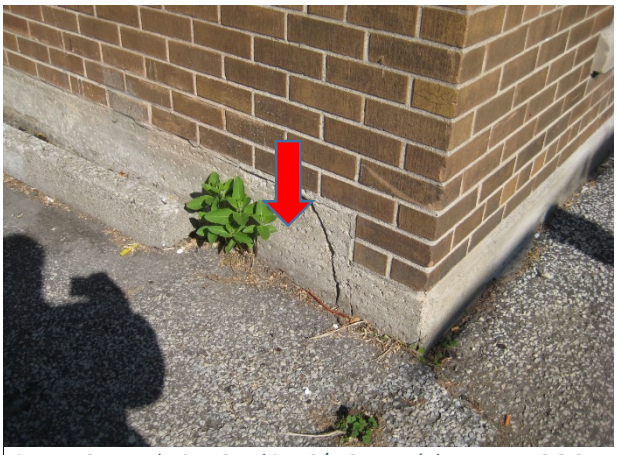


Figure 19 Foundation Cracking S/E Corner (Photo: DIALOG 07-15-15)

There is some evidence of cracking of the foundation at the south-east corner. (Fig 19). It is not known if this has resulted in any water infiltration into the basement service spaces.

4.3 Building Interiors

4.3.1 Interior Partitions

Interior walls throughout the GoCB are a variety of concrete block, stud framing (wood and metal) with gypsum board on each side, and demountable partitions in some of the open office areas. Wall finishes consist of painted concrete and concrete block in the service rooms and basement corridor, painted and vinyl covered gypsum board in office areas, and ceramic tile in the washrooms. Existing wood columns are typically clad with gypsum board on furring which also enclose the rain water leaders at some column locations. (Fig 20) It is not known if these are fire rated. Base types vary throughout depending on the adjacent flooring and include rubber cove type, terrazzo, carpet, and ceramic tile. It would be expected in a major renovation that most of the demising walls would be removed or renovated for different layouts or to accommodate increased acoustic and fire separations. The interior face of most of the exterior walls are plaster on lathe finish with exposed heating cabinets on the upper floor, and units built into the wall on the 1st floor with an extended laminate sill. (Fig. 21)

Figure 20 CRA Interiors (Photo: DIALOG 07-15-15)

Figure 21 Built-In Heating Cabinet 1st Floor (Photo: DIALOG 07-15-15)

4.3.2 Ceilings

The ceilings throughout the GoCB include exposed painted concrete in the basement level storage and service rooms (mechanical/electrical), (Fig 22) painted plaster and gypsum board in the stairwells, and suspended 2'x4' T-bar ceilings with lay-in acoustic unit tiles in many other areas. Portions of the original suspended ceiling (Fig 23) (T&G acoustic tile adhered to gypsum board on suspended metal framing, with 100 mm mineral wool (Rockwool) batt insulation) were visible in many areas above newer suspended ceilings at various locations throughout the 1st and 2nd floor levels. Ceiling heights on the 1st floor are generally 2700mm and 2700mm on the 2nd floor.

Figure 22 Basement Concrete Structure (Photo: DIALOG 07-15-15)

Figure 23 Original & Suspended Tile Ceilings (Photo: DIALOG 07-15-15)

4.3.3 Flooring

The flooring in the GoCB consists of painted concrete throughout the basement level, terrazzo flooring in the main entrance lobbies and stairwells (Fig 24), ceramic tile in the washrooms, resilient flooring (i.e. vinyl tile, rubber tile) (Fig 25) in the corridors, secondary stairwells, computer equipment rooms, janitor rooms, staff break/lunch rooms, and some tenant spaces, and carpet flooring throughout the remaining areas. It is understood that the original flooring was typically vinyl tile over a plywood type substrate over the laminated wood decking. Much of the existing flooring is covered by newer finishes such as 2'x2' carpet tile over much of the 1st and 2nd floor office areas especially the CRA offices.

Figure 24 Main Lobby Terrazzo (Photo: DIALOG 07-15-15)

Figure 25 EC WEB Renovation (Photo: DIALOG 07-15-15)

4.3.4 Interior Doors, Frames, and Screens

Interior doors throughout are a mixture of solid core wood (paint finished), hollow metal (paint finished), and anodized aluminum. Frames and screens are a mixture of wood (paint finished), hollow metal (paint finish), aluminum, and vinyl (integral with demountable type partitions. A number of doors in fire separations are labeled and equipped with closers and self-latching devices. (Refer to Life Safety Section 5.7) Glazing in door lights and screens is a mixture of wired glass, clear glass, and opaque/fluted glass. Some doors are equipped with accessible hardware but in general the facility would not meet the requirements of B651.

4.3.5 Window Coverings

Many of the exterior windows in the CRA renovated area on the 1st floor have newer, manually operated pull down window shading devices. These are typically full width (2.5m) and are a good quality. The remainder of window coverings in the building are generally in poor condition or inappropriate for future use and should be replaced.

5 Technical Requirements

5.1 Building Envelope

5.1.1 Exterior Walls

It is recommended that measures to repair the existing masonry should be undertaken due to the project's objective of achieving a 25 Year Life Cycle with the building renovation. This would include repairs to joints, replacement of cracked masonry units and installation of vertical control joints to minimize future cracking. Spalled masonry units should be repaired and or replaced and granite and limestone trim and accents repaired or reinstalled.

Summary

Existing Condition	Recommendation	Risk of Inaction	Cost
Fair (moderate revision required to achieve 25 year life cycle mandate)	Patch cracked & spalled brick. Replace centre portion of North Façade.	Extent of masonry damage and potential for water infiltration will increase without repair.	$60,000

5.1.2 Exterior Windows & Glazed Entrances

The majority of the sealed glazing units for the GoCB are 38 years old and while there does not seem to be a significant number failures of the seals they are approaching their effective life span. The glazing units and the aluminum window framing have thermal resistance values well below current standards as well as high light transmission values and low reflectance rate. It was also noted that the windows on both the east and west elevation at grade level are both immediately adjacent to the Alley and Lane. There may be concerns with security of these windows both from breakage and visual access into the secure areas.

It is recommended that the renovation of the GoCB include a full replacement of the glazing panes and frames with a glass type that has a lower light transmission value and higher reflectance rate. It is also recommended that the glass on the ground level include a laminated glass lite to increase the building security.

Summary

Existing Condition	Recommendation	Risk of Inaction	Cost
Fair (moderate revision required to achieve 25 year life cycle mandate)	All exterior windows are recommended for replacement with security film on ground floor units	At 38 years old, incidence of water or air leaks will increase in future. Replacement required to achieve 25 year life cycle.	$317,500 + $27,400

5.1.3 Hollow Metal Exterior Doors

The exterior doors and framing are in reasonable condition and would continue to serve their current purpose. Depending on the extent of any proposed redevelopment of the GoCB, consideration should be given to repair or selective replacement of the doors, glazing and hardware security systems to meet the new requirements for life safety, access control, visual and physical security.

Summary

Existing Condition	Recommendation	Risk of Inaction	Cost
Good (minimal revision required to achieve 25 year life cycle mandate)	Exterior doors & framing can be included in renovation without significant modification.	Security requirements of tenants may require alterations of existing hardware.	$0

5.1.4 Roofing

The current roof installation is sixteen years old plus and the effective life span of a modified bitumen membrane is 15-20 years so the roof has effectively reached the end of its life cycle. While it is understood that there are no significant issues with water infiltration into the 2nd floor areas, any major renovation of the building should consider an upgrade to the roof system. The lack of proper drainage due to the low spots as well as the minimal insulation value offered by the existing system are significant issues that should be addressed as part of a 25 Life Cycle.

It is likely that a major upgrade to the building to accommodate new tenants would result in a significant changes to the mechanical systems including the removal of a number of the smaller roof top units and replacement with fewer, more efficient units. This would result in a number of repairs or modifications to the existing roof membrane and drainage. If it was decided not to undertake a replacement roof system, it is recommended that an electronic leak detection test be undertaken prior to the start of any renovation to document the extent of any leaks. This will provide a baseline so that any damage which occurs during construction shall be the responsibility of the Contractor.

Summary

Existing Condition	Recommendation	Risk of Inaction	Cost
Poor (extensive revision required to achieve 25 year life cycle mandate)	Upgrade of modified bitumen roofing system.	Further water damage in building, higher cost for remediation in future with tenant in-place.	$550,900

5.1.5 Foundation & Exterior Stair

The foundations, area wells, exterior concrete stairs and landings are in acceptable condition. Consideration should be given to some upgrading or enhancements of the landings and stairwells. The south-east stair and door which is used for staff access is not barrier free and this should be considered as part of any upgrade. Confirmation of the legal agreements, easements, for the exterior roof access stair should be undertaken with adjacent property owner to determine whether this stair is on Crown property. Consideration should be given to providing a roof access stair internally in a more secure location to service mechanical equipment and the Environment Canada monitoring room and equipment.

Summary

Existing Condition	Recommendation	Risk of Inaction	Cost
Good (minimal revision required to achieve 25 year life cycle mandate)	No change to foundations. Refer to Vertical Systems for South-East stair recommendation.	N/A	$0

5.2 Building Interiors

5.2.1 Interior Partitions

To accommodate up to 300 staff in a WP 2.0 Workspace environment it is recommended that a majority of the existing interior demising walls be removed. WP 2.0 generally requires that workstations are an open office concept with access and views to exterior windows. With the exception of Collaborative Spaces and Special Purpose Spaces (SPS) much of the existing floor plate would be open with demising walls devoted to support and service spaces. As the recommendation is being made to maintain the ground floor spaces occupied by Environment Canada, the walls that separate this space from the renovation area should be reviewed for fire and acoustic separation, conformance to tenant security requirements, and whether they are required to be full height for mechanical services and air returns.

Summary

Existing Condition	Recommendation	Risk of Inaction	Cost
Partitions do not conform to Workplace 2.0 Requirements	Demolish all partitions and provide new partitions in configuration that conforms to Workplace 2.0.	Required to achieve project objective.	$471,400

5.2.2 Ceilings

As most of the existing interior demising walls would need to be removed to accommodate the renovation plans, most (if not all) existing ceilings will need to be removed and replaced. Similarly, it is likely that a new cable tray system will be required to accommodate the information technology requirements of an open office environment. Consideration will be required to provide a ceiling system with the correct Noise Reduction Coefficient (NRC) and Sound Transmission Coefficient (STC) that meet WP 2.0 Fit-Up Standards for acoustics. For this, the recommendation is to proceed with new lay-in acoustic tile ceilings throughout the ground and second floors, with gypsum ceilings in washrooms and janitor rooms.

Summary

Existing Condition	Recommendation	Risk of Inaction	Cost
Ceiling layout does not conform to Workplace 2.0 compliant partition layout	Demolish all ceilings and provide new ceilings that conform to new partition layout.	Discontinuity of materials in final design.	± $312,550

5.2.3 Flooring

All floor finishes included within the scope of renovation are recommended for replacement. Though the carpet tile in the recently renovated areas on the 1st floor CRA is only 5-6 years old and still in relatively good condition, it is recommended this area also be included for replacement to ensure material consistency and compatibility. As the washrooms will require a major renovation in order to conform to accessibility standards, all washroom flooring should also be replaced to suit the new design.

In accordance with the Pinchin Asbestos Materials Report of March 31, 2011, it is presumed that the original vinyl floor tile has Asbestos Containing Materials (ACM's). If any existing vinyl floor tiles are required to be removed as a result of planned demolition or renovation, the Contractor must be advised and must use Type 1 procedures as outlined within Ontario Regulation 278/05 if the work is done using wet methods and using hand-held non-powered tools.

Consideration should be given to maintaining the existing terrazzo floor finishes in the two main entrances if this can be achieved while meeting life safety and barrier free requirements.

Summary

Existing Condition	Recommendation	Risk of Inaction	Cost
Flooring layout does not conform to Workplace 2.0 compliant partition layout	Demolish all floors and provide new floors that conform to new partition layout.	Discontinuity of materials in final design.	± $295,150

5.2.4 Interior Doors, Frames, and Screens

It is recommended that a majority of the existing interior demising walls would be removed, as WP 2.0 requires most workstations to be established in an open office environment. The new Collaborative Spaces and SPS outlined by WP 2.0 & the project's Terms of Reference will require new door and hardware systems. The Environment Canada SPS will require doors and hardware in accordance with the *Operations, Security and High Security* requirements of the Treasury Board Secretariat (TBS). A number of other doors to stairwells and service spaces may be acceptable or may require upgrading depending on the applicable requirements. Security and access control systems will likely be required for many doors throughout the GoCB.

Summary

Existing Condition	Recommendation	Risk of Inaction	Cost
Partitions that host doors are not Workplace 2.0 compliant.	Remove interior doors, frames, and screens during demolition phase and replace with new.	Many doors do not conform to design standards for WP2.0.	$124,600

5.2.5 Window Coverings

It is recommended that a majority of the existing interior demising walls would be removed. WP 2.0 generally requires that workstations are an open office concept with access and views to exterior windows. Most windows on the 1st floor will require shading devices for both environmental and security purposes as the windows are adjacent to public thoroughfares. Depending on the final interior layouts, there should be a sufficient inventory of existing window shading devices that can be saved and consolidated in an area of the building to maintain a consistent level of finishes such as the rear elevation on both floors. The remainder of the windows would require new window shading devices for security and sun control.

It is also recommended that translucent films should be considered for windows in areas where privacy is a concern, such as the stairwells and along the 1st level north wall.

Summary

Existing Condition	Recommendation	Risk of Inaction	Cost
Most in poor condition, some are newer	Provide new window coverings for all exterior windows.	Discontinuity between few good quality existing window coverings and new.	$46,500

5.2.6 High-Density Mobile Storage

As part of the CRA Fit-Up, it is understood that a High Density Mobile Storage (HDMS) system will be required. It is understood that the program requirement is for 50m^2 of mobile shelving units which will require a space larger than the system for circulation and operation of the system.

There are a number of specific Federal Government security and fire protection requirements which may have to be incorporated into the system in order to meet these requirements.

Mobile Shelving System: means a system of records storage (also known as compact shelving, track files, compaction files, high density file storage or movable files) in which sections or rows of shelves are manually or electrically moved on tracks to provide access aisles. Mobile shelving is usually a type of open-shelf file equipment.

Figure 26 Photo of HDMS System (Photo: DIALOG)

Mobile Shelving located in Unsprinklered Buildings: Where the record storage is located in an unsprinklered building, mobile shelving system is permitted provided it is located in a fire separation having a fire-resistance rating of at least ¾ h, and the aggregate size or area of the mobile shelving system does not exceed 25m^2, or the aggregate size or area of the mobile shelving system does not exceed 4m2 within an open office area or in a floor.

Mobile Shelving located in Sprinklered Buildings: Except for some limitations, the sprinkler system protecting the mobile shelving system shall be hydraulically designed as an Ordinary Hazard Group 2 occupancy classification. Where the records storage utilizing a mobile shelving system is subsidiary to a floor area protected by a Light Hazard Occupancy sprinkler system, the sprinkler system may be deemed acceptable where the aggregate area of the mobile shelving system is not more than 70 m^2 on one floor, or in a 1 h fire compartment.

The sprinkler occupancy classification described above for the protection of the mobile shelving system shall be extended to the entire fire compartment, or at least 4.6 m beyond the area associated with the mobile shelving.

The criteria which governs the size limitations for HDMS indicates that in order to provide for 50m^2 of HDMS that a sprinkler system will be required. These requirements should be reviewed in further detail with the client and Fire Protection Engineering. In addition to the fire protection, there are RCMP requirements such as 'G1-028 Security Use of Mobile Shelving' which determine the security requirements for perimeter walls and doors. The Feasibility Study has followed a SR-1 guideline for "Protected' and 'Confidential' document storage subject to further discussions with the client department.

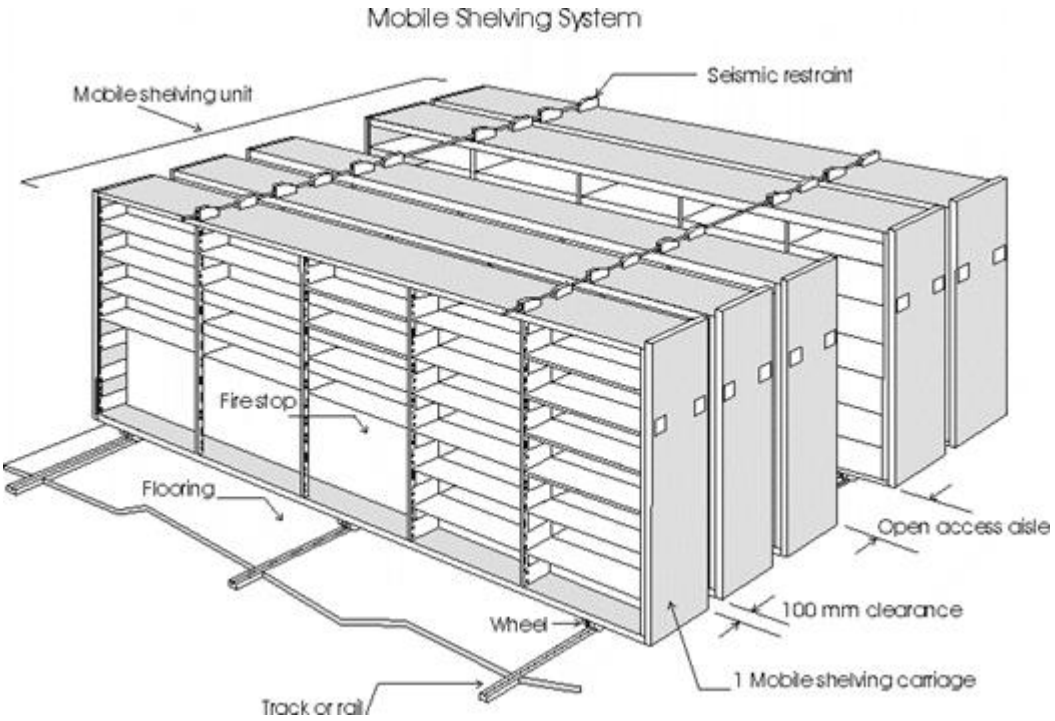


Figure 27 Schematic of HDMS System (Illustration: RCMP)

Summary

Existing Condition	Recommendation	Risk of Inaction	Cost
N/A	Provide new high density mobile storage.	Required to achieve project objective.	$75,000

5.3 Vertical Systems

5.3.1 Elevator Traffic Handling Capabilities

The GoCB Windsor currently accommodates approximately 50-60 staff of the Canada Revenue Agency (CRA) on the ground floor who occupy approximately 1,600m^2 in an open office environment. It is projected that the upgraded facility will be required to accommodate 300 full time staff distributed between the 1st and 2nd floors. From an elevator standpoint this is important information as persons assigned to work on the 1st floor, would, for the peak traffic periods (i.e. morning in rush, lunch time) be discounted from requiring elevator service. On the assumption that the GoCB cafeteria or lunch area would not be situated at 2nd floor, we have assumed for the traffic study that the 2nd floor population will be 170 persons.

As part of the actual traffic handling performance, the performance requirements or target benchmarks that elevator systems should be capable of accommodating in a commercial application should be noted. From an elevator standpoint there are three important criteria. The first is interval, or service quality, the second is handling capacity or quantity of service, while the third is car loading, or service practicality.

The first element, interval, is the calculated travel time it takes one elevator to load up its travellers, respond to their floor demands, then return back to the main loading lobby to pick up the next batch or passengers. Acceptable interval ranges (expressed in seconds) is a function of the number of elevators within the group. An elevator group having seven or eight cars will require a much lower interval result than a group having 3 or 4 cars. This occurs because of how interval is calculated, by estimating the round trip time for each car, and then dividing the result by the number of cars. For example, an eight car group with a 25 second interval means the round trip time calculation was 200 seconds per car. In the case of an elevator group consisting of 3 cars, a similar round trip time would equate to an interval result of 66.6 seconds, a figure that would be completely unacceptable. As such, one cannot say that an interval value of 30 seconds is required in every instance. Determining the acceptability of an interval result is very much a factor as to the number of elevators in the group.

The second element is a representation of how many persons the elevator can effectively accommodate for one trip, and this result is typically expressed as a percentage of the buildings above grade population. Unlike interval, there is general agreement that regardless of the size of an elevator group, the equipment solution must be able to move a certain number of the Building's staff and visitor within a five minute time period. Where traffic study results show a dearth of handling capacity then additional elevators must be provided.

The final element determines the percentage of actual car loading to its theoretical design loading as expected under peak loading times. Even though an elevator's rated capacity is 15 persons, one cannot, nor will not load this car up with that number of persons. Typically, maximum loading in North America is between 75% and 80% of the design loading. In a commercial office building, one would never design or plan for an elevator system that was required to move that percentage of car loading during peak traffic times. Typically, the maximum recommended for commercial elevators would be between 60 and 65%.

For the GoCB Windsor elevator, the following existing technical elements will have an impact on its traffic handling capability include:

- Car has a rated speed of 0.50 metres per second (100 fpm)
- Car has a design capacity of twelve (12) persons so 60% of this would mean a maximum car loading of seven (7) persons
- Car is equipped with a 915 mm x 2135 mm single slide entrance door. Given this door size and design, expected open and close times would be 2.5 seconds open and 3.6 seconds close. Use of shorter duration times would be impractical.

Small size of entrance opening, coupled with smallish size of cabin will result in higher passenger transfer times (i.e. longer boarding times and longer exiting times). However this cannot be seen as a significant impact as the GoCB elevator is only servicing two floors so on each trip there will not be multiple loading and unloading stops.

Given the above noted car specifics, and based upon the 2nd floor loading of 170 persons, it has been determined that the existing elevator will provide the following performances:

- Average Interval: 59.5 seconds
- Persons Moved in 5 Minutes: 25
- 15.6% of 2nd floor population
- Maximum Car Loading: 45%

These results show that in terms of being able to move at least 15% of the estimated floor loading, the existing elevator will be able to do this, and do it without coming close to the maximum car loading recommendation of 60%. Average interval result is far longer than one would expect to wait in a normal commercial office building, but it is not inconsistent with an installation served by only a single car.

Given the above performances the GoCB elevator would be capable of serving the intended new building population loading. However, it must be recognized that this elevator, given its age, cannot remain in its status quo condition and left to provide long term reliable operation without first considering a major modernization of the equipment. The other major issue with the elevator installation is the non-conformance with respect to the National Building Code of an elevator opening into an *exit stair* as noted in Section 5.8.

5.3.2 Existing Equipment Concerns

As noted in the Investigation Report, the existing elevator is approaching 33 years of operation and its practical equipment life cycle is typically between 30 and 35 years. As such, the existing installation will soon require a major modernization. The existing hydraulic jack design, Dover IVO, is no longer supported, so getting replacement parts for this unit will become increasingly difficult. As such, at the time of the next major modernization this unit should be re-designed with a new jack unit which will likely require a modification to the existing hoistway size, if an in ground hydraulic option is not used.

Replacing the existing inverted jack with a new holeless design will require the car frame be re-designed as the mounting points to where the new holeless jack units would connect to the car frame would be different. Also, new holeless designs have a jack unit mounted on either side of the car platform, not just in a single location. So as to avoid having to make the current cab size smaller, something that would end up with a cabin size too small to accommodate minimum barrier free access requirements, if a twin post hydraulic jack replacement were to be considered, the existing hoistway size would need to be enlarged. The current hoistway width of 2.25 metres would need to increase by a minimum of 200 mm. The elevator would also require relocation of its guide rails so as to accommodate a side mounted jack.

If an in ground hydraulic design were used, this would still require the re-design of the car structural frame, but as it would no longer be necessary to have two jack units mounted either side of the platform, the existing shaft size could remain. In addition, the existing guide rail columns could also remain in place. The only drawback with this option is that there would be a requirement for inside shaft drilling, something that is both expensive and noisy. However, the limited travel of this elevator will serve to minimize the costs and duration of this work.

Existing hoistway construction is block wall, once outside of the pit space. The elevator pit walls are cast in place concrete and in order to expand the existing hoistway's width, it would be necessary to either create a new elevator core in some other location, or, cut out at least one of the existing pit's formed wall, and remove the block work above. It should be noted that the existing elevator does not have an elevator pit floor drain as required by B44-10 Elevator Safety Code and it is proposed that a new elevator would include this within the scope of work.

In terms of the NBC requirements, where an elevator is provided to serve as a barrier free access path, it must be sized so the elevator can accommodate a mobile stretcher in its prone position. This requirement would not be retroactively enforced on an existing building, but we believe that where a building's existing elevators are undergoing modernization that the scope of work to include enlarging one car to make it able to accommodate a mobile stretcher in its prone position will be required. The GoCB elevator at 441 University is currently too small to achieve this provision. This car would have to be upgraded in terms of its current capacity as well as platform size in order to be able to accommodate a mobile stretcher.

To accommodate a mobile stretcher the elevator cab platform would need to be increased from its current 1,725 mm width to 2,030 mm. This would require a corresponding increase in car capacity from 900 kg to 1,135 kg. It would also require that the car door opening width be increased from its current 915 mm to 1,065 mm. From a building structural standpoint, this would require the enlargement of the

current shaft size from 2,250 mm to 2,540 mm. The front walls of the hoistway would also require opening up so as to remove the old elevator and allow for the installation of the new car and new wider entrances.

While the existing elevator meets many of the requirements of the B651-12 it is recommended that an upgraded elevator be considered to accommodate other mobility aides such as power-assisted wheel chairs and motorized scooters. While these are not a specific requirement of the B651-12, increasingly accessibility standards such as AODA will require publically assessable buildings to accommodate them.

Based on the analysis, it is our recommendation that a new hydraulic elevator be provided for the GoCB. It is recommended that this elevator be a 1,134kg to 1,260kg capacity and be relocated from within the existing North-West Exit Stair to another location as indicated on the attached plans. The elevator location has been selected in part to avoid undermining any existing concrete foundations and minimize the costs associated with new installation.

5.3.3 Stairs

The GoCB layout is a fairly simple design with stairwells in each of the four corners of the building which serve the 1st and 2nd floors and in addition the south-east and south-west stairs serve the basement Mechanical areas. These stairs serve an area of approximately 2400 m^2 with floor to floor heights for the 1st to 2nd floor of 4.55m; 2nd floor to roof is 4.5m and the Basement to 1st floor is 4.5m at the highest point. The north-east and north-west stairs which exit to University Avenue are feature stairs while the other two stairs are more utilitarian.

Existing Stairs, Handrails and Guards

There are a number of issues with the current stairs that would not meet current standards with respect to the building codes or accessibility requirements. If the building was to be constructed today, the following subheadings would be required for compliance with the NBC.

Treads and Risers

If the building was constructed today, stair treads and risers would be required to comply with the following requirements of the NBC and B651:

a) Treads and Risers - In accordance with Sentence 3.4.6.5.(1), of the NBC, and Sentence 5.4.1 (b) & (c) a flight of stairs shall have risers not more than 180mm in height and not less than 280mm in depth. The risers on the northeast and north-west stairs are 178mm in height and 290mm in depth. The south-west and southeast stairs are 178mm in height and 290mm in depth.

The treads and risers of the stairs meet the requirements of the NBC and B651.

Handrails

If the building was constructed today, handrails would be required to comply with the following requirements of the NBC:

a) Number - In accordance with Sentence 3.4.6.5.(1), of the NBC, every ramp or stairway of this Project are required to be provided with a handrail on at least one side, and, where 1100 mm or more in width, are required to be provided with handrails on both sides. In accordance with Sentence 3.4.6.5.(2), where the required width of a ramp or flight of stairs exceeds 2200 mm, one or more intermediate handrails continuous between landings will be provided, and the spacing of these intermediate handrails will be not more than 1,650 mm. In accordance with Sentence 5.4.4(b) of the B651-12, handrails shall be installed on both sides of stairs.

Handrails have been provided on both sides within the exit stair, however, due to obstructions the handrail on the wall side of the exit stair it is not continuous. Further, the handrail was not continued past the obstruction.

Figure 28 A & B – N-E Stair Handrails. (Photo DIALOG 07-15-15)

b) Height - In accordance with Sentence 3.4.6.5.(4), of the NBC, handrails on stairs and ramps are required to be not less than 865 mm and not more than 965 mm high, measured vertically from a line drawn through the outside edges of the nosing or from the surface of ramp. In accordance with Sentence 5.4.4(c) of the B651-12, handrails on stairs shall be from 860 to 920mm measured vertically. The handrails serving the exit stairs were measured at 840mm. The exit stair handrails do not currently conform to the requirements of the NBC as they are 20mm less than the required height.

c) Extensions - In accordance with Sentence 3.4.6.5.(10), of the NBC, at least one stair handrail at the top of a flight is required to extend parallel to the floor or ground surface not less than 300 mm beyond the top riser, and at the bottom of a flight and continue to slope one tread depth beyond the bottom riser then continue horizontally 300 mm. At the top and bottom of a ramp, handrails are required to extend parallel to the floor or ground surface not less than 300 mm.

Handrail extensions have not been provided for the handrails serving exit stairs. As such, the handrail extensions for each exit stair do not comply with the requirements of the NBC or B651.

Figure 29 A & B – N-E Stair Treads. (Photo DIALOG 07-15-15)

d) Termination - In accordance with Sentence 3.4.6.5.(9), of the NBC, handrails will be terminated in a manner which will not obstruct pedestrian travel or create a hazard. Based on the current design of the handrails for the stairs, neither appear to terminate in a manner that would obstruct a pedestrian or create a hazard. In accordance with Sentence 5.4.4(f, g & h) of the B651-12, handrails extensions must return to the post, floor or wall. Based on the current design of the handrails for the stairs, neither terminate and would not meet the requirements of B651.

e) Handrail Grip - In accordance with Sentence 3.4.6.5.(10), of the NBC, and Sentence 5.3.1(b) of the B651-12, handrails shall have a graspable cross section that is either circular with an outside diameter of 30 to 40mm or elliptical and have clear space of 35 to 45mm between the railing and wall.

The handrail grip of the exit stairs is a flat plate of approximately 12mm x 100mm or a 50mm x 50mm tube and as such the exit stairs do not comply with the requirements of the NBC or B651.

Guards

If constructed today, guards would be required to comply with the following requirements of the NBC:

a) Stairs - In accordance with Sentences 3.3.1.18.(1) and 3.4.6.6.(2), of the NBC, the height of guards on stairs used by the public and exit stairs will be not less than 920 mm measured vertically to the top of the guard from a line drawn through the outside edges of the stair nosing's, and will not be less than 1070 mm around landings.

The handrails within the exit stairs are being used as a guard. The 'guards' were measured to be less than 920 mm as required above. Accordingly, the guards do not comply with the current requirements of the NBC as they are 150mm less than the minimum required height.

b) Maximum Size of Openings - In accordance with Sentence 3.4.6.6.(5), of the NBC, unless it can be shown that the size of openings that exceed this limit does not present a hazard, guards serving exits will be designed such that there will be no openings that permit the passage of a sphere whose diameter is more than 100 mm.

In accordance with Sentence 3.3.1.18.(2), unless it can be shown that the size of openings that exceed this limit does not present a hazard, the size of any openings through guards serving an exterior balcony or a room, stairway or space not within a suite of residential occupancy will be such as to prevent the passage of spherical objects having a diameter of 100 mm. This criteria also applies to the triangular space between treads/risers and the underside of guards.

Currently, the guard members for the exit stairs are noted to be horizontal with openings greater than 100 mm. Further, the guards are currently considered to be climbing elements. As such, the guards do not comply with the requirements of the current NBC.

Exterior Stair to Roof

The GoCB currently has an exterior steel access stair which extends from ground level in the existing parking area to the roof level. This stair which is supported at grade and attached to the brick façade is open to the elements and used to access the roof top mechanical equipment as well as the Environment Canada Air Quality Monitoring equipment. It is our recommendation that this steel stair be removed to minimize the risks of an exterior stair. It is proposed that the south-west stair be extended to roof level within an enclosed space to facilitate access to the roof.

Recommendations

The building codes, both the NBC and OBC establish the regulatory framework for the construction, renovation, and change of use of buildings, including stairways. These codes set out the minimum standards which must be met for the construction of a stairway. These standards include reference to the height, width, number of risers, and height between landings, uniformity of risers, run of treads, depth of treads, edges of treads, and the turn of any winders on a stairway. Enforcement of the codes is delegated to local authorities or in the case of the GoCB to the DFPC. The DFPC have some discretion in how to enforce standards. The exit stairs, guards and railings of the GoCB Windsor, built in 1953, do not meet the design standard found in the current versions of the NBC and OBC. It is our opinion that regardless of whether the stairs and railings complied with the building code requirements in 1953 and could be considered 'grandfathered' is not significant in that the current design could be considered unsafe for the purposes for which the stair would be used. It is our recommendation that the minimum intervention involve the reconstruction of the guards to conform to the most recent NBC. From a risk management approach it is recommended that PWGSC consider reconstructing the exterior stairs to comply with the current building code and accessibility regulations for the use of the building occupants. As is noted in the subsequent Architectural Layout & Design Options section, it is also our recommendation that the north-east stair be removed entirely as it is not required for exiting and presents an additional security point that has to be monitored. Removing rather than reconstructing this stair would be a significant cost saving as well as making additional space available for future uses.

Summary

Existing Condition	Recommendation	Risk of Inaction	Cost
Elevator			
Does not conform to NBC.	Demolish existing elevator and provide new elevator that conforms to current codes.	Life safety concerns with non-code conformance; higher maintenance costs	$105,000
N-E Stair			
Stair not required. See note for 'Stairs General' if recommendation is not proceeded with.	Remove N-E Stair, reclaim area for usable office space.	Wasted costs due to guard upgrades and space conditions for useless space.	$47,200
S-W Stair			
See note for 'Stairs General'.	Extend up to roof.	Precarious exterior roof access would increase risk of injury for maintenance personnel.	$93,300
Stairs General			
Guards don't conform to NBC. Treads and risers conform to NBC.	Replace guards.	Life safety concerns with non-code conformance.	$7,500

5.4 Structural Systems

5.4.1 Summary of Existing Structural Framing

The primary structural system of the building observed from on-site investigation as well as historical photographs is a wood post and beam with a laminated timber decking serving as the structural supporting elements for the 2nd floor and roof. The basement is constructed of cast-in-place foundation walls and a cast-in-place suspended floor slab over the basement area on the south side of the building. The remainder of the 1st floor is a concrete slab on grade.

The structural system for the 2nd floor and roof is 150mm x 150mm (6”x6”) wood posts at 6.86 m oc in the north-south direction and spaced at 6.4m east to west. These are believed to be supported on concrete pad footings observed from the historical photographs. The exterior concrete block walls are load bearing 290mm on the first floor and 190mm on the second floor. Laminated glulam timber beams 200mm wide x 700mm deep span in the N/S direction and are supported by a fabricated steel bracket at each column. Laminated glulam timber purlins are located at mid-span in the E/W direction and are 150mm wide x 500mm deep. These are supported by fabricated steel brackets bolted to the main beams. The decking material for the 2nd floor is a 50mmx150mm (to be confirmed) wood decking on edge nailed together and spanning in the N/S direction. The structural system for the roof is similar with the exception that the decking material is a nominal 50mm x 100mm.

Further site investigation to verify 2nd floor framing will require creating opening the ceiling of ground floor to expose the 2nd floor framing. However, based on that the original use of the 2nd floor as office space, it is not anticipated that reinforcing of the 2nd floor framing will be required to accommodate the new proposed office space layout. This will be confirmed once further site investigation is completed. Larger filing cabinets will have to be stored on the ground floor.

A number of rooftop air handling units have been added over time. There does not appear to have been any significant reinforcing provided for these units. No cross or lateral bracing was observed and it is likely that the lateral resistance is from the exterior concrete block wall and stairwells at the corners. Some areas of distress in the exterior walls was noted and there have been repairs to some existing structural members.

The structural framing appears to be in good overall condition with no visible signs of water leaks that would cause premature deterioration of the roof structure and interior structural components. Many of the structural elements are considered to be in good overall condition with only minor repairs and ongoing maintenance (such as exterior sealants, roofing, flooring and interior fitments) required to ensure continued satisfactory performance for the next 25 to 50 years.

5.4.2 Load capacity of existing framing

Based on the limited visual review of the existing roof framing and historical photographs during construction, the capacities of the roof framing and 2nd floor framing were reviewed.

The roof framing has a capacity to support a total of 4.3 kPa uniformed load. The existing uniform roof dead load (based on the current construction) is 0.75 kPa and the uniform snow load in Windsor is 1.05 kPa. The roof framing is thus adequate to support current loading as per NBCC 2010 and OBC 2012. As noted further in the report, localized reinforcing of the roof framing around the new roof top units and/or skylight will be required.

Assuming that the second floor framing is identical to the roof framing, it will have a capacity equal to 4.3 kPa uniform load. The uniform dead load (based on current and proposed future floor finishing) is 0.75 kPa, in addition to 1.0 kPa partition allowance, and the uniform live load for 2nd storey of office

building as per NBCC 2010 and OBC 2012 is 2.4 kPa. And thus, the second floor framing is adequate to support the current and proposed loading as per NBCC 2010 and OBC 2012.

5.4.3 Lateral stability

Based on the limited visual review of the existing roof framing and historical photographs during construction, the existing block wall construction on all four corners of the two-storey building is providing lateral stability to the building. Further investigations, including removal of portions from the interior dry wall finishing and portions of the exterior brick veneer will be required to uncover the existing block wall construction, to better determine and verify the lateral capacity of the corner walls.

5.4.4 Summary of Structural Scope of Work

The structural scope of work to complement the proposed interior building renovations, installation of new enlarged elevator and mechanical upgrades are listed below. A breakdown of the structural scope of work is also reviewed and presented per floor in subsequent sections.

5.4.4.1 Skylight

A new central opening in the roof and second floor are proposed to create a light well. This will involve creating a new opening in the second floor to allow for clear open space to the skylight above. Cut and remove existing second floor timber plank deck framing, two glulam purlins (secondary beam) and one glulam girder to create new opening. Maintain perimeter timber framing around new opening. No reinforcing to the existing timber framing in the second floor is anticipated to create this opening.

To create the opening in the roof for the new skylight, Cut and remove existing second floor timber plank deck framing, two glulam purlins (secondary beam) and one glulam girder to create new opening. Maintain perimeter timber framing around new opening. Reinforce existing timber girder beams and purlins to support new skylight structure as required. Allow for reinforcing of existing timber deck, purlins and beams around new skylight to accommodate for possible snow accumulation.

5.4.4.2 New Roof Stair

To replace the existing external overhanging steel stairs, the existing south-west corner staircase is to be extended to the roof. Cut and remove existing roof timber plank deck, purlins and girders to create opening for new staircase. Construct new staircase roof enclosure structure with steel framing to minimize loading on existing building. New perimeter veneer brick wall is to be supported on light gauge stud framing back-up. New stairs to be of steel construction. Adjoining the new stair enclosure will be the new room to replace the existing Environment Canada roof lab.

5.4.4.3 Reinforcing of Existing Roof Framing to Support New Roof-Top Mechanical Units

As part of the mechanical upgrade, new roof top condenser units (CU) and make-up air units (MAU) are to be installed on the roof. Reinforcing of the existing roof framing is required to support the additional loading from the new roof equipment, as well the snow accumulation around the units. To accommodate new openings in the existing roof, cut and remove portions of the existing timber plank deck. Install new timber / steel framing around new openings.

5.4.4.4 Elevator Upgrade

To accommodate new enlarged elevator, the existing elevator pit will have to be enlarged. Construct new 1.524m deep elevator pit, footing and foundation walls. Construct new elevator shaft walls using 190mm fully grouted reinforced concrete block. Extend elevator shaft walls along full height of building and above roof to accommodate new machine room as required. Refer to section 5.5.3 for more detailed breakdown of structural scope of work required at each floor level.

5.4.4.5 Repair and Patching of Concrete Wall and Stairs In Basement

There are two locations in the basement which require repair and patching of the existing concrete which has deteriorated due to water leakage. Refer to section 5.5.3 for a more detailed breakdown of structural scope of work required.

5.4.4.6 Building Envelope

The exterior brick walls are a fair to poor condition. There are some areas adjacent to the stairs on the south-west and north-west elevations with significant cracking of the brick and masonry joints. Refer to section 5.5.3 for more detailed review of building envelope.

The exterior brick veneer will have to be removed to review condition of back-up wall. Further investigation is required to confirm wall construction, verify existing condition, and confirm lateral support of brick veneer to back-up wall. Allow for possible installation of brick masonry helical ties in the north-west and south-west corners of the building, approximate area of 120 sq.m (1300 sq.ft)

5.4.5 Structural Scope of Work per Floor

A breakdown of the structural scope of work is reviewed and presented here as it pertains to each floor.

5.4.5.1 Partial Basement

There is current water leakage from the storm drain pipe in the basement. The existing interior foundation wall was cut to expose the storm pipe, *(Fig. S-1)*. Repair of the storm pipe is required. Repair and patching of the foundation wall is required at the access hatch in the switch room.

Figure S-1 (left): Existing access hole cut in foundation wall at water leak from storm drain

Figure S-2 (right): Signs of water leak in basement corridor stairs

There are signs of water leakage in the existing stairs in the basement corridor across the workshop, boiler and equipment rooms, *(Fig. S-2)*. Further investigation is required to determine source of water leakage. Repair of existing concrete stairs will be required.

5.4.5.2 Ground Floor

Trenching in existing slab-on-grade may be required for new plumbing. Allow for cutting and removing portions / strips of existing slab-on-grade, and re-pour of new concrete floor once plumbing pipes are installed.

Review of proposed location(s) of new high density mobile storage units to be installed on ground floor. Allow for cut and removal of area of existing slab-on-grade to be replaced with thickened reinforced slab-on-grade on well compacted subgrade to support loads from new storage.

There are signs of concrete spalling from the exterior concrete ramp located at the north-east entrance, *(Fig. S-3)*. Allow for repair and patching of concrete ramp.

Figure S-3 A&B: Signs of concrete spalling at north-west main entrance

To accommodate new enlarged elevator, the existing elevator pit will have to be enlarged. Construct new enlarged 1.524m deep elevator pit, footing and foundation walls. Construct new elevator shaft walls using 190mm fully grouted reinforced concrete block. Extend elevator shaft walls along full height of building and above roof to accommodate new machine room as required.

5.4.5.3 Second Floor Framing

Second floor framing was concealed behind existing T-bar ceiling and original secondary drywall ceiling above the T-bar. Partial removal of both of the existing ceilings will be required to verify and confirm assumed existing second floor framing.

A new opening in the second floor is proposed to create clear open space to skylight above. Cut and remove existing second floor timber plank deck framing to create new opening. Maintain timber glulam beams and purlins.

As part of the mechanical upgrade, expanded HVAC systems and ducts are to be installed. To accommodate new openings in existing second floor, cut and remove portions of the existing timber plank deck. Install new timber / steel framing around new openings. Existing timber glulam beams and/or purlins may require reinforcing. Further analysis is required. Locations to be coordinated with mechanical discipline.

Demolish and remove existing north-east corner stairs, *(Fig. S-4)*. Further review of existing corner masonry wall construction will be required to determine if intermediate horizontal support will be required to provide lateral stability to existing masonry block wall, in lieu of the stair landing; especially that corner walls are providing lateral stability to the building.

Figure S-4 A&B: Existing north-east staircase to be removed

To accommodate new enlarged elevator, extend existing opening in the second floor. Depending on the exact location and orientation of the new elevator, partial demo and removal of existing block shaft wall will be required.

To accommodate enlarged and expanded washroom areas, new floor penetrations for floor and sanitary drains will be required. Coordinate locations with mechanical consultant to ensure that new floor core drills are only provided in existing timber plank deck floor. Provide reinforcing around new flor openings.

5.4.5.4 Roof Framing

Roof framing was concealed behind existing T-bar ceiling and original secondary drywall ceiling above, except for an area in the south-west corner of the building. Existing timber roof framing was reviewed in the exposed area, *(Fig. S-5)*. To confirm roof framing in areas where reinforcing work is anticipated, partial removal of existing ceilings will be required to verify and confirm assumed existing roof framing.

Figure S-5: Existing timber roof framing

New opening in roof is proposed to create a new skylight. Cut and remove existing roof timber plank deck framing to create new opening. Reinforce existing timber beams and purlins to support new skylight structure as required. Allow for reinforcing of existing timber deck, purlins and beams around new skylight to accommodate for possible snow accumulation.

Create new opening in roof framing to allow for elevator opening. Extend new reinforced block shaft walls above roof to support new elevator machine room, (if required). Reinforce existing roof timber plank deck, glulam purlins and beams to accommodate for snow accumulation around new elevator machine room.

As part of the mechanical upgrade, new roof top condenser units (CU) and make-up air units (MAU) are to be installed on the roof. Reinforcing of the existing roof framing is required to support the additional loading from the new roof equipment, as well the snow accumulation around the units. To accommodate new openings in the existing roof, cut and remove portions of the existing timber plank deck. Install new timber / steel framing around new openings. Further analysis is required. Locations to be coordinated with mechanical discipline.

The existing overhanging steel access stairs to the roof, currently located at the ear / south elevation, is to be removed and replaced with a new staircase located above the existing south-west staircase, accessed from inside the building. Cut and remove existing roof timber plank deck and purlins to create opening for new staircase. Construct new perimeter staircase wall with block wall and brick veneer to match existing. Construct interior staircase walls with steel / timber framing to minimize loading on existing roof framing. Reinforce existing framing around new staircase for loading from new staircase and snow accumulation around staircase roof dog-house. New staircase to be constructed of steel to reduce additional loading onto existing structure.

New and enlarged shed is proposed to replace existing Environment Canada roof lab. Construct new lab with timber / steel framing to reduce additional loads onto existing roof framing. Provide reinforcing and install new roof framing to support new lab, and to account for additional snow accumulation.

Sagging of the roof deck between beams was observed, with water ponding evident at these locations, *(Fig. S-6)*. Further investigation is recommended to confirm that roof plank deck panels are not cracked or show signs of overstress.

Figure S-6: Sagging of roof deck and water ponding

5.4.5.5 Building Envelope

The exterior walls of the building in most locations are comprised of a 90mm x 190 mm face brick, 190mm and 290 mm load bearing concrete block back-up, wood strapping and plaster on plaster lathe. As there are no existing drawings to document the construction, this information was determined from

earlier reports and historical photographs. The masonry veneer is laid in a running bond pattern with a header course every seventh row of masonry. This may form a tie to the back-up concrete block wall. There is an indication of 25mm insulation in the wall but this has not been confirmed.

The exterior brick walls are a fair to poor condition. There are some areas adjacent to the stairs on the south-west *(Fig. S-7)*, and north-west elevations *(Fig. S-8)*, with significant cracking of the brick and masonry joints. This is believed to be due to a lack of vertical and horizontal expansion joints over the long expanse of brick veneer above the window openings. The 60 metre length of brick does not have any control joints and consequently the expansion and contraction of the brick veneer due to temperature changes has resulted in the cracking close to each end of the building. This is a common occurrence in this type of construction and the investigators were unable to examine the load bearing back-up walls that provide lateral stability. Further investigation is required to confirm wall construction and verify existing condition. The exterior brick veneer will have to be removed to review condition of back-up wall.

Figure S-7: Cracking in existing exterior brick veneer at south-west elevation

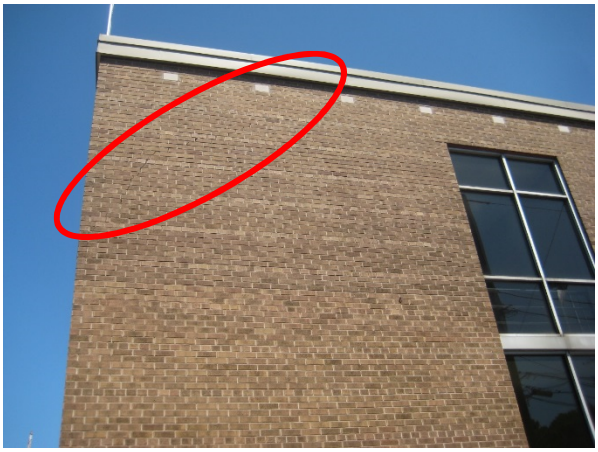


Figure S-8: Cracking at top in existing exterior brick veneer at north-west elevation

Figure S-9: Spalling of exterior brick face

There are also a number of areas, especially on the east side adjacent to the sidewalk where the face brick has spalled. This is likely due to freezing and thawing from water splashing from the sidewalk or from the ice melting salt used to prevent freezing during the winter.

Structural Recommendation Summary

Existing Condition	Recommendation	Risk of Inaction	Cost
S-W Stair Extension			
Roof requires reinforcement for stair extension.	Demolish existing elevator and provide new elevator that conforms to current codes.	Life safety concerns with non-code conformance; higher maintenance costs	$15,100
Skylight & Floor Opening			
Roof requires reinforcement for Skylight and Opening.	Provide opening for new skylight and second floor opening.	Structure reinforcement required for this design option.	$66,700 + $20,000
Support for new Mechanical Roof-Top Units			
Roof requires reinforcement to support roof-top mechanical units.	Remove planks, install new framing around RTUs.	Structure reinforcement required for new mechanical units.	$73,600

5.5 Mechanical Systems

5.5.1 Introduction

The majority of existing HVAC components within the Government of Canada Building (GoCB) are at or nearing the end of their useful service life. With the goal of providing a 25 year life cycle, a new heating, cooling and ventilation system is proposed. The new system will prioritize energy efficiency and the thermal comfort of building occupants.

The existing air handling systems, including all associated ductwork, controls and electrical components will be demolished. This will create space on the rooftop and in the basement to accommodate new mechanical equipment. The existing steam boilers and heat exchanger will be demolished and replaced with new high efficiency condensing boilers. Perimeter radiators will be demolished and a new perimeter heating system will be provided, utilizing ceiling mounted radiant panels.

Domestic water piping will be reconfigured as required to accommodate plumbing fixtures in washrooms and kitchenettes. The existing domestic water heater will remain, though a recirculation pump and recirculation piping will be added to minimize the wait time for hot water. All roof drains will be replaced and leaking sections of storm water piping will be replaced. Roof drains may require relocation to accommodate the installation of the new skylight.

5.5.2 Design Criteria

The new mechanical systems will be designed in accordance with the current edition of the following codes and standards:

- National Building Code 2010
- National Fire Code 2010
- American Society of Heating, Refrigerating and Air-conditioning Engineers, Inc. (ASHRAE) standards and journals
- Sheet Metal and Air Conditioning Contractor's National Association, Inc. (SMACNA) standards and publications
- Canadian Standards Association (CSA)
- Canadian Gas Association
- National Fire Protection Association (NFPA)
- CSA B149.1, Natural Gas Installation Code
- CSA B52 – Mechanical Refrigeration Code
- Government of Canada Workplace 2.0 Fit-Up Standards

The HVAC system shall use the following conditions as the basis of design:

Outdoor Design Conditions	
Winter Ambient Temperature:	-18°C
Summer Ambient Temperatures:	32°C DB/ 24°C WB
15 Minute Rainfall:	28 mm
Indoor Design Conditions - Summer	
Indoor Temperature -Air Conditioned Spaces	24°C
Relative Humidity: Minimum	20%
Indoor Design Conditions - Winter	
Indoor Temperature – All Spaces	21°C
Indoor Air Quality:	MERV 8 pre-filters and MERV 13 final filters
Noise Levels:	Meet current ASHRAE standards not to exceed NC 30 for office spaces

5.5.3 Plumbing and Drainage

Existing plumbing fixtures will be demolished to suit the architectural reconfiguration of the washrooms, kitchenettes, and service rooms.

Existing roof drains will be demolished and replaced.

M-Figure 1 Existing Lavatories

M-Figure 2 Existing Water Closet

M-Figure 3 Existing Urinals

M-Figure 4 Existing Janitor Sink

Plumbing and Drainage Recommendations

Plumbing fixtures will be of high institutional grade quality, provided to meet the building code and as shown on the architectural plans.

- Water closets to be wall mounted low-flow flush fixtures.
- Lavatories will either be countertop mounted or wall hung when no counter is provided.
- Lavatory faucets will be complete with hard-wired touchless sensors.
- Lunchroom faucets will be low flow, manually operated faucets
- Utility sinks will be manually operated faucets.

Domestic cold and hot water will be provided to all fixtures, as required. The existing gas fired domestic water heater, located at basement level, will remain. Domestic hot water recirculation piping will be provided, complete with recirculation pump.

Storm water drainage will be remain in its current routing, though roof drains and leaking section of piping will be replaced. New roof drains will be standard flow. Placement of the skylight may require further examination of roof drain placement.

Summary

Existing Condition	Recommendation	Risk of Inaction	Cost
Plumbing Fixtures			
Fair (Existing fixtures are outdated)	Replace existing fixtures to suit architectural layout as required by space-fit up.	Old fixtures can leak and cause maintenance issues. Water consumption of new low-flow fixtures will be reduced.	$186,900
Storm Drainage			
Poor (Storm piping leaking and in conflict with proposed skylight)	Repair leaking pipes and relocate roof drains and piping as required to accommodate new skylight.	Leaking pipes can cause damage to the equipment within the building and the building itself.	$48,400
Domestic Hot and Cold Water			
Fair (Existing DWH and piping in fair condition)	Install hot water recirculation line and pump	Legionella can develop in stagnant hot water piping and cause health problems. Excessive wait times for hot water lead to wasted potable water.	$75,000

5.5.4 Fire Protection

The building is not currently sprinklered, though a sprinkler system could be provided to comply with the requirements of the National Building Code and National Fire Protection Association. The sprinkler system design will be based on light hazard occupancy in accordance with NFPA 13. A sprinkler system will require an upgrade to the incoming water main service, new zone risers, distribution and branch piping, and a new fire alarm panel.

Portable fire extinguishers will be installed in accordance to the more stringent of either the National Fire Code or NFPA 10.

It was been confirmed by the local utility company that the GoCB is served by a 300mm water main, and the residual pressure is 379 kPa (55 psi). The residual pressure in the incoming water pipe is expected to be sufficient for providing wet sprinkler coverage to the building to meet current code requirements without the need of a booster pump.

Summary

Existing Condition	Recommendation	Risk of Inaction	Cost
Non-existent (Building is not sprinklered)	Provide wet sprinkler system in building.	Renovated building will not be code compliant.	$220,500

5.5.5 HVAC

Existing packaged air conditioning systems serving the building, including ductwork, controls, and electrical components will be demolished. Existing roof curbs will be removed and duct openings will be closed off and made good.

Currently, there are 12 (twelve) packaged rooftop units on the GoCB, tagged as RTU-1 through RTU-12. The rooftops range in vintage from 1976 to 2004. The units are nearing the end of their service life and are to be demolished. Nameplate cooling capacities of the units were noted as follows:

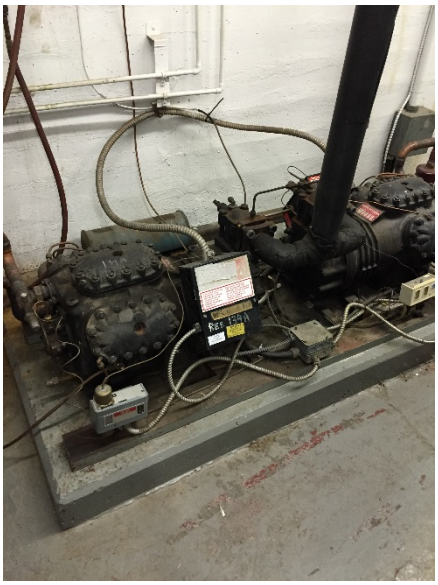
RTU-1	5 ton
RTU-2	2.5 ton
RTU-3	15 ton
RTU-4	6 ton
RTU-5	6 ton
RTU-6	6 ton
RTU-7	7.5 ton
RTU-8	2.5 ton
RTU-9	15 ton
RTU-10	10 ton
RTU-11	15 ton
RTU-12	7.5 ton

Two additional air handling units are located in the basement. These units provide cooling only, and are equipped with electric humidifiers. The basement air handling units are coupled with outdoor condensing units located on the rooftop. The air handling units were installed in 1970 and the condensing units were replaced in 2002. The majority of these air handling units, as well as the associated humidifiers and outdoor condensing units, shall also be demolished. It is understood that the Environment Canada space on the ground floor is to remain operational during construction. As such it is recommended that RTU-1 not be demolished and remain in service.

Existing washroom, general, and elevator machine room exhaust fans are also nearing the end of their useful service life. These fans are to be demolished and will be consolidated, wherever possible, to facilitate exhaust air heat recovery in the new HVAC system

Three LAN rooms are currently located throughout the GoCB; two on the second floor and one on the ground floor. One of the second floor LAN rooms is conditioned by a Mitsubishi split unit, with an outdoor air cooled condensing unit. The other second floor LAN room is conditioned by a split air conditioning unit with a water cooled condensing unit. The ground floor LAN room is conditioned by a split air conditioning unit with an air cooled condensing unit. These units are approximately 10-15 years old. It is recommended to demolish all three split systems and replace them with new systems.

M-Figure 1 Existing Indoor AHU



M-Figure 2 Existing Compressors

M-Figure 3 Existing Humidifier

M-Figure 4 Existing Air Cooled Condenser

M-Figure 5 Existing Rooftop Units

M-Figure 6 Existing Rooftop Units

HVAC Recommendations

It is recommended to demolish the existing rooftop and basement air handling equipment, associated ductwork, diffusers, and controls, and replace this equipment with new HVAC equipment. It is recommended to retain the existing rooftop unit RTU-1, which serves the Environment Canada space on the first floor, along with its associated ductwork and controls.

Heating, cooling and ventilation will be provided via an air source variable refrigerant flow (VRF) heat pump system, coupled with dedicated outside air handling systems (DOAS). In the VRF system, compressors are centralized outdoors on the building rooftop, and the evaporator coils are distributed throughout the building within fan coils. It is anticipated that the total capacity of the outdoor condensing units will be 422 kW (120 tons), which will be distributed amongst five pieces of equipment. Refrigerant piping connects the two components (condensing units and fan coil units) of the system together. The result is a system that can provide an excellent degree occupant control as well as simultaneous heating and cooling.

To improve on energy efficiency, heat recovery is possible between individual fan coils within the building. Refrigerant liquid and refrigerant gas is directed to fan coils requiring cooling and heating respectively by using zone control boxes. Heat generated by refrigerant piping serving zones requiring cooling can be transferred to zones which call for heat. This allows the system to operate efficiently with lower energy inputs than a conventional system.

Fan coils and thermostats will be located within the GoCB based on zoning requirements. The evaporator coil within the fan coil will be capable of heating and cooling the spaces they serve. It is anticipated there will be approximately 60 zones (30 per floor) within the GoCB, with fan coils ranging in capacity of one to three tons. The flow of outdoor air through the fan coil units will be determined by readings from carbon dioxide (CO2) sensors located within the spaces. Placement of thermostats, CO2 sensors, and zoning of the HVAC system will be arranged such that requirements of the Government of Canada Workplace 2.0 Fit-Up Standards are met, as they apply to open office areas, enclosed offices, meeting rooms, and kitchenettes.

Ventilation air will be provided by two DOAS units. Both units will be located outdoors on the roof, utilizing electric (DX) cooling and natural gas heat. The DOAS units will be complete with heat recovery to capture heat from the exhaust air stream. The DOAS units will pre-condition the outdoor air, which will then be ducted to each fan coil. The ventilation and exhaust rates will meet or exceed the requirements of ASHRAE 62-2013. Airflow capacity of each of the two DOAS units is anticipated to be 1,880 L/s (4,000 CFM)

New gas fired humidifiers will be provided for each of the DOAS units, and will be integral to the units. Though humidification is provided, it is not recommended to exceed 20% relative humidity due to the age of the building and wood construction. Excessive humidification can lead to moisture damage in

the building envelope. If upgrades are planned for the building's vapour barrier, humidification levels can be increased to 30% RH or greater.

Return air will be collected within the ceiling plenum and returned to the DOAS unit. Where possible, sanitary and general exhaust air will be collected within the building and ducted to the DOAS unit. Both the return and sanitary exhaust air streams will be combined at the DOAS and pass through an energy recovery wheel to recovery the energy and use it to pre-treat the incoming outside air stream.

LAN rooms will be provided with new split AC cooling units. The new units will be DX units with outdoor air cooled condensers mounted on the rooftop. It is recommended to use air cooled condensing units, rather than a water cooled condensing unit, to minimize utility costs.

A dedicated exhaust fan will be provided for the Special Purpose Space (SPS) which will have an area allocated to holding live animals. Exhaust air from the SPS will not be returned for heat recovery at the DOAS. The SPS supply air will be provided by the main VRF/DOAS system.

The roof level Environment Canada Laboratory will be heated and cooled by a heat pump unit connected to the main VRF system. Outdoor air will be provided by a small energy recovery ventilator (ERV) unit. The Laboratory will be complete with gas detection to activate a secondary exhaust fan in the event of high levels of contaminants.

Summary

Existing Condition	Recommendation	Risk of Inaction	Cost
Air Handling Equipment			
Fair to Poor (Existing equipment approaching the end of their useful service life)	Demolish and remove existing air handling equipment and install new HVAC system.	Old equipment can be subject to ongoing maintenance issues and become unreliable.	$1,029,000
Exhaust Fans			
Fair (Existing equipment is nearing the end of its useful service life)	Demolish and remove existing exhaust fans and install new exhaust fans.	Old equipment can be subject to ongoing maintenance issues and become unreliable.	$48,400
LAN Room Conditioning			
Fair (Existing equipment is nearing the end of its useful service life)	Demolish and remove existing split AC system and replace with new split AC system.	Old equipment can be subject to ongoing maintenance issues and become unreliable.	$40,000
Humidifiers			
Fair (Existing equipment is nearing the end of its useful service life)	Demolish and remove existing humidifiers and install new humidifiers.	Old equipment can be subject to ongoing maintenance issues and become unreliable.	$24,000
Natural Gas Piping			
Fair to good (Existing gas service provided to DWH and boilers, may be undersized for future use)	Examine demand and upgrade incoming gas service to suit.	If demand of new systems exceeds capacity available from incoming service, heating systems may become unreliable.	$24,000

5.5.6 Boiler System

Two existing steam boilers are located at basement level, which supply hot water to the building's perimeter radiator system and fan coil units via a steam-to-water heat exchanger. The boilers and heat exchanger were installed in 1982 and are nearing the end of their useful service life of 35-40 years.

M-Figure 7 Existing Boiler

M-Figure 8 Existing Heating Loops

Boiler System Recommendations

New gas fired hot water boilers will be provided in the building basement to serve the perimeter and vestibule hydronic heaters. The new boilers will connect to the existing hydronic piping distribution system. The boilers will be high efficiency condensing or near-condensing boilers. A new control system will be provided for the boiler system, which will modulate the boiler supply temperature based on outdoor air temperature. Existing perimeter radiators will be removed and replaced with ceiling mounted radiant panels. New controls will be provided for the perimeter radiators to integrate them with the zone control for the fan coil units.

Summary

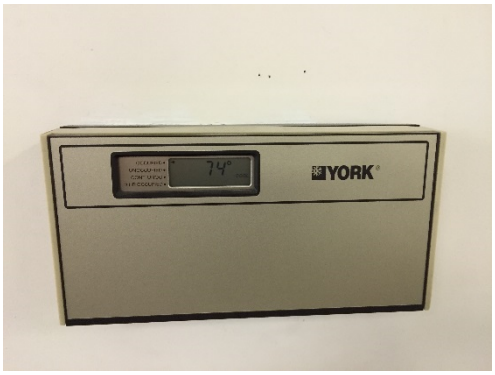
Existing Condition	Recommendation	Risk of Inaction	Cost
Poor (Existing boilers are beyond useful service life)	Demolish existing boilers and install new hot water distribution system for perimeter heating.	Old equipment can be subject to ongoing maintenance issues and become unreliable.	$389,400

5.5.7 Controls

The HVAC control system in the building currently consists of a mix of pneumatic controls on the perimeter radiators and electronic control of the air handling equipment. It is recommended to demolish the existing controls for future integration into a centralized Building Management System.

Summary

Existing Condition	Recommendation	Risk of Inaction	Cost
Poor (Existing building has a mix of electric and pneumatic controls and does not have a centralized building management system to control and monitor HVAC equipment)	Install centralized building management system	HVAC systems without centralized control can lead to comfort complaints due to competing heating/cooling set points and maintenance issues occurring without notification reaching operations personnel. HVAC systems without centralized control may not be able to fully utilize time-of-day programming to save energy in off-peak hours	$251,800



M-Figure 9 Existing Thermostat

M-Figure 10 Existing Thermostat

Controls Recommendations

A new open protocol Direct Digital Control system (DDC) will be provided to replace the existing electrical and pneumatic controls system. The Building Management System will control and monitor all major equipment including; air handlers, VRF system, and hydronic heating system.

5.6 Electrical Systems

5.6.1 Power

The main power to the facility is via a 600V, 1000A, 3 phase, 4 wire incoming service, via pole mounted transformers on the east side of the building. The main switchboard located in the basement electrical room is a 1200A bus with a 1000A main breaker. The switchboard was replaced in 1999 and has roughly 25 years lifespan remaining. It has two utilized breakers, one spare breaker, and a number of spaces for future expansion. Preliminary investigation indicates that this main incoming service is well suited to the proposed reconfiguration of the building.

One of the breakers feeds a 600V, 400A, 3Ph, 3W splitter. This splitter feeds a number of 600V mechanical loads throughout the building. The 600V splitter and associated disconnects and distribution panels are approaching their end of life and should be considered for replacement.

The second breaker within the main switchboard feeds a 225kVA transformer feeding all the plug and lighting loads. The transformer appears to have been replaced at the same time as the main switchboard and is in good condition.

Power is distributed throughout the building via fifteen (15) 120/208V panel boards throughout the floor space. Some of the panel boards are approaching their end of life and should be considered for replacement. Power is distributed to the plug level via a combination of recessed wall outlets and pac poles.

The most recent arc flash study was performed in 2010. An updated short circuit, coordination, and arc flash study should be performed after any significant electrical upgrades.

E-Figure 1 Incoming Service and pole mounted transformers in background

E-Figure 2 Main Incoming Switchboard – Good condition

E-Figure 3 600V Splitter and Disconnects – Recommended for replacement

E-Figure 4 Typical 120/208V panelboard

Power Recommendations:

The main incoming switchboard. The existing utility service is suitable for the proposed renovations based on the following power density calculations:

Building Area (m^2)	4,562				
Load Type	**W/m^2**	**Total Connected Load (kW)**	**Diversity Factor**	**Total Demand Load (kW)**	**Remarks**
Lighting	**10.00**	45.6	1.00	45.62	
Plug Loads	**20.00**	91.2	0.75	68.43	
IT loads	-	**25.0**	0.75	18.75	Based on 5kW per Comms room
Elevator	-	**30.0**	0.50	15.00	
Mechanical	-	**300.0**	0.75	225.00	Based on preliminary mechanical loads
Total Estimated Loads		**491.9**		**372.80**	
Minimum Service Size in Amps @600V		473A			
Recommended Service Size in Amps @600V		600A			
Existing Service Size in Amps @600V		1000A			

The 225kVA 600-120/208V transformer is in good condition, however, it should be considered for replacement with an equivalent K13 type transformer. This type of transformer is specially designed to withstand the harmonic currents associated with high densities of computer workstations.

The 600V splitter and associated disconnects and feeders for mechanical equipment should be replaced with a new 600V, 400A, 3Ph, 4W distribution panel in the basement electrical room. This panel will feed the new elevator as well as new mechanical rooftop equipment, including the following major systems:

- Make Up Air Units, 25kW each - Quantity 2
- Condensing Units, 30kW each – Quantity 5

All the 120/208V panelboards and associated plug loads throughout the space should be demolished as part of the proposed renovation. New panelboards should be installed within the dedicated electrical rooms on each floor. Refer to enclosed Single Line Diagram for proposed distribution system.

New outlets should be provided in the perimeter walls and the furniture should be serviced with power and communications via PAC poles.

A new short circuit, coordination, and arc flash study should be performed as part of the new electrical design.

Summary

Existing Condition	Recommendation	Risk of Inaction	Cost
Existing 225kVA 600-120/208V transformer is standard type	Replace with K13 type transformer, able to withstand higher neutral loads associated with substantial nonlinear/computer loads.	Potential overheating and degradation of transformer when feeding substantial nonlinear/computer load.	$18,000

5.6.2 Emergency Power

There is no generator servicing the building.

Emergency Power Recommendations: There are no Code requirements mandating a generator for a building of this size and occupancy.

Should PWGSC desire a generator, an outdoor generator can be placed within the parking lot. A ~60kW, 600V generator could be considered to provide power for life safety and IT loads. PWGSC to provide further direction on whether a generator is required.

With or without a back generator, a local UPS can still be provided within the Communications Room for IT equipment in the event of a power loss. This can provide roughly 15 minutes of runtime to perform a controlled shutdown sequence on the IT equipment.

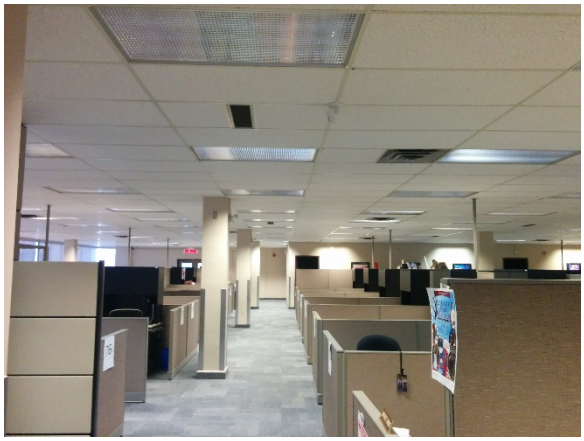
5.6.3 Lighting

Interior lighting in the building is provided from a variety of fluorescent fixtures containing T8 lamps and electronic ballasts. Fixtures are generally not controlled via occupancy sensors. In the offices area, the majority of fixtures are recessed troffers. Stairwells and service areas are lit via a combination of suspended and surface mounted fixtures.

Exterior lighting has recently been upgraded to modern LED fixtures within the last 5-6 years and are in good condition. These fixtures are automatically controlled via photocells.

All emergency lighting is via remote battery packs. The battery packs are tested monthly. Existing exit signs are illuminated Exit/Sortie type and are non-compliant with National Building Code and would need to be replaced building wide with the new green running man type.

E-Figure 5 Typical Office Fluorescent Troffer



E-Figure 6 Office Troffer in CRA Space

E-Figure 7 Typical Exterior LED Lighting

E-Figure 8 Typical emergency battery unit with lamp heads

Lighting Recommendations:

As the proposed renovations are a substantial redesign of the partitions and ceilings, we recommend upgrading the interior lighting to modern LED fixtures. LED fixtures offer improved efficiency and control options. A direct/indirect LED fixture mounted in the T-Bar will provide soft and even ambient illumination reducing glare and increasing visual comfort with low power consumption. The new lighting control system should be based primarily on occupancy sensors for open offices areas. In areas where daylighting is expected to provide a significant source of light (vertical glazing as well as proposed skylight), the interior lighting fixtures should be controlled by daylight sensors that will measure the total light within the room and dim the lighting fixtures accordingly to compensate for the natural

lighting. In addition, task lighting should be considered at the workstations when increased light levels are required in targeted areas.

Exterior lighting is in good condition and should remain as is.

Emergency lighting will need to be re-designed to suit the new floor plans. New battery packs and remote heads should be provided.

All new green running man type exit signs should be provided throughout the floor area to suit the new egress paths.

Summary

Existing Condition	Recommendation	Risk of Inaction	Cost
Interior lighting is designed for previous layout and consists of less energy efficient fixtures.	Provide new LED lighting with suitable occupancy and daylight control.	Lighting system will not have a 25 year life span and lighting control won't meet Workplace 2.0 Standards.	$561,800

5.6.4 Telecommunications

The main communications line to the building is via overhead cables incoming from the west side. Any additional capacity required to suit the potential renovations would be coordinated with the service provider. The main telecom room is located on the 2nd floor with limited local closets for distribution. Select tenant spaces have their own IT rooms and cable tray but the building overall did not have a cable tray infrastructure and most areas were serviced via open horizontal wiring.

E-Figure 9 Typical Loose Horizontal Communications Wiring

E-Figure 10 Atypical Cable Tray in CRA Space Only

Telecommunications Recommendations:

New Telecommunications rooms will need to be provided throughout the floor space to suit Workplace 2.0 standards as well as to meet horizontal distance requirements of networking cabling. Based on these two requirements, we recommend a minimum of 2 Telecommunications Room (TR) rooms per floor, each roughly 3.3m x 3m. The building will also require a LARGER Main Telecommunications Room (MTR) / Equipment Room for telecommunications equipment, servers, etc.

Backbone cabling will need to be extended from the service provider entrance point to the MTR and from there to each of the TRs.

Each dedicated telecommunications room will require a cooling system to provide temperature and humidity control, protecting the equipment from dust/dirt.

A cable tray infrastructure should be provided throughout the corridors ceiling space for all horizontal distribution of low voltage wiring. Final runs from the cable tray to the workstation should be via conduit to suit Workplace 2.0 recommendations.

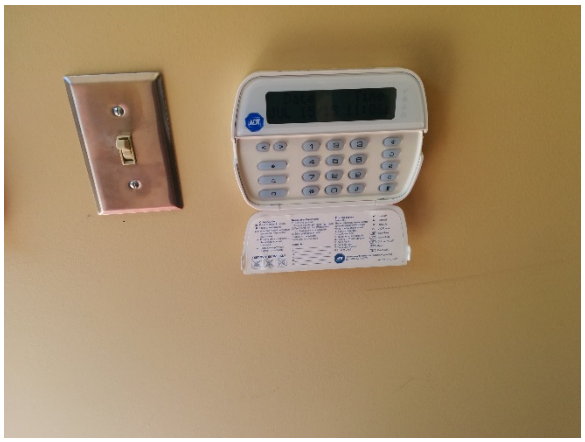
Summary

Exist. Cond.	Recommendation	Risk of Inaction	Cost
Loose cabling within plenum.	Provide new cable tray and conduit to suit Workplace 2.0 requirements and future flexibility.	Not compliant with Workplace 2.0 Standards which recommend standards compliance during a major re-fit.	$96,900

5.6.5 Security

The building security system controlled only exterior doors and parking lot access. Select tenants have their own security and/or intrusion alarm system.

E-Figure 13 Exterior gate access card reader on base building security system



E-Figure 12 Tenant-owned security keypad; not in operation

Security Recommendations:

Existing security for the exterior doors and parking lot access can be re-used. Upgrades to the existing base building security system are not expected unless further security requirements are required noted by the client department or PWGSC (e.g.: CCTV cameras, interior card access).

Summary

Existing Condition	Recommendation	Risk of Inaction	Cost
Good (Sufficient for building needs)	No new security scope.	N/A	$0

5.6.6 Fire Alarm System

The building fire alarm system is a single stage system. The main fire alarm panels was upgraded approximately 5-6 years ago and is in good condition. Fire detection is via smoke and heat detectors. Fire alarm annunciation is generally via bells.

E-Figure 15 Non-conformant bells, typical

E-Figure 16 Recently replaced main fire alarm panel, good condition

Fire Alarm System Recommendations:

The fire alarm panel is in good condition and can remain as is. All fire alarm devices would require updating to suit new code requirements and new layouts. If a sprinkler system is installed in the building, the quantity of detection devices can be drastically reduced. The current bells which are non-compliant with today's building code due to the requirement to have a combined horn and strobe device should be provided in all public corridors and bathrooms if the building is to undergo an upgrade. As part of the renovations, it should be ensured that any magnetic locking devices and hold open devices are connected to the fire alarm system, as well as a review of the pull station locations.

Summary

Existing Condition	Recommendation	Risk of Inaction	Cost
Fire alarm system is in good condition. Existing initiation and annunciation devices are suited to current layout.	Provide new devices to suit new layout.	N/A. Required to suit new layout.	$96,900

5.6.7 Other Systems

We recommend providing a sound masking system to provide increased privacy and comfort within the context of an open office environment which is specified as part of a Workplace 2.0 environment.

We recommend A/V infrastructure be provided for specific collaborative spaces and meeting rooms. This would include rough-ins for wall mounted screens with appropriate connections for laptops and video conferencing.

Summary

Existing Condition	Recommendation	Risk of Inaction	Cost
No existing sound masking system.	Provide new sound masking system to suit new open layout.	Risk of tenant discomfort related to sound and noise stemming from open office layout.	$48,400
Minimal existing A/V infrastructure.	Provide new A/V rough-ins for collaborative spaces.	Not compliant with Workplace 2.0 Standards.	$30,000

5.7 Life Safety Report

The following is an outline of the building code concepts for the feasibility study for the proposed improvement to the Government of Canada Building (GoCB) (Project) located at 441 University Avenue in Windsor, Ontario.

The Project will consist of the renovation of an existing office building that is 2-storeys above-grade with a single level basement below-grade. The building includes offices on both levels with storage and service space subsidiary occupancies. The basement contains service and storage rooms. The building was originally constructed in 1953, is approximately 2,418 m² in building area on the first floor, is of combustible construction (heavy timber) and is not currently sprinklered.

All reference numbers indicated in this report refer to the 2010 National Building Code, unless otherwise indicated. This report is based on drawings prepared by Dialog Design and the Investigation and Report prepared by DIALOG and dated August 5, 2015.

5.7.1 Project Building Characteristics

The following identifies the characteristics of the Project for the purpose of applying the Building Code:

Applicable Building Code Part:	3
Building Height:	2-storeys 9.0 m (Level 1 to ceiling of top storey)
Building Area:	Approx. 2,418 m^2
First Storey:	Level 1
Number of Streets Facing:	1
Sprinklered:	Yes (The building is proposed to be upgraded to include sprinkler protection)
Major Occupancies:	Group D,
Construction Type:	Combustible

Major Occupancy

The building will be classified as containing Group D (Business), and will include subsidiary service and storage rooms. It is understood that the existing S/W stair is to be extended to the roof level and an adjoining roof-top enclosure is to be provided which will contain equipment for air quality monitoring. In accordance with Sentence 3.2.1.1(1), a roof top enclosure provided for elevator machinery, a stairway or service room used for no purpose other than for service for the building, will not be considered as a storey in calculating the building height. The enclosure is expected to be less than 10m^2 in area and will exit directly unto the S/E stair through a fire rated door and a second means of egress will not be required.

5.7.2 Provisions for Fire Fighting

Fire Department Principal Entrance

In accordance with Sentence 3.2.5.5.(1), the principal Fire Department entrance for the facility will be located at Vestibule 112 at the north main entry to the building and will be located not less than 3 m and not more than 15 m from the closest portion of the corresponding Fire Department access route.

Fire Department Connections

In accordance with Article 3.2.5.15. and Sentence 3.2.5.5.(2), the Fire Department will be required to be able to position their Fire Department pumper vehicle adjacent to a hydrant and will be not more than 45 m from new Fire Department connections for the building sprinkler system.

5.7.3 Project Construction/Structural Fire Protection

Floor and Roof Ratings

Based on the building characteristics noted in **Section 1.0** of this report, the construction/ structural fire protection for the Project will be governed by the following requirements:

Occupancy Classification	Article	Max. Bldg. Height	Max. Bldg. Area (m²)	Constr. Type	Floor Assembly[a]	Sprinklered	Supports (f.r.r.)
D	3.2.2.59.	Up to 3-storeys	7,200	Comb. Permitted	¾-hour	Yes	(b)

Notes: (a) Constructed as fire separations.
(b) Same fire-resistance rating as for supported assembly.

Summary of Construction Requirements

The construction/structural fire protection and major occupancy requirements, based on Article 3.2.2.59., are summarized below:

- combustible or noncombustible construction,
- the building is proposed to be sprinklered as part of the renovations,
- floor assemblies, if of combustible construction, constructed as ¾-hour fire separations, and
- no fire-resistance rating required for unoccupied roof assemblies if of noncombustible construction, and
- roof assemblies, if constructed of combustible construction, constructed as ¾-hour fire-resistance rating (or heavy timber construction).

In accordance with Article 3.1.7.1., a material, assembly of materials, or a structural member required to have a fire-resistance rating will be based on either:

a) listings from ULC (or an equivalent approved listing agency), or
b) Appendix D, "Fire Performance Ratings," of the Supplementary Standard to the 2010 National Building Code.

5.7.4 Required Fire Separations

The following sections summarize requirements for other fire separations of the Project.

5.7.4.1 Vertical Shafts

In accordance with Articles 3.4.4.1., 3.5.3.1., and 3.6.3.1., new shaft walls around elevator shafts, exits, and vertical service spaces will be constructed as fire separations having the fire-resistance ratings (F.R.R.) indicated in the following table. Where the top of a service shaft does not extend through the roof, it will terminate at an assembly having a fire-resistance rating at least equal to the walls of the shaft. Similarly, the bottom of a service shaft will terminate at an assembly having a fire-resistance rating at least equal to the walls of the shaft, except where the shaft extends to the bottom of the building.

Shaft/Hoistway Type	Shaft/Hoistway F.R.R. (Hours)
Exits/Exit Corridors	¾[a]
Elevators	¾
Vertical Service	¾

(a) If of combustible construction

5.7.4.2 Other Required Fire Separations

In accordance with Sentence 3.6.2.1.(8), a room containing a limited quantity of service equipment, and service equipment that does not constitute a fire hazard, will not be required to be separated from the remainder of the building by a fire separation.

In accordance with Sentence 3.3.1.20.(3), janitor rooms will be required to be separated from the remainder of the building by fire separations having no fire-resistance rating in consideration that the building will be fully sprinklered.

5.7.4.3 Closures (Doors and Fire Dampers)

Maximum Size

In accordance with Sentence 3.1.8.6.(2), the size of an opening in an interior fire separation required to be protected with a closure will not exceed 22 m² and will have no dimension greater than 6 m provided the fire compartments on both sides are sprinklered.

Fire-Protection Rating

Closures (doors and fire dampers) for openings in all fire separations will be provided with a fire-protection rating in accordance with Article 3.1.8.4. and Table 3.1.8.4., as reproduced below:

Fire-Resistance Rating of Fire Separation (Hours)	Required Fire-Protection Rating of Closure (Hours)
½	⅓
¾	¾
1	¾
1½	1

Permitted Glazing in Fire Separations

In accordance with Article 3.1.8.14., wired glass or glass block may be used as a closure in a fire separation (except as noted in Table 3.1.8.15.) provided the required fire-resistance rating of the fire separation does not exceed 1-hour.

Wired glass assemblies used in vertical fire separation assemblies with a rating of up to 1-hour installed in accordance with Appendix D, of the NBC, will be acceptable.

Glass assemblies that are ULC listed for use in a fire separation may also be used provided they are installed in accordance with their listing and the manufacturer's installation instructions.

Hold-Open Devices for Doors

In accordance with Article 3.1.8.12., hold-open devices, if provided, will be designed to release upon a signal from dedicated smoke detector(s) located as described in CAN/ULC-S524 and upon a signal from the fire alarm system of the Project.

5.7.5 Fire Protection & Life Safety Systems

5.7.5.1 Sprinklers

As part of the renovations to the facility, the building is proposed to be fully sprinklered in accordance with Article 3.2.5.12.

In accordance with Sentence 3.2.5.12.(1), the automatic sprinkler system will be required to be designed, constructed, installed and tested in conformance with NFPA 13-2007, "Installation of Sprinkler Systems." In accordance with Sentences 3.2.4.8.(2) and 3.2.4.10.(2), the sprinkler system will be required to be electrically supervised and monitored.

5.7.5.2 Fire Alarm System

The building is currently equipped with a single-stage fire alarm system. The following subheadings identify devices that will be required to be provided as part of the upgrade to the existing building.

Location of Fire Alarm System Devices

Sprinkler Waterflow Devices

In accordance with Article 3.2.4.16., sprinkler zones will be equipped with waterflow detecting devices to activate the fire alarm system.

Smoke Detectors

In accordance with Article 3.2.4.12. and Article 3.1.8.12., smoke detectors will be installed:

- at the top of each exit stair shaft,
- in ducts where recirculating air handling systems serve more than one storey, and
- at openings in fire separations where closures are equipped with hold-open devices.

Manual Pull Stations

In accordance with Article 3.2.4.18., manual pull stations will be provided near the principal entrance and near every required exit.

Zone Configuration

In accordance with Article 3.2.4.9., zones will be provided throughout the Project based on the following:

- sprinkler system area limits as determined by NFPA 13 (not less than one per storey),
- shafts required to be equipped with smoke detectors, and
- air handling systems required to be equipped with smoke detectors.

Fire Alarm Signals

In accordance with Article 3.2.4.19., alarm signal devices forming part of the fire alarm system will be installed in the building such that:

- fire alarm signals are clearly audible throughout all floor areas (with signals being not less than 10 dBA above ambient or 65 dBA minimum), and
- the alarm signal will follow the temporal pattern required per Sentence 3.2.4.19.(2).

5.7.5.3 Standpipe System

In accordance with requirements of Sentence 3.2.5.8.(1), a standpipe system will not be required for the Project as the building will not exceed 3-storeys and will be less than 14 m high measured between grade and the ceiling of the top storey.

5.7.5.4 Portable Fire Extinguishers

In accordance with Article 3.2.5.16., portable fire extinguishers will be required to be provided throughout the Project in accordance with the National Fire Code.

5.7.5.5 Emergency Lighting & Power

In accordance with the requirements of Subsection 3.2.7., a ½-hour emergency power supply will be required for:

- emergency lighting,
- exit signs, and
- fire alarm system.

In accordance with Article 3.2.7.3., emergency lighting is required to be provided at an average of 10 lx in the following areas:

- exits,
- principal routes providing access to exit in open floor areas and service rooms, and
- corridors used by the public.

5.7.6 Spatial Separation and Exposure Protection

In accordance with Article 3.2.3.1. and Table 3.2.3.1.C., unlimited unprotected openings will be permitted on any exposing building face in consideration that a minimum limiting distance of 9 m measured from the building face to a property line, an imaginary property line between buildings on the same property, or the centreline of a street will be provided. The limiting distances for the exposing building faces will be measured to property lines at the South, East and West building faces and to the centreline of a street for the North building face.

Elevation	Storey	Area of Exposed Building Face (m^2)	L/H Ratio	UPO Permitted (%)	UPO Provided (%)	LD (m)	Rating Required
North 1	1	22.5	<3:1	100	17	12	N/A
North 1	2	22.5	<3:1	100	0	12	N/A
North 2	1	76.5	>3:1	100	100	11	N/A
North 2	2	76.5	>3:1	100	100	11	N/A
North 3	1	19.5	<3:1	100	30	11	N/A
North 3	2	19.5	<3:1	100	0	11	N/A
South 1	1	10	<3:1	95.5	0	4.5	¾-hour
South 1	2	10	<3:1	95.5	0	4.5	¾-hour
South 2	1	52.2	>3:1	100	60	>9.0	N/A
South 2	2	52.2	>3:1	100	60	>9.0	N/A
South 3	1	53.4	>3:1	0	0	0.0	1-hour
South 3	2	53.4	>3:1	0	0	0.0	1-hour
West 1	1	22.2	<3:1	26	13	3.0	¾-hour
West 1	2	22.2	<3:1	26	13	3.0	¾-hour
West 2	1	142	>10:1	**17(22)***	**46**	3.0	1-hour
West 2	2	142	>10:1	**17(22)***	**46**	3.0	1-hour
West 3	1	23.4	<3:1	26	7	3.0	¾-hour
West 3	2	23.4	<3:1	26	0	3.0	¾-hour
East 1	1	26.4	<3:1	23	3	3.0	1-hour
East 1	2	26.4	<3:1	23	3	3.0	1-hour
East 2	1	145.5	>10:1	**13(20)***	**48**	2.5	1-hour
East 2	2	145.5	>10:1	**13(20)***	**48**	2.5	1-hour
East 3	1	11.1	<3:1	29	14	2.5	¾-hour
East 3	2	11.1	<3:1	29	0	2.5	¾-hour

* Value in parentheses indicates the percent of unprotected openings permitted if the building is fully sprinklered.

Based on the table above, the percentage of unprotected openings for the West and East sides of the building exceed the percentage of unprotected openings permitted for the building. Listed fire shutters are permitted to protect unprotected openings. Alternatively, sprinkler protected windows are permitted with concurrence from the Departmental Fire Protection Coordinator (DFPC).

5.7.7 Interconnected Floor Space Requirements

Except as described below, and in accordance with Clause 3.2.8.1.(1)(a), floor assemblies that do not terminate at an exterior wall will be required to terminate at 1-hour rated vertical fire separations.

The Project will include an interconnected floor space between the first storey and second storey. In accordance with Sentence 3.2.8.2.(6), this interconnected floor space is not required to conform to the requirements of Articles 3.2.8.3. to 3.2.8.9.

5.7.8 Egress/Existing Requirements

5.7.8.1 Location of Exits

In accordance with Clause 3.4.2.5.(1)(b), a 45 m maximum travel distance to an exit will be provided and will be measured from any point in a floor area of the Project. Based on current design which proposes to remove the N/E stair, the floor plans conform to a maximum travel distance of 45 m.

5.7.8.2 Egress from Rooms

In accordance with Sentence 3.3.1.5.(1) and Table 3.3.1.5.B, a minimum of two egress doorways (located such that one doorway could provide egress from the room or suite if the other doorway becomes inaccessible) will be required to be provided from every room or suite intended for an occupant load exceeding 60 persons; or where the following area and/or egress distance limits are exceeded in a floor area that is fully sprinklered:

Occupancy Type	Area	Egress Distance
Offices (D)	300 m^2	25 m
Storage/Service Rooms (F3)	300 m^2	25 m

Egress distance is measured from the most remote location within the room or suite to a corridor or an exit, taking into account permanent fixtures which interfere with the most direct egress path. Based on the current design, the floor plans conform to the requirements described above.

5.7.8.3 Open Floor Areas

In accordance with Article 2.7.1.2., of the 2010 National Fire Code (NFC), aisles will be provided in every floor area that is not subdivided into rooms or suites served by corridors giving access to exits, and are required by the NBC to have more than one egress doorway.

Every required egress doorway will be served by an aisle that

a) have a clear width not less than 1,100 mm,
b) has access to at least one additional egress doorway, and
c) at every point on the aisle, provides a choice of 2 opposite directions by which to reach an egress doorway.

A subsidiary aisle with only a single direction of travel to an aisle described above is permitted provided it has a clear width not less than 900 mm and a length not greater than 7.5 m in business and personal services occupancies.

The aisles on the north side of the building exceed 7.5m and the main aisle near the glazing is noted to be less than 1,100 mm.

5.7.8.4 Occupant Loads and Exit Capacities

In accordance with Sentence 3.4.3.2.(1), the aggregate required width of exits serving the floor areas of the Project has been determined by multiplying the occupant load of the area served by:

a) 6.1 mm per person for ramps with a gradient of not more than 1 in 8, doorways, corridors, and passageways,
b) 8.0 mm per person for a stair consisting of steps whose rise is not more than 180 mm and whose run is not less than 280 mm, or
c) 9.2 mm per person for a ramp with a slope less than 1 in 8 or stairs other than those described in sentence (b) above.

The required exit capacities and therefore the widths of the exit stairs for the Project will be based on the occupant loads as determined by Table 3.1.17.1. Approximate exit widths available are indicated in the following table:

Level	Occupant Load (persons)	Aggregate Width of Exits Required (mm)	Aggregate Width of Exits Provided (mm)
Level 0	8	74 (stairs)	2,523 (stairs)
Level 1	258	2,190 (doors)	6,540 (doors)
Level 2	258	2,373 (stairs)	5,608 (stairs)

5.7.8.5 Minimum Egress and Exit Widths

In accordance with Subsection 3.3.1. and Sentence 3.4.3.2.(8), the minimum widths for egress/exit facilities will be as follows:

- Exit Stairs serving not more than two storeys above lowest exit level 900 mm
- Public Corridors: 1,100 mm
- Exit doors 790 mm
- Room entry/egress doors: 800 mm
- Doors providing access for persons with disabilities: (clear) 850 mm

5.7.8.6 Exit Signs

In accordance with Sentence 3.4.5.1.(1), every exit door will have an illuminated exit sign placed over it. Where illuminated exit signs at exit doors are not visible from open floor areas or corridors used by the public, directional exit signs will be provided to indicate the direction of egress. Specifications for these exit signs will conform to the requirements of Subsection 3.4.5.

In accordance with Sentence 3.4.5.1.(2), exit signs will consist of a green pictogram and white graphic symbol meeting the visibility specifications referred to in ISO 3864-1, "Graphical Symbols- Safety Colours and Safety Signs- Safety Signs Used in Work places and Public Areas" for the following symbols:

E001 emergency exit left,

E002 emergency exit right,

E005 90-degree directional arrow, and

E006 45-degree directional arrow.

5.7.8.7 Mobile Shelving

In accordance with Section 4.2 of the DFPC Fire Protection Design Requirements for Mobile Shelving, record storage utilizing a mobile shelving system that is subsidiary to a floor area protected by light hazard occupancy sprinkler system is permitted provided the aggregate area of the mobile shelving system is not more than 70 m² on one floor or is located within a 1-hour fire compartment. (Refer also to Section 5.2.6 High Density Mobile Storage)

In accordance with Section 20.6 of NFPA 13 (2010), mobile shelving will:

a) compact storage modules up to 2.4 m high storing commodities consisting of paper files, magazines, books and similar documents in folders and miscellaneous supplies with no more than 5% plastics will be permitted to be classified as light hazard.
b) the top of the compact storage module will be at least 457 mm below the sprinkler deflector.
c) sprinklers will be ordinary temperature, quick-response, standard spray upright or pendent.

d) the compact storage modules will be provided with minimum solid steel 24 gauge metal longitudinal barriers installed every third carriage.
e) solid 24 gauge metal transverse barriers will be spaced not more than 1.2 m apart.
f) compact storage module sizes will not exceed 23.2 m².
g) steel barriers that are shown to have equivalent resistance to passage of flames and heat transfer in fire tests as solid 24 gauge steel barriers are permitted.
h) the size of a module will be defined by the area of compact storage bound by the length of the carriages times the distance between longitudinal barriers or to the outward edge of a fixed storage unit in the module, including the width of the aisle in the module.
i) the lengths of the carriages will be measured to the end of the carriages enclosed by solid metal transverse panels and separated by a minimum 700 mm aisle to a storage unit perpendicular to the carriage.

5.7.9 Health Requirements

5.7.9.1 Water Closet Requirements

In accordance with Sentence 3.7.4.2.(1) and Table 3.7.4.7., water closets will be provided throughout the building as required for a Group D office building. The following table provides the number of water closets required for the building based on the calculated occupant load.

Level	Occupant Load (persons)	Number of Water Closets Required (male/female)	Number of Water Closets Provided (male/female)
Level 0	0	7/7	10/10
Level 1	258		
Level 2	258		
Total	**516**		

As shown in the table, the number of water closets provided will be sufficient based on the number of water closets required by the applicable Sentence and Table in Subsection 3.7.4.

5.7.10 Requirements for Barrier-Free Accessibility

Applicability

The Project will comply with Section 3.8 with respect to barrier-free accessibility. In accordance with Sentence 3.8.2.1.(1), access from the accessible main entrance to all parts of this building required to be accessible, and each type of facility, will be provided.

Clearance at Doorways

In accordance with Sentence 3.8.3.3.(10), all doors in a barrier-free path of travel will be required to provide a clear space of 600 mm on the latch side of the door when the door swings toward the approach side. A 300 mm clear space is required on the latch side of the door when the door swings away from the approach side.

Areas of Refuge

In accordance with Article 3.3.1.7., areas of refuge will not be required for the Project based on the provision of automatic sprinkler protection.

Number of Barrier-Free Entrances

In accordance with Article 3.8.1.2., not less than 50% of the pedestrian entrances of a building will be barrier-free. Currently, two barrier-free entrances and four pedestrian entrances are indicated on the design drawings.

5.8 Preliminary Sustainable Recommendation Report

5.8.1 Introduction

The Government of Canada Building Windsor (GoCB Windsor) originally completed in 1953 is in need of modernization to accommodate the operational needs of federal tenants and meet current building codes and regulations. The modernization of the space must be planned with the next 25-years in mind: providing materials and systems that are durable, offer a long service life, and address current and future environmental challenges.

This capital project will be aligned with the Federal Sustainable Development Strategy (FSDS) and the federal government's framework for sustainable planning. The proposed retrofits for this building target 4 themes of sustainability:

I. Energy efficiency
II. Material and envelope durability
III. Enhanced workplace environmental quality
IV. Potable water conservation

The overall goal is to create a great place to work and to achieve a level of operating efficiency and building infrastructure that will withstand a 25-year lifecycle.

5.8.2 Sustainable Design Process

DIALOG has developed the mechanical, electrical and envelope recommendations that are consistent with the Federal Sustainable Development Strategy (FSDS) to target levels of efficiency and savings that go beyond typical standard practice.

Achieving a higher level of performance and integrating new, innovative technologies requires a better design process – one that engages the client, includes all of the stakeholders and harnesses the expertise of the assembled design and construction team. This model, called the Integrated Design Process (IDP), is the preferred method of delivery for high performance buildings.

To kick-start the IPD, the various design disciplines met to evaluate proposed retrofit options and how each discipline's scope could inform other design decisions; for example, characteristics of the mechanical system were input into energy analysis software to assess envelope design options and insulation levels. In turn, daylight studies helped to inform electrical lighting layouts and fixture counts, and architectural programming.

5.8.3 References, Benchmarks and Standards

The following references will be used, either as a minimum standard or as a target for higher levels of performance:

- ASHRAE Guideline 0 – 2013 The Commissioning Process
- ASHRAE Guideline 1.1 – 2007 The HVAC Commissioning Process
- ASHRAE Standard 55-2004, Thermal Comfort Conditions for Human Occupancy
- ASHRAE Standard 62.1 – 2010 Ventilation for Acceptable Indoor Air Quality
- ASHRAE Standard 90.1-2010 Energy Standard for Buildings Except Low-Rise Residential Buildings
- ASHRAE Standard 110-1995 Method of Testing Performance of Laboratory Fume Hoods
- International Performance Measurement and Verification Protocol Volume III: Concepts and Options for Determining Energy Savings in New Construction, April, 2003

- ISO 14040:2006 Environmental management - Life cycle assessment - Principles and framework
- LEED Canada for Commercial Interiors, 2007
- LEED Canada for Existing Buildings: Operations and Maintenance, 2009
- NRC National Energy Code for Buildings 2011
- Public Works and Government Services Mechanical Design Guidelines:
    - MD 250005 Energy Monitoring and Control Systems Design Guidelines
- Sheet Metal and Air Conditioning Contractors National Association (SMACNA) IAQ Guidelines For Occupied Buildings Under Construction, 2nd Edition 2007, ANSI/SMACNA 008-2008

5.8.4 Sustainable Design Strategies

The following strategies, features, and technologies are incorporated into the proposed retrofit design options, contributing to higher operating energy efficiency and envelope longevity.

5.8.5 Energy Use and Greenhouse Gas Reduction

Energy use is a primary driver for climate change and reductions in energy use and GHGs are a key measure for any project targeting sustainability. Office buildings in cold climates are high users of energy; achieving a percentage reduction in energy use has proportionately high impact in total GHG emissions.

5.8.6 Building Envelope

Building envelope upgrades are recommended to improve the appearance of the building, increase durability, and improve the building's thermal performance. The walls, roof, and windows of the building are indicative of the building's age and there are significant energy savings available for upgrading these assemblies.

Windows

The existing windows are approaching 40 years old and they consist of double pane glazing units in thermally unbroken frames. We estimate that the existing windows have a U-value of 3.24 W/m²°C (including the framing system) and a SHGC of 0.70.

We are recommending the replacement of the glazing units with new IGUs including warm edge spacers, argon gas fill, and low-e coating on surface #3. This will improve the system U-value to 2.06 W/m²°C and lower the SHGC to 0.44.

We are also recommending the replacement of the existing window frames with a new, high performance thermally broken framing system. This will improve the system U-value to 1.82 W/m²°C.

Upgrading the glazing units and window frames is predicted to save 12% of building energy use annually, translating to a yearly energy savings of 303 GJ and cost savings of approximately $1,400.

Walls

The building walls are clad in masonry with concrete block backup and plaster interior. We believe that there is 25mm of rigid insulation in the walls which would result in a total thermal performance of approximately RSI-1.41 m²°C/W.

Based on the exact construction of the walls it may be possible to add 25mm of continuous insulation on the inside of the concrete masonry units (exact assembly should be identified to confirm there will not be issues with crossing the dew point in the air space).

Adding 25mm of continuous foam insulation to the inside of the wall assembly will save approximately 3% of building energy use annually, equivalent to 90GJ or an energy cost savings of $750.

Roof

The existing roof consists of a modified bitumen membrane over a wooden deck and it is anticipated that the overall thermal performance is in the range of RSI 1.76 – 2.47 m²°C/W.

If the roof membrane is to be replaced then we recommend that the roof insulation also be replaced with a target R-value of RSI of 3.94 m²°C/W (equivalent to adding 50mm of polyisocyanurate roof board).

Adding 25mm of rigid insulation to the roof assembly will save approximately 4% of building energy use annually, equivalent to 100GJ or an energy cost savings of $850.

5.8.7 Heating, Cooling and Ventilation

Replacing the building's HVAC systems represents an opportunity to dramatically increase energy efficiency while also enhancing the quality of the indoor environment. Improved comfort conditions and fresh air can make a dramatic contribution to increased satisfaction and productivity in the space.

Ventilation will be provided by a Dedicated Outdoor Air System (DOAS) with energy recovery. With traditional HVAC systems, ventilation is combined with the delivery heating and cooling energy. These configurations can be wasteful when excess outside air or reheat energy need to be provided to meet demand in the zone. With the DOAS system every zone can receive just the required amount of outdoor air, heating, and cooling. Since the same unit provides supply and exhaust for the entire building an energy recovery wheel can be used to reclaim waste heat from the general and washroom exhausts.

Cooling for the building will be provided by a Variable Refrigerant Flow (VRF) system. The VRF uses roof mounted condensing units to provide cooling which is distributed throughout the building via a refrigerant loop and ceiling mounted fan coils. The VRF system provides efficient cooling to each zone with a full load coefficient of performance (COP) of 3.5 in cooling mode.

Office buildings frequently have periods where some zones require cooling while others simultaneously require heating. This can typically occur in winter when perimeter zones require heating while internal zones need cooling due to high occupant and equipment gains, or when one face of the building has high solar gains. The VRF allows heat to be exchanged between zones via the refrigerant loop, rather than separately provided by building systems that consume energy.

For perimeter heating needs that are not met by the VRF system there will be a dedicated hydronic heating loop supplied by a high efficiency condensing boiler. The condensing boilers take advantage of low water return temperatures to recover additional energy from vapour in flue gases and are capable of efficiencies of up to 95%. Zone heating will be provided by ceiling mounted radiant panels which provide efficient delivery of heating energy and enhanced comfort in the zone.

A new digital Building Management System (BMS) will be provided to optimize performance of the building systems and give operator access to zone temperature set points and operational information for air handlers, boilers, VRF system, etc. New thermostat control in the zones will improve occupant temperature control and thermal comfort conditions. Carbon dioxide (CO2) sensors will be located in

meeting rooms and office space to monitor air quality and adjust ventilation air according to occupancy levels.

It is predicted that HVAC upgrades will result in building energy savings upwards of 20% vs. the current operating conditions with an annual energy cost savings of over $12,000. Energy cost savings should be significantly enhanced by savings to operations and maintenance and gains in occupant productivity.

5.8.8 Power and Lighting

Lighting systems will be designed to appropriately balance environmental quality, safety and energy consumption. Best practices will be followed to optimize systems and minimize lighting energy use. LED lighting fixtures are recommended as the best balance between up-front costs, maintenance / replacement costs and energy use / GHG footprint.

The ASHRAE 90.1 – 2010 Standard provides maximum allowable Lighting Power Densities (LPDs) for building space types, taking into account space environment and required lighting levels. Best practice typically allows for a lower connected wattage by focusing on effective placement of light fixtures and efficacy (lumens per watt). The lighting design for the GoCB Windsor will target the following lighting levels for an office building type:

Building Area Type	ASHRAE 90.1 LPD Allowance (W/ft^2)	Target LPD (W/ft^2)	% Reduction
Office	0.9	0.765	15 %

Overhead lighting will be used to reach a basic level of lighting suitable for most tasks, in the range of 300-400 lux. Task lighting will be investigated to supplement the overhead lighting, providing higher light levels of up to 600 lux on an as-needed basis.

LED lighting is recommended for the open office areas, meeting rooms, and corridors, storage etc. The LED fixtures have higher efficiency, supplying the same output as traditional fluorescent fixtures while using fewer watts and with longer lamp life requiring fewer lamp replacements over the project lifecycle.

A high-level costing analysis for linear lighting options shows that LED fixtures are cost effective choice when considering total cost of ownership. While the LED fixtures have a higher capital cost than the equivalent T8 fluorescents, there are significant lifecycle savings in labour for replacements and operating energy costs. The chart below summarizes a Lifecycle Costing Analysis for linear T8 LED lamps vs. linear fluorescents.

Lifecycle Costing	T8 fluorescent	LED T8
# of Lighting Fixtures	500.0	
Initial Capital Cost (Equipment plus installation)	$ 28,750	$ 55,000
Maintenance cost, present value	$ 29,375	$ 42,500
Annual Energy Use (MWh)	204	152
First Year Energy Cost	$ 24,480	$ 18,240
10-year energy costs, present value	$ 214,262	$ 159,646
Total Cost of Ownership, 10 years	**$ 272,387**	**$ 257,146**

This analysis is based on a constant electricity cost of $0.12 / kWh (blended to include demand and fixed monthly charges) and an annual discount rate of 3%. Cost figures are taken from this report issued by US Department of Energy:
http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/caliper_21-3_t8.pdf .

Space layouts are designed with daylighting strategy in mind, ensuring that natural light is accessed in areas of the floor plate where it's available. The use of glass partitions allows natural light into the interior zones lowering lighting energy while allowing for a greater connection to the exterior. Daylight and occupancy responsive controls will be used to achieve further energy savings.

5.8.9 Operations and Process

A full commissioning process, according to ASHRAE requirements as dictated in Guidelines 0 and 1.1, should be employed to ensure the proper operation of equipment and systems. Operations and maintenance will be considered in the design of all mechanical & electrical systems to provide for ongoing efficiency.

We recommend that energy monitoring be considered for the detailed design, using a network of connected meters to track energy use by system. Benchmarking and metering are a method for office buildings to demonstrate leadership and facilitate ongoing building optimization. Separate metering of energy and water uses (HVAC, lighting, plug loads, equipment) allows potential areas for improvement to be identified and tacked. A 'dashboard' style user interface can be considered to facilitate continuous improvement and benchmarking vs. other lab facilities. Energy use data can be combined with employee engagement – occupant training, user surveys, and communication of energy savings achievements – to achieve deeper energy savings in the operations phase.

5.8.10 Materials and Lifecycle Impact

Construction materials can represent a significant portion of a building's environmental footprint. By adopting a Lifecycle Analysis (LCA) approach we can minimize the impact of construction materials through all phases:

- Extraction
- Manufacturing
- Transportation
- Installation
- Use & Maintenance
- Disposal or reuse

When choosing systems and materials all phases of the materials lifecycle will be considered to ensure that decisions reflect the best possible functionality and durability in the 25-year range, with lowered lifecycle impacts.

During the demolition and construction phases a Waste Management Plan will be implemented to maximize the diversion of materials from landfill. Wherever possible materials will be identified for reuse on- or off-site through programs like Habitat for Humanity. Recycling facilities will be identified for expected waste materials including wood, metal, gypsum board, cardboard etc. Contractor waste tracking will be required to ensure that a waste diversion rate of over 75% is achieved

The GoCB project is designed to maximize adaptability in the space, configured with the next 25 years in mind. Material and capital efficiency can be achieved by planning for space use flexibility and minimizing the work required to periodically reconfigure space use. As research trends and government requirements change over years to come the space must be ready to accommodate. Durable materials

with a long service life are incorporated to minimize maintenance requirements over time and minimize the environmental impact of replacements.

The emergence of Environmental Product Declarations means that new materials can be chosen with the goal of minimizing environmental impact:

- Greenhouse gases
- Ozone depletion
- Acidification of land and water sources
- Eutrophication
- Smog formation

Figure ST-1 - Construction materials are a significant contributors to GHG emissions

Similarly the emergence of Health Product Declarations (HPDs) and the movement for disclosure and transparency in the construction materials industry is allowing designers and owners to identify and eliminate materials that contain bio-accumulative carcinogens, toxins, mutagens, and endocrine disruptors.

Materials selection will prioritize the use of products with EPDs and HPDs available, minimizing environmental and human impact.

Other materials properties will be evaluated to assist in making sustainable material choices:

- Recycled content
- Regional materials / local manufacture
- FSC certified wood
- Embodied carbon
- Long service life
- Low-emitting materials (VOCs & formaldehyde emissions)

5.8.11 Indoor Environmental Quality

Healthy buildings contribute to occupant wellbeing and satisfaction as well as employee comfort, health and productivity. A premium work environment is one that is well ventilated, comfortable, well lit with access to daylight and natural views, and creates a great environment for concentration and collaboration. Studies have repeatedly demonstrated that healthy workplaces translate to improved worker satisfaction, less sick days, increased productivity and increased ability to attract and retain talented employees.

Ventilation for offices and other spaces are designed according to the latest version of ASHRAE standard 62.1 to meet thermal loads, provide adequate outdoor air and balance energy cost via the two dedicated outdoor air systems (DOAS). In addition to ventilation performance, the DOAS features a heat recovery function to capture heat from exhaust air that would otherwise be wasted as it is expelled from the building. This heat will pre-condition fresh incoming air for distribution to occupied spaces.

During construction the contractor will be required to create and implement an Indoor Air Quality Management Plan, which will encourage clean air at occupancy and employ the SMACNA best practices:

- HVAC protection
- Pollutant source control
- Housekeeping
- Pathway interruption
- Scheduling of construction activities

Prior to occupancy it will be required that the contractor administer a building 'flush-out', using increased outdoor air volumes to remove particulates, CO_2 and Volatile Organic Compounds (VOCs) which may be emitted by materials, finishes and furniture. If desired an air quality test can be commissioned to ensure that pollutants are at acceptably low levels prior to occupancy.

In addition to low environmental impact, materials, finishes, and furniture will be selected to best industry standards for low emission of VOCs and other harmful materials:

- South Coast Air Quality Management District Rules # 1113, 1168 (latest versions) for adhesives, sealants and coatings
- Green Seal Standards GS-03, and GS-11, and GS-36 for top coat paints, aerosol adhesives & anti-corrosive coatings
- CRI Green Label program for carpet tile
- FloorScore certification (or equivalent test results per State of California methods) for hard surface flooring including vinyl, linoleum, laminate, rubber flooring, and wall base
- Composite wood materials certified as 'No added urea-formaldehyde' including plywood, MDF, and particle board
- New furniture and seating certified as low-emitting according to GreenGuard, BIFMA Level, or equivalent

Space layout will be designed to give occupants access to natural light and views of the exterior. Locating open plan workspaces around the perimeter of the building provides a greater proportion of occupants with access to views and daylight. The proposed skylight will provide natural light to the core of the floor plate, around which occupied spaces such as meeting rooms and private offices can be located. Furnishing the open plan workspaces with low-rise partitions incorporating vision panels and fitting interior spaces with glass walls further increases the distribution of light and views.

Window shades will be provided to limit excessive glare and preserve light quality. Lighting quality will be maintained throughout the space, balancing safety, function, environmental quality and energy efficiency.

Natural materials, textures, and patterns will be incorporated where possible to enhance the feeling of connection to nature and wellbeing according to the principles of biophilic design.

HVAC controls for space temperature and humidity will be designed to maintain comfort conditions as per the latest version of ASHRAE Standard 55 for Thermal Comfort.

5.8.12 Water Conservation

Water conservation will be a central feature of the retrofit, treating water as a valued resource and limiting consumption of potable water.

Plumbing fixtures in washrooms and break rooms will be selected for low flow rates, suggested as follows:

- 4.8L / 3.0L dual flush water closets
- 0.5 LPF urinals
- 1.9 LPM faucets with automatic sensor control
- 5.7 LPM kitchen sink faucets

Based on these fixture selections it can be expected that the building will save over 40% in potable water compared to a baseline building using typical flow rates.

5.8.13 Rating Systems and Benchmarks

Green building rating systems are frequently used as a way of communicating sustainable design and construction success to occupants, stakeholders and the public. The LEED certification program (Leadership in Energy and Environmental Design) has gained widespread popularity for its marketing appeal and recognition amongst the general public.

LEED Canada for Commercial Interiors (LEED-CI) is the LEED rating system that is applicable to the retrofit project. Based on the sustainable design measures detailed in this report it is reasonable to expect that LEED Silver certification could be achieved with the additional investment of LEED consulting services and contractor tracking / documentation.

When the project proceed to the schematic design phase, a LEED strategy meeting with PWGSC and the consulting disciplines should be held to establish a clear approach and design to obtain the desired certification.

The following scorecard illustrates a preliminary LEED strategy based on current knowledge of the building, results of the building investigation and proposed retrofit strategies offered in this report. Credits that are shown as 'targeted' represent points that can be reasonably achieved based on the aforementioned information; credits that are not compatible are marked as 'dismissed'. Credits that are marked us 'under consideration' require further exploration into design options and consultation with PWGSC to establish a strategy or feasibility of achievement.

Registration is open for LEED-CI v1.0 until October 31st 2016, after this date LEED v4 for Interior Design will be the applicable rating system. LEED registration should be conducted before that date if certification under the original LEED CI v1.0 is desired.

DIALOG

GoCB Windsor

TARGETED | UNDER CONSIDERATION | DECISION REQUIRED

LEED Canada CI v1.0		27	22.5	17	0	TARGETED CERTIFICATION:	Silver
Sustainable Sites		1	5.5	10	0		Responsibility
Site Selection - Select a LEED Certified Building	3			3		SSc1	
Site Selection - Brownfield Redevelopment	0.5			0.5		SSc1A	Architect
Site Selection - Stormwater Management, Rate & Quantity	0.5		0.5			SSc1B	Civil Engineer
Site Selection - Stormwater Management, Treatment	0.5		0.5			SSc1C	Civil Engineer
Site Selection - Heat Island Reduction, Non-Roof	0.5			0.5		SSc1D	Architect
Site Selection - Heat Island Reduction, Roof	0.5			0.5		SSc1E	Architect
Site Selection - Light Pollution Reduction	0.5		0.5			SSc1F	Electrical Engineer
Site Selection - Water Efficient Irrigation, Reduce by 50%	0.5		0.5			SSc1G	Landscape Architect
Site Selection - Water Efficient Irrigation, No Potable Use or No Irrigation	0.5		0.5			SSc1H	Landscape Architect
Site Selection - Innovative Wastewater Technologies	0.5			0.5		SSc1I	Mechanical Engineer
Site Selection - Water Use Reduction, 20% or 30% Reduction	1			1		SSc1J	Mechanical Engineer
Site Selection - Onsite Renewable Energy	1			1		SSc1K	Mechanical Engineer
Site Selection - Other Quantifiable Environmental Performance	3			3		SSc1L	Architect
Development Density & Community Connectivity	1	1				SSc2	Architect
Alternative Transportation - Public Transportation Access	1		1			SSc3.1	Architect
Alternative Transportation - Bicycle Storage & Changing Rooms	1		1			SSc3.2	Architect
Alternative Transportation - Parking Availability	1		1			SSc3.3	Architect
Water Efficiency		2	0	0	0		Responsibility
Water Use Reduction - 20% Reduction	1	1				WEc1.1	Mechanical Engineer
Water Use Reduction - 30% Reduction	1	1				WEc1.2	Mechanical Engineer
Energy & Atmosphere		5	7	0	0		Responsibility
Fundamental Commissioning						EAp1	Commissioning Agent
Minimum Energy Performance			PREREQUISITE			EAp2	Energy Modeler
CFC Reduction in HVAC&R Equipment						EAp3	Mechanical Engineer
Optimize Energy Performance - Lighting Power	3	2	1			EAc1.1	Electrical Engineer
Optimize Energy Performance - Lighting Controls	1	1				EAc1.2	Electrical Engineer
Optimize Energy Performance - HVAC	2	1	1			EAc1.33	Mechanical Engineer
Optimize Energy Performance - Equipment & Appliances	2		2			EAc1.4	Interior Designer
Enhanced Commissioning	1	1				EAc2	Commissioning Agent
Energy Use - Measurement & Payment	2		2			EAc3	Client/Owner
Green Power	1		1			EAc4	Client/Owner
Materials & Resources		5	4	5	0		Responsibility
Storage & Collection of Recyclables			PREREQUISITE			MRp1	Architect
Tenant Space - Long-Term Committment	1	1				MRc1.1	Architect
Building Reuse - Maintain 40% of Interior Non-Structural Components	1			1		MRc1.2	
Building Reuse - Maintain 60% of Interior Non-Structural Components	1			1		MRc1.3	
Construction Waste Management - Divert 50% from Landfill	1	1				MRc2.1	Contractor
Construction Waste Management - Divert 75% from Landfill	1	1				MRc2.2	Contractor
Resource Reuse - 5%	1			1		MRc3.1	
Resource Reuse - 10%	1			1		MRc3.2	
Resource Reuse - 30% Furniture & Furnishings	1		1			MRc3.3	Interior Designer
Recycled Content - 10% (post-consumer + 1/2 pre-consumer)	1	1				MRc4.1	Contractor
Recycled Content - 20% (post-consumer + 1/2 pre-consumer)	1		1			MRc4.2	Contractor
Regional Materials - 20% Manufactured Regionally	1	1				MRc5.1	Contractor
Regional Materials - 10% Extracted & Manufactured Regionally	1		1			MRc5.2	Contractor
Rapidly Renewable Materials	1			1		MRc6	
Certified Wood	1		1			MRc7	Contractor
Indoor Environmental Quality		11	4	2	0		Responsibility
Minimum Indoor Air Quality (IAQ) Performance			PREREQUISITE			EQp1	Mechanical Engineer
Environmental Tobacco Smoke (ETS) Control						EQp2	Architect
Outdoor Air Delivery Monitoring	1	1				EQc1	Mechanical Engineer
Increased Ventilation	1			1		EQc2	
Construction IAQ Management Plan - During Construction	1	1				EQc3.1	Contractor
Construction IAQ Management Plan - Before Occupancy	1	1				EQc3.2	Contractor
Low-Emitting Materials - Adhesives & Sealants	1	1				EQc4.1	Contractor
Low-Emitting Materials - Paints & Coatings	1	1				EQc4.2	Contractor
Low-Emitting Materials - Carpet Systems	1	1				EQc4.3	Contractor
Low-Emitting Materials - Composite Wood and Laminate Adhesives	1	1				EQc4.4	Contractor
Low-Emitting Materials - Furniture Systems & Seating	1	1				EQc5	Interior Designer
Indoor Chemical & Pollutant Source Control	1		1			EQc5	Mechanical Engineer
Controllability of Systems - Lighting	1		1			EQc6.1	Electrical Engineer
Controllability of Systems - Temperature & Ventilation	1			1		EQc6.2	
Thermal Comfort - Compliance	1	1				EQc7.1	Mechanical Engineer
Thermal Comfort - Monitoring	1	1				EQc7.2	Mechanical Engineer
Daylight and Views - Daylight 75% of Spaces	1		1			EQc8.1	Architect
Daylight and Views - Daylight 90% of Spaces	1		1			EQc8.2	Architect
Daylight and Views - Views for 90% of Seated Spaces	1	1				EQc8.2	Architect
Innovation In Design		3	2	0	0		Responsibility
Innovation in Design: Exemplary Performance Water Use Reduction 40%	1	1				IDc1.1	Contractor
Innovation in Design: Low-Mercury Lighting	1	1				IDc1.2	Client/Owner
Innovation in Design: TBD	1		1			IDc1.3	Electrical Engineer
Innovation in Design: TBD	1		1			IDc1.4	Client/Owner
LEED® Accredited Professional	1	1				IDc2	LEED Consultant
TARGETED TOTAL		**27**	**23**	**17**	**0**		**27 / 57**

Updated: 10-9-2015

CERTIFIED 21-26 SILVER 27-31 GOLD 32-41 PLATINUM 42-57

5.9 Accessibility

It is apparent as part of the review of the facilities that there are a number of areas that do not meet the current standard for accessibility in accordance with Treasury Board of Canada, Accessibility Standard for Real Property – "*Accessible Design for the Built Environment – CAN/CSA B651-2012".* In order to meet these accessibility standards, a number of renovations and changes would be required. Foremost among these concerns accessibility and reasonable accommodation of staff with disabilities while maintaining the safety, security and operational effectiveness of the building and processes.

The current policy regulating accessibility to federal facilities is identified in the Treasury Board of Canada Federal Real Property Accessibility (FRPA) Standard. Section 4.2 of the FRPA standard specifies the use of the Canadian Standards Association B651 Standard as the technical reference for accessibility. The B651-12 presents numerous technical changes from earlier editions of the standard and also incorporates the accessibility requirements of the CAN CSA B44 00 Elevator Code as a mandatory annex of the standard. While the project falls under the jurisdiction of the federal government and may not be required to meet all provincial regulations, consideration should be given to the *Accessibility for Ontarians with Disabilities Act (AODA)* mandate that all facilities meet the requirement for accessibility and the removal of barriers for all citizens and provide for an enhanced quality of the environment for services and work. We would propose to review these standards with PWGSC as part of the further design development to determine if these requirements are applicable to the GoCB Windsor project.

With the exception of service rooms, all other areas of the building require a barrier-free path of travel suitable for wheelchairs. The NBC contains specific barrier-free provisions and in addition, federal government requirements under CSA-B651-12 Barrier-Free Design also apply to this building.

Barrier-free design features will include the following:

a) All controls such as light fixtures, manual pull stations, etc. are required to be mounted at a minimum of 900 mm and a maximum height of 1200 mm and be operable with one hand.
b) A minimum clearance of 300 mm is required to be provided on the push side beside the latch of all doors in a barrier-free path of travel. A minimum clearance of 600 mm is required to be provided on the pull side beside the latch of all doors in a barrier-free path of travel.
c) Sills greater than 13 mm in height or other floor obstructions are not permitted.
d) Wall mounted fixtures and obstructions are not permitted to project up to 100 mm into a corridor. Projections beyond 100 mm are permitted only when located above 1980 mm or within 680 mm of the floor.
e) The main entrance is required to be barrier-free, including the provision of power-door operators.
f) Where drinking fountains are provided, at least one fountain is required to be barrier-free.

Washrooms and Individual Washrooms:

a) 1500 mm x 1500 mm in front of accessible stalls
b) Barrier-free toilets require a clear transfer space of 900 mm wide by 1800 mm, the 1800 mm is to include a recess of 300 mm behind the wall supporting the toilet
c) Where more than one accessible toilet is provided, both right and left handed layouts should be provided
d) A barrier-free toilet stall requires internal dimensions of 1600 mm wide by 1800 mm deep including a 300 mm behind the wall supporting the toilet
e) For accessible urinals, a clear area in front accessible urinal of 900 mm x 1800 mm is required
f) Individual unisex barrier-free washroom - floor area not less than 3.5 m², minimum dimension of 1700 mm
g) Clear area in front of barrier-free shower entrance of 2250 mm x 2250 mm
h) Shower stall with curb - Interior area of 1065 mm x 1065 mm

It is recommended that existing 1st and 2nd floor washrooms be upgraded to provide full accessibility in accordance with B-651-12 and Treasury Board Standards. It is also recommended that a review be undertaken with CRA and Environment Canada Technical Committees to determine if there are any other requirements to accommodate persons with disabilities including increased turning areas for motorized aides or other mobility equipment. Providing accessibility for everyone is more than a minimum standard and the facility should provide a built environment that meets the physical and emotional well-being of all users.

5.9.1 Accessibility Issues

Car & Van Parking

There is one fenced surface parking compound area on the south side of the GoCB with 30 parking spaces. Where employee or visitor parking is provided, the quantity of accessible parking spaces provided shall conform to municipal by-laws or the following table, whichever has the higher number of accessible spaces:

Total parking Spaces (26-50) Minimum Number of Accessible Spaces Two (2)

It is unknown whether parking will be offered to staff or visitors in a renovated GoCB but it is recommended that the following be considered:

Two (2) accessible parking spaces with access aisle and required directional wayfinding.

Building Entrances and Barrier Free Path of Travel

Currently, no barrier free path of travel is provided from the parking area to the building entrances. In accordance with B651-12, a barrier free path of travel should be provided to at least one entrance. There is a ramp at the north-west entrance which currently serves as a barrier-free access. It is recommended that this entrance remain as the principal barrier-free access as the south-west door is approximately 900mm below the existing sidewalk. It is recommended that the existing sidewalk which extends from the parking area to University Avenue be re-constructed away from the building and serve as the barrier-free path of travel from the parking if the parking area is designated with accessible parking spots.

The existing north-west entrance door is equipped with a power door operator. There is an interior vestibule door which has a power assisted door operator. It is recommended these doors remain as a barrier-free entrance subject to a security review with the client departments. There is minimum room to maneuver within the current vestibule and it is recommended that this be addressed by providing a distance of a door width plus 1200mm as part of the renovation to provide required barrier-free access by increasing the distance between doors.

The existing GoCB has a ramp from the existing sidewalk to the north-west entrance door. The existing guardrails do not provide the required ramp edge protection to prevent wheelchairs or walkers from falling off the edge. It is recommended that an upgrade of the ramp be undertaken as part of any renovation of the GoCB to meet the requirements of the applicable codes.

5.9.2 Vertical Movement

Elevators

As noted in Section 5.3 Vertical Systems, the existing elevator cab marginally meets the minimums for accessibility. Due to the age of the existing elevator it is recommended the elevator be replaced and a new elevator be provided to better address the requirements for accessibility and stretchers in accordance with applicable building codes and B-651-12. The new elevator would meet all requirements of B651-12 although it is recommended that consideration be given to be able to accommodate other mobility aides such as power-assisted wheel chairs and motorized scooters. While these are not a specific requirement of the B651-12, increasingly accessibility standards such as AODA will require publically assessable buildings to accommodate them.

Ramp: With the exception of a ramp at the entrance to the Environment Canada Wildlife Enforcement Branch suite on the south side of the ground floor, there are no other internal changes of elevation within the 1st or 2nd floor that require ramps.

Drinking Fountains

One accessible cooler or fountain shall be provided in each location where water coolers or drinking fountains are provided;

Public Areas

Accessible seating spaces shall be provided within auditoriums, theatres, and other general assembly areas in conformance with the quantities identified in the National Building Code of Canada. Classrooms, auditoriums, meeting rooms and theatres with an area of more than 100 square metres shall be equipped with an assistive listening system encompassing the entire seating area.

5.10 Site Improvements

In general, the exterior sidewalks and parking areas are in fair condition. Sidewalks beyond the entrance ramp and exterior doors on University Avenue are on City of Windsor property so not the responsibility of the Crown. Consideration should be given to replacing the existing walkway along the west side of the building to move pedestrian traffic away from the exterior windows and to minimize the damage to exterior masonry from water/thaw and from de-icing salts.

The asphalt paving in the parking lot is in fair condition and will continue to serve the intended purposes. It should be budgeted for replacement at some point in the future. If an extension or addition to the building on the south side is part of any current or future proposal, it is recommended that geo-technical testing be undertaken in the area adjacent to the location of the original underground oil tank to determine if there are any hydrocarbons or contaminants present where the tank was located.

5.11 Architectural Layout & Design Options

The proposed architectural layout is shown in diagrams on the succeeding pages. The predominant feature on the ground and second floor is the establishment of large open areas to accommodate the Workplace 2.0 preferred workstations layout. The workstations are arranged with respect to the planning guidelines provided in the Workplace 2.0 Fit-Up Standard, with aisles running perpendicular to and adjacent to the exterior windows to ensure maximum access to natural light and views for all. The grid layout of the building was found to be convenient for the conversion to the required full open office arrangement, as their placement may enable electrical and telecommunications servicing of the workstations to be provided discreetly through furred-out columns.

Each floor's central core is occupied predominantly by the designated support spaces stipulated by Workplace 2.0 Fit-Up Standards. This central location not only allows the workstations to benefit from proximity to the exterior windows, it also ensures all areas of the floor plate have equal access to the support provisions. The high-density mobile storage is also located on the ground floor in the building's central core, as structural modifications may be required for placement on the second floor.

The three enclosed offices proposed for each floor are located within the central portion of the floor plate, apart from the director's office which was provided a location near the main entrance due to the assumption it may be used to host visitors.

The telecommunication rooms have been distributed evenly throughout the floor plates of both floors, as close to the centre of their respective areas of coverage as the open floor plan requirement dictates in accordance with WP 2.0 Fit-Up Standards. Furthermore, the telecommunication rooms have been placed in a stacked arrangement to minimize the lengths of service runs of conduit and cabling.

It should be noted that the architectural layout is reflective of the Feasibility Study goal of establishing compliance with the project’s objectives. Further refinement of the layout would be expected during future design concept and design development phases.

Washroom Design

The washrooms have been redesigned to conform to NBC & B-651 accessibility requirements, and are shown to remain in the south east corner to minimize construction costs. In the NBC Table 3.7.2.2.B, which illustrates the required fixture count for a business occupancy, the code requires that for an occupancy of 50 persons or more, 3 fixtures are required plus 1 for every additional increment over 50. With 150 people as the aggregate floor population, the washrooms have been designed with 5 fixtures for each male and female washroom. To qualify for the LEED credits for Bicycle and Shower Rooms the facility must have 1 shower for the first 100 FTE and an additional shower for every 200 FTE thereafter, resulting in two shower rooms accessible on each floor area.

Renovation Scope

The floor areas being considered for renovation involve most of the ground and second floors. It was determined that apart from upgrades to service equipment, the basement level would receive no significant interior renovation.

Additionally, it was determined that the area currently occupied by the Environment Canada's Wildlife Enforcement Branch at the south end of the ground floor would similarly be separated from the renovation scope and remain largely as is. The reasoning for this exclusion of scope is due to the good quality of the space, having been the most recently renovated area of the building. Furthermore, the functional separation of the Wildlife Enforcement Branch from the major tenant area that occupies the remaining floor plate allows for a discontinuity in material finishes and type, while ensuring EC's

operations can continue on-site during the renovation work. Minor alterations, such as the addition of washroom and shower facilities, could be introduced with minimal disruption to EC operations.

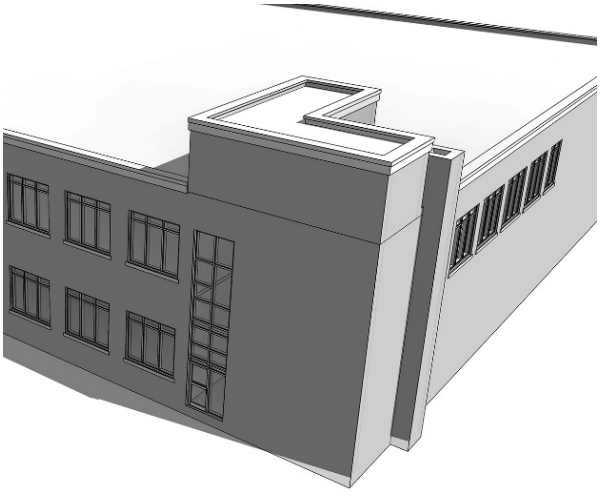
5.11.1 Design Options

With the goal of providing Canada with more flexibility in their selection of the preferred scope of renovation, we have grouped the recommended changes into three distinct options. The options are listed in ascending order of scope, where the base option includes all changes deemed the minimum necessary to fulfill the building's mandate, and the succeeding two options include additional changes that will further enhance the building's quantitative and qualitative value. The descriptions provided here present an overview of the changes being proposed in each defined option. For a full list of changes with itemized costing refer to Appendix B *Class D Cost Estimate*.

5.11.1.1 Option 1

Design Option 1 includes the minimum changes required for the building to perform its mandate to accommodate 300 FTEs in a WP 2.0 compliant office space with a 25 year life cycle. This option includes all recommended changes to bring the building up to current code requirements for life safety and accessibility, outlined in Section 5.8. This includes the introduction of fire suppression sprinklers through the building, which while not required by the NBC are identified as a base building provision in the Workplace 2.0 Fit-Up Standards. In addition to reducing the number of upgrades required to achieve a minimal level of code compliance for life safety, the presence of sprinklers enables the required high density mobile storage system to occupy a single room and will eliminate the requirement for a fire resistance rating between the 1st floor and the 2nd floor helping to offset the capital cost. It would also satisfy the requirements of the zero lot line exposure on the east and west elevations which have glazing on or very close to the existing lot line. It should also be considered from a risk management approach.

The replacement of the undersized elevator and reconstruction of the stair and guard rails are also minimum requirements to establish building code compliance. Furthermore, it is recommended that the renovation include a rationalisation of the building's washrooms, wherein all fixtures required for each floor would be grouped together in a single location with a fully accessible design. The recommended location for these washrooms is near the existing main washrooms in the south-east corner of the floor plate in order to minimise the demolition and plumbing costs. See Section 5.4 for more information on the logic of these proposed changes. Option 1 also includes all base building recommended changes described in the preceding Sections 5.1, & 5.2, including the replacement of all window units, repairs to cracking and spalling in the brick walls, and all interior alterations required for the accommodation of the WP 2.0 fit-up.



The mandate to establish Environment Canada's monitoring station on the building's roof calls for the provision of a safe, internal pathway to the roof from the building interior. Specifically this would involve extending the S-W stairwell up to the roof level, and in turn removing the precarious exterior roof access stair on the building's south wall.

Figure 27 View of S-W Stairwell w/ Monitoring Station

For the roof, Option 1 includes the recommendation of a full replacement the roof insulation and membrane. The new insulation would be engineered to correct the aforementioned pooling issues caused by roof sagging, and would ensure the 25 year life cycle mandated for the building could be achieved. Though the project could proceed with a lesser remediation focused on patching existing trouble spots, the roof is nearing its effective list span and would require full replacement in a few years especially with the removal of a number of existing air handling units. Replacement in an occupied building in the future would cost significantly more than being undertaken as part of a major renovation.

Option 1 Architectural Layout

Due to the omission of the skylight, second floor opening, and revision to the N-E stair in Option 1, the architectural layout varies from that of the recommended layout shown for Option 2 & 3 and discussed in *Section 3 - Workplace 2.0*. Without the reclaimed floor space in the N-E Stair, the ground floor cannot accommodate all required Workplace 2.0 support spaces, so the medium size meeting room that would otherwise be located in the N-E stair was instead located on the second floor. In doing so the design is in minor conflict for the stipulations of WP2.0, however as the two floors are to be occupied by a single tenant the design is in keeping with the intent of Workplace 2.0.

Summary of Work Included in Option 1

Architectural ($3,534,700)

- Wall, Ceiling & Floor Demolition ($140,200 + $217,900)
- Miscellaneous Demolition ($121,100)
- Asbestos Abatement ($360,000)
- Exterior Wall Refurb. ($60,000)
- New Ext./Entrance Doors ($27,400)
- Roof Replacement ($582,300)
- Stair Guardrail Revisions ($7,500)
- Elevator Upgrade ($105,000)
- Window Upgrade ($336,000)
- S-W Stair Extension ($78,200)
- New Interior Walls ($471,400)
- New Ceilings & Floors ($607,700)
- New Interior Doors ($124,600)
- New W/Cs & Kitchenettes ($39,600)
- High-Density Mobile Storage ($75,000)
- Signage ($9,000)
- Rough Carpentry, Misc. Millwork, Misc. Specialties, & Misc. Metals ($84,800)
- Site Development ($21,800)
- New Window Coverings ($46,500)
- New Roof Penetrations ($10,000)
- Fire Extinguishers ($8,700)

Structural ($100,700)

- Upgrades to roof for S-W Stair ($15,100)
- Structural Mod. for RTU ($73,600)

Mechanical ($1,992,750)

- New Sprinkler System ($220,500)
- New Plumbing Fixtures ($186,900)
- New Water Recirc. Line/Pump ($300,000)
- Boilers/HW distribution Sys. ($167,850)
- Replace HVAC system ($400,000)
- Install New Space Thermostats ($125,900)
- Replace Exhaust Fans ($48,400)
- Replace LAN Room AC system ($40,000)
- Replace Humidifiers ($24,000)
- Upgrade Natural Gas Piping ($24,000)
- Install New Bldg. Mgmt. Syst. ($125,900)
- New Ductwork ($329,300)

Electrical ($1,595,900)

- New 120/208V panel boards in the fit-out space and associated feeders
- Power receptacles
- Communications equipment, cabling (horizontal and backbone)
- Lighting
- Sound masking
- A/V rough-ins
- Fire alarm work
- All electrical demolition scope
- Basement electrical room scope:
    - New 225kva transformer
    - New 600v distribution panels for mechanical loads
    - New 120/208v distribution panels.
- Power connections for mech. equip, based on approximate 65% of connections

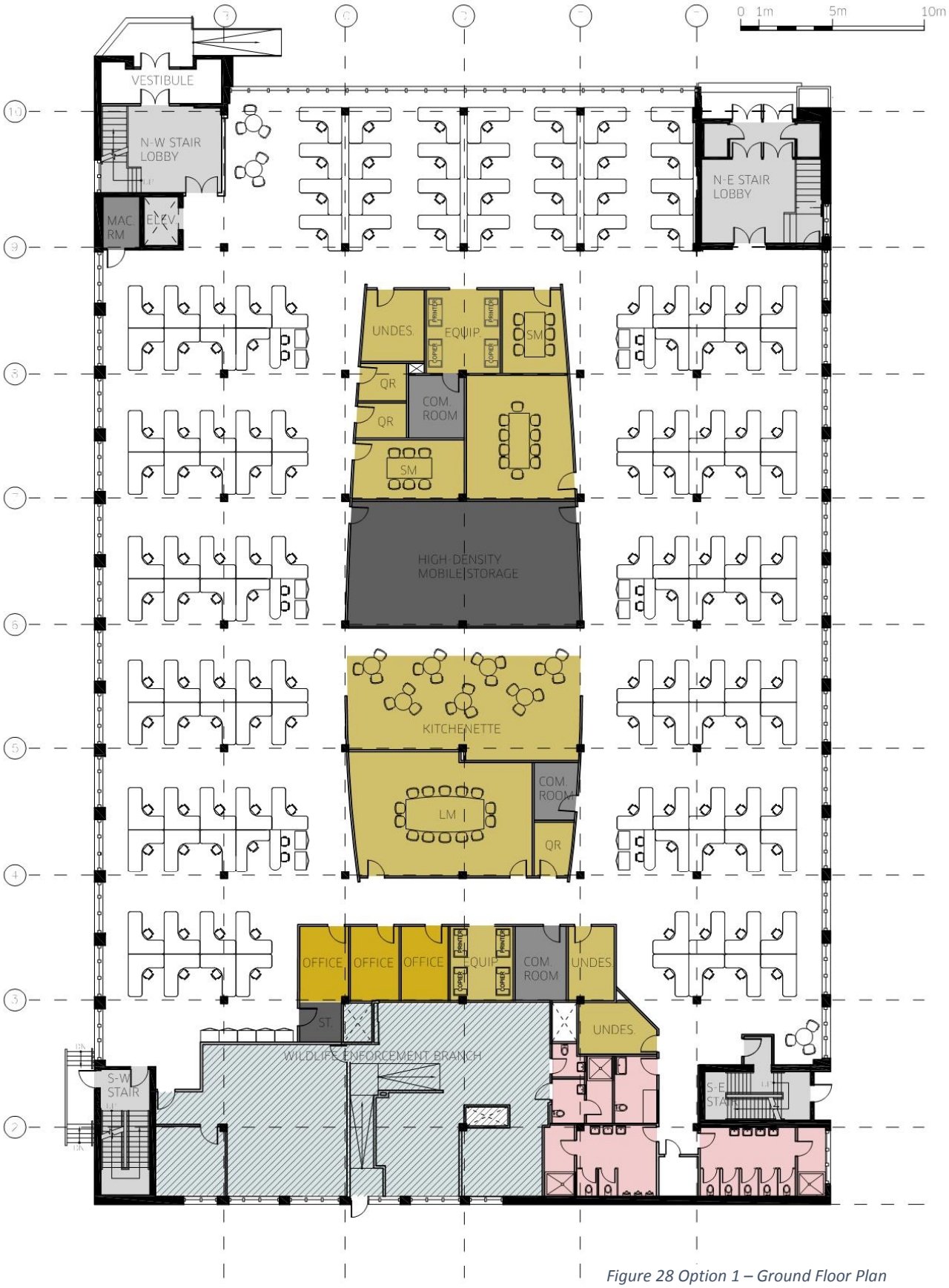


Figure 28 Option 1 – Ground Floor Plan

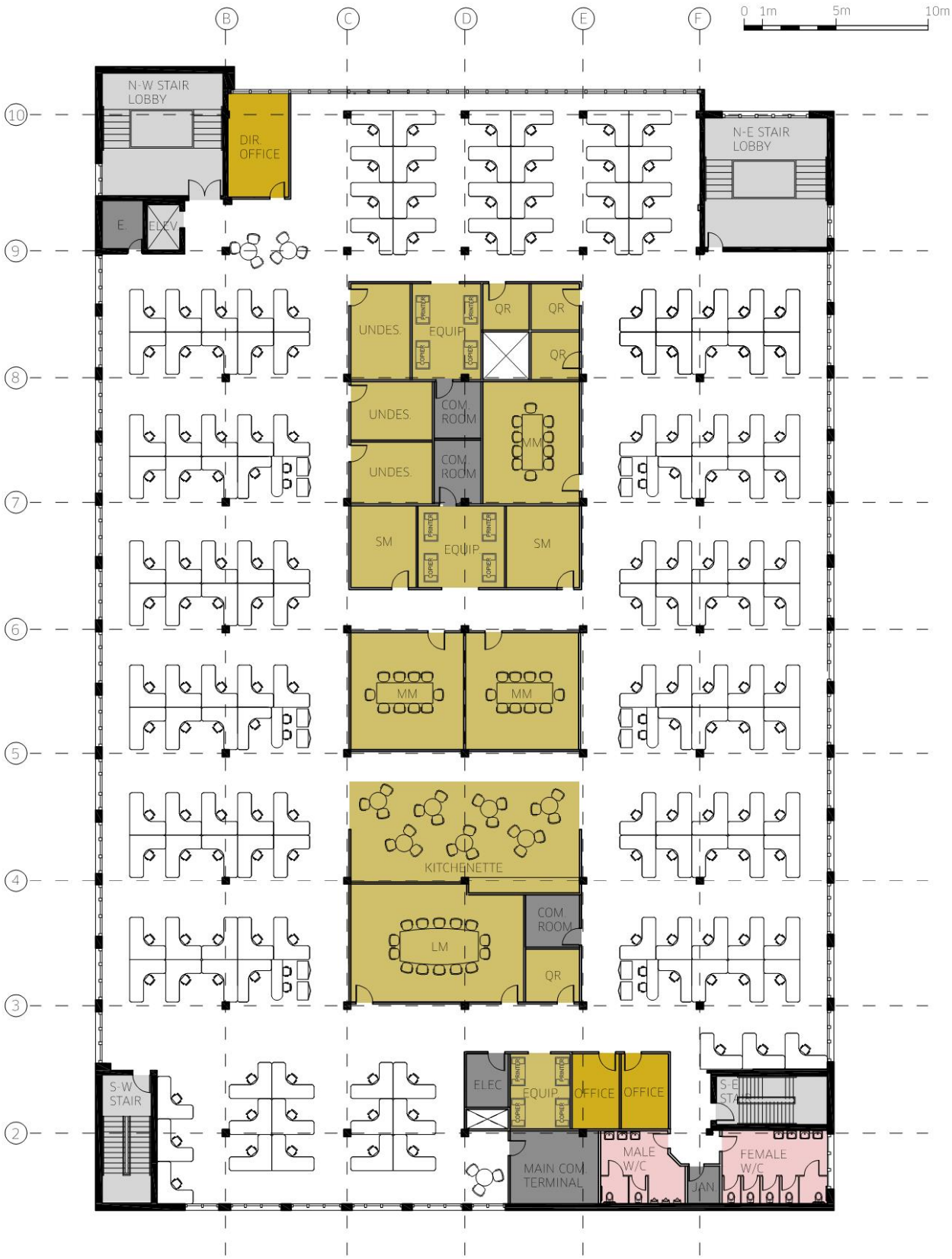


Figure 29 Option 1 – Second Floor Plan

5.11.1.2 Option 2

The second design option includes all provisions noted in Option 1, with the inclusion of a recommended additional base building alteration that would have a significant impact of both user comfort and building electricity use.

With a footprint of 61.9 m x 39.1m (203 feet x 128 feet), 441 University Avenue has a very large span between the exterior walls and building core. As a result, a very small percentage of the floor area would have access to natural lighting. To improve this deficiency, it is recommended to introduce a large skylight in the building's core, occupying two structural bays for a dimension of 12.4m x 6.4m (41 feet x 21 feet).

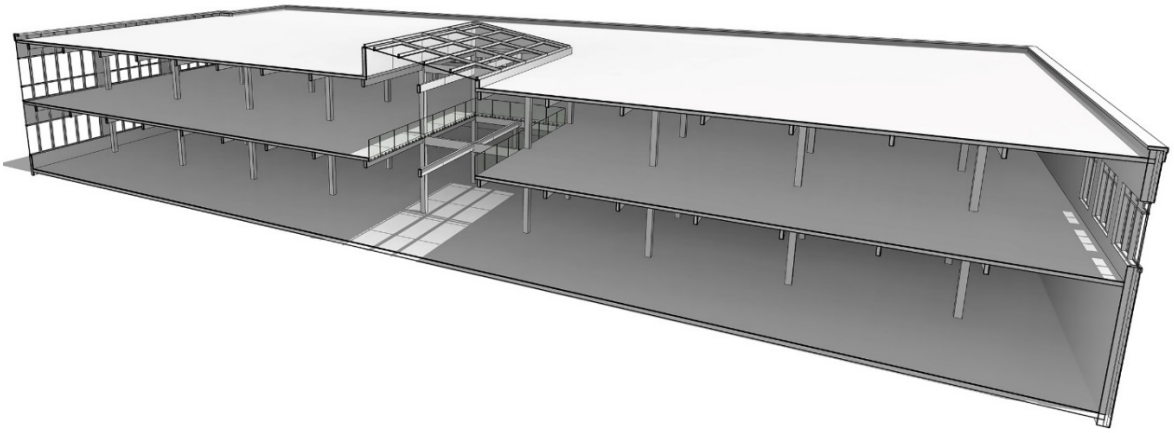


Figure 30 - Section Perspective of Skylight and Floor Opening

To maximise the benefit of the skylight throughout both floors intended for office use, it is also recommended to introduce a similarly large opening in the building's second floor. This opening would not only enable support spaces that benefit from natural light (e.g. large kitchenettes) to be conveniently located in the building's centre, it would also create a dramatic space that would add much needed character to the office environment. The following daylighting diagrams identify the significant improvement that would be made to the presence of natural light in the building's floor plate.

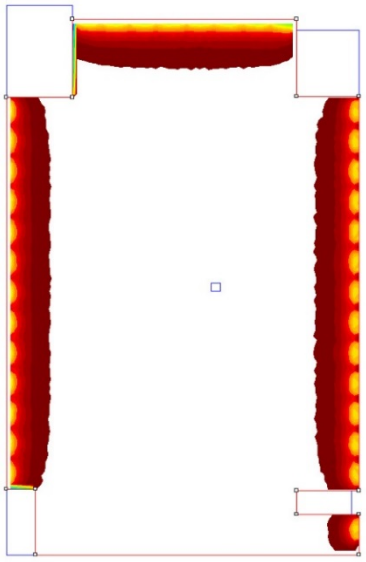


Figure 31 - Daylighting Analysis, Existing Ground FL

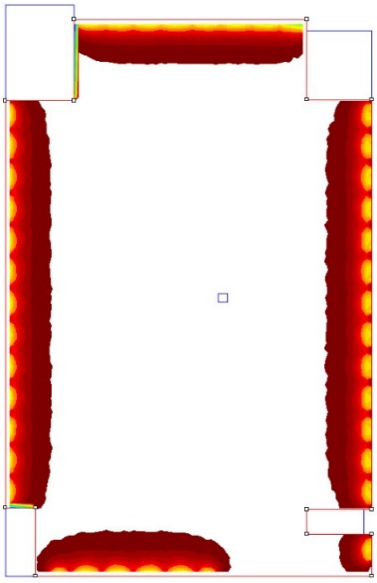


Figure 32 - Daylighting Analysis, Existing Second FL

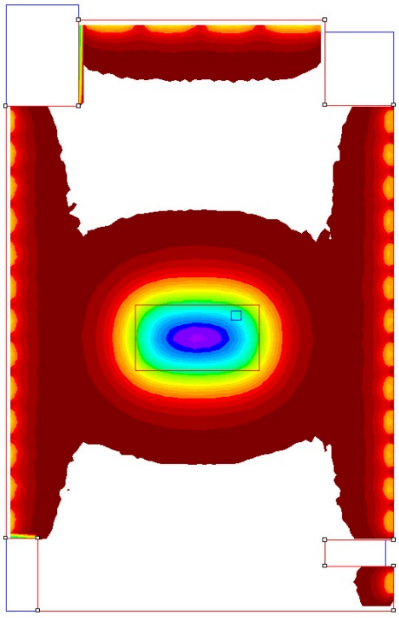


Figure 33 - Daylighting Analysis, Existing Ground FL

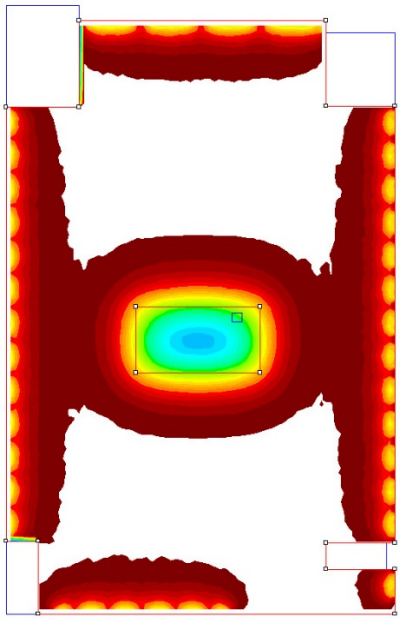


Figure 34 - Daylighting Analysis, Existing Second FL

The recommendation for the skylight addition is derived from the stipulations of the Workplace 2.0 Fit-Up Standards Section 5.1 *Planning and Workplace 2.0 Design Principles*. With the overarching goal of incorporating innovative and sustainable design principles, the section explains the following:

> *The Government of Canada encourages the use of sustainability design tools such as Leadership in Energy and Environmental Design (LEED) and Green Globes. For interior fit-ups in existing buildings, materials selection and designing for good access to daylight are key factors in a sustainable design approach. PWGSC has reviewed the Workplace 2.0 Fit-up Standards to ensure*

that they do not inhibit achieving the criteria for LEED Commercial Interiors (CI) certification. Further information on LEED is available from the Canada Green Building Council. Information on Green Globes criteria is available from the Green Globes Web site.

Though the structural system analysis in Section 5.5 references the possibility of removing the beams and purlins in the proposed roof and floor openings, a more cost effective strategy would involve retaining these glulam members as exposed structure. With some minor aesthetic refurbishment it is believed these structural members could become an attractive element to the building's proposed new focal point. The cost of this refurbishment would be approximately $264,720 above the costs of Option 1, or 2.6% of the Option 2 total cost of $9,900,500.

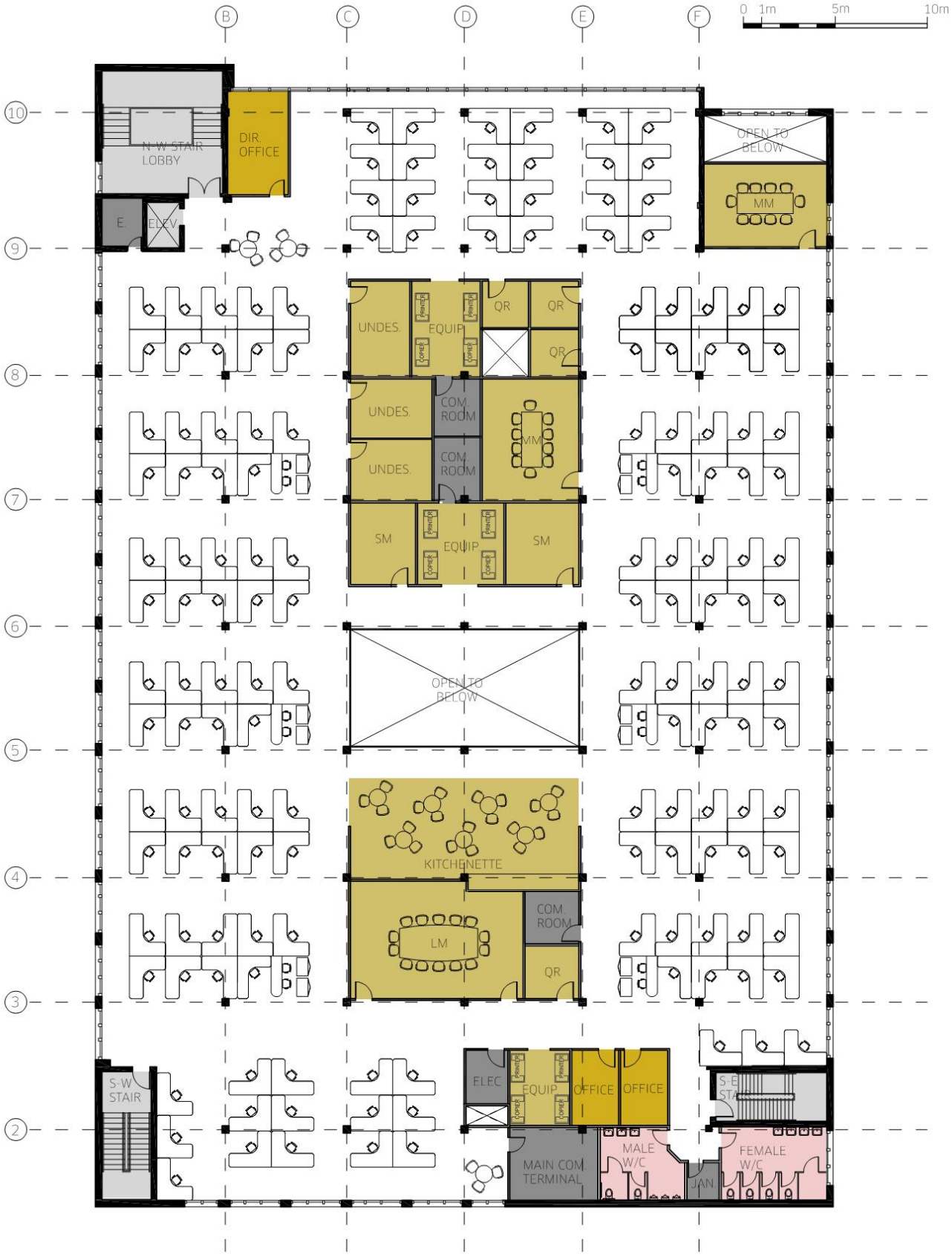
Another Option 2 recommendation is to remove the N-E stairwell and entrance lobby. While this may be considered unnecessary to achieve the project's mandate, it is viewed as a highly recommended revision for a few reasons. Currently the exterior doors are not used, and the stairwell is not required for exiting. By removing the entrance and stairwell the security concern presented by an underutilized entry can be eliminated, while the waste of energy incurred in maintaining the indoor environment of an unnecessary volume of space can be avoided. Furthermore, reclaiming the volume of the unnecessary stairwell was required to accommodate the workstation count, designated support spaces, and mandated special purpose spaces within the present building envelope. Lastly, if the stairs were not to be removed, the project would be compelled to upgrade this unnecessary stair to current the code requirements, thus incurring costs with no resultant benefit to the building. The cost of this intervention would be approximately $47,200, or 0.4% of the Option 2 total cost. Refer to Section 7 *Feasibility Budget for the GoCB Windsor* and Appendix B for more information on the costing of Option 2.

Summary of Work Included in Option 2

- All work itemized in Option 1 ($7,223,450)
- Conversion of N-E Stair into Office Support Spaces ($47,200)
- Addition of Skylight ($149,600)
- Structural Alterations for Skylight ($66,700)
- Addition of Second Floor Opening ($20,000)
- Relocation of Roof Drains and Piping to Accommodate Skylight ($48,400)

The succeeding pages illustrate the proposed architectural layout including all design recommendations provided in Options 1 through 3. Refer to the legend below for room assignments and abbreviations.


0 1m 5m 10m
VESTIBULE
N-W STAIR LOBBY
MAC. RM.
ELEV.
MM
QR
UNDES.
EQUIP.
SM
QR
COM. ROOM
QR
SM
HIGH-DENSITY MOBILE STORAGE
KITCHENETTE
COM. ROOM
LM
QR
OFFICE
OFFICE
OFFICE
EQUIP.
COM. ROOM
UNDES.
ST.
UNDES.
WILDLIFE ENFORCEMENT BRANCH
S-W STAIR
S-E STAIR


B
C
D
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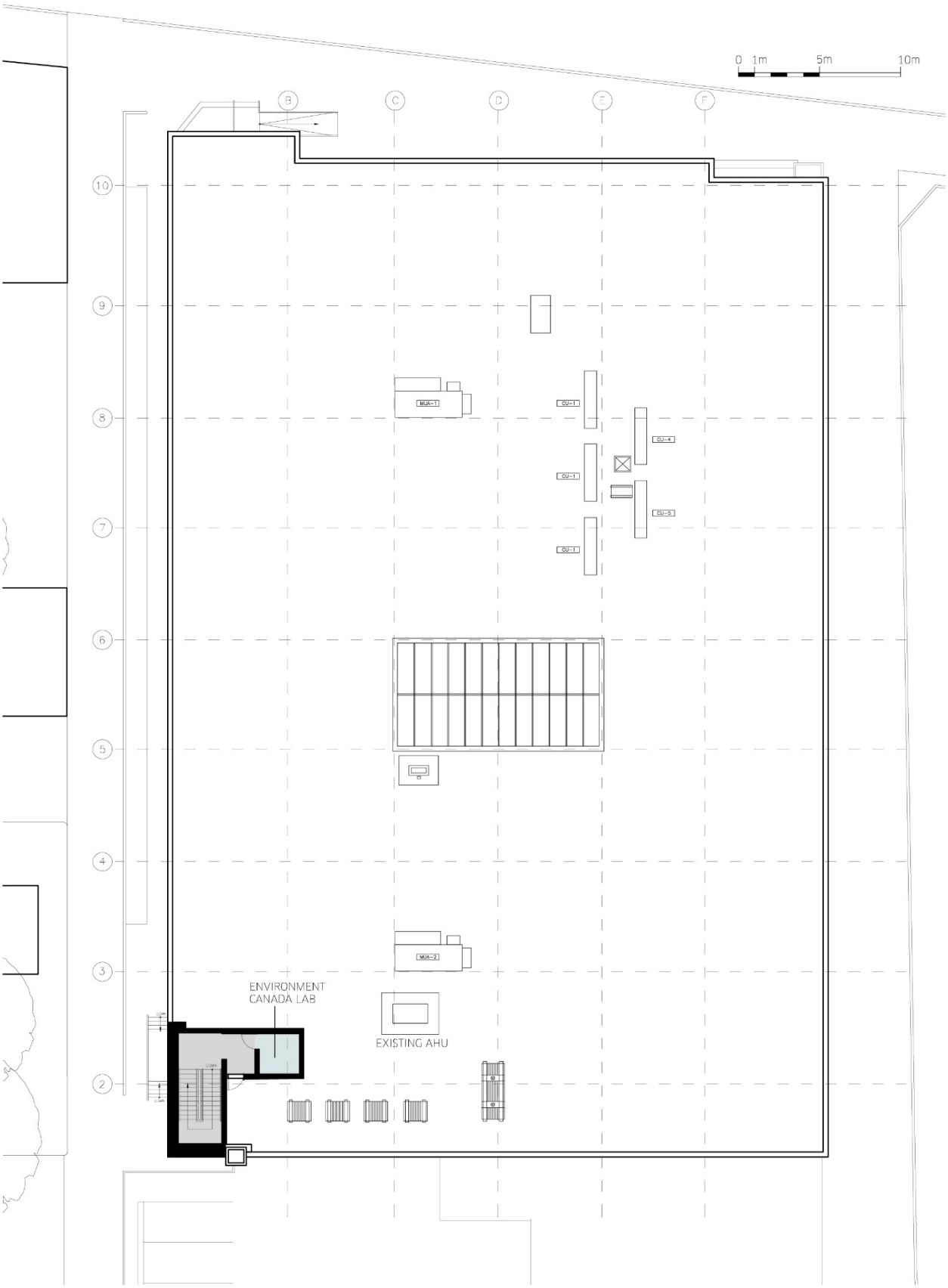
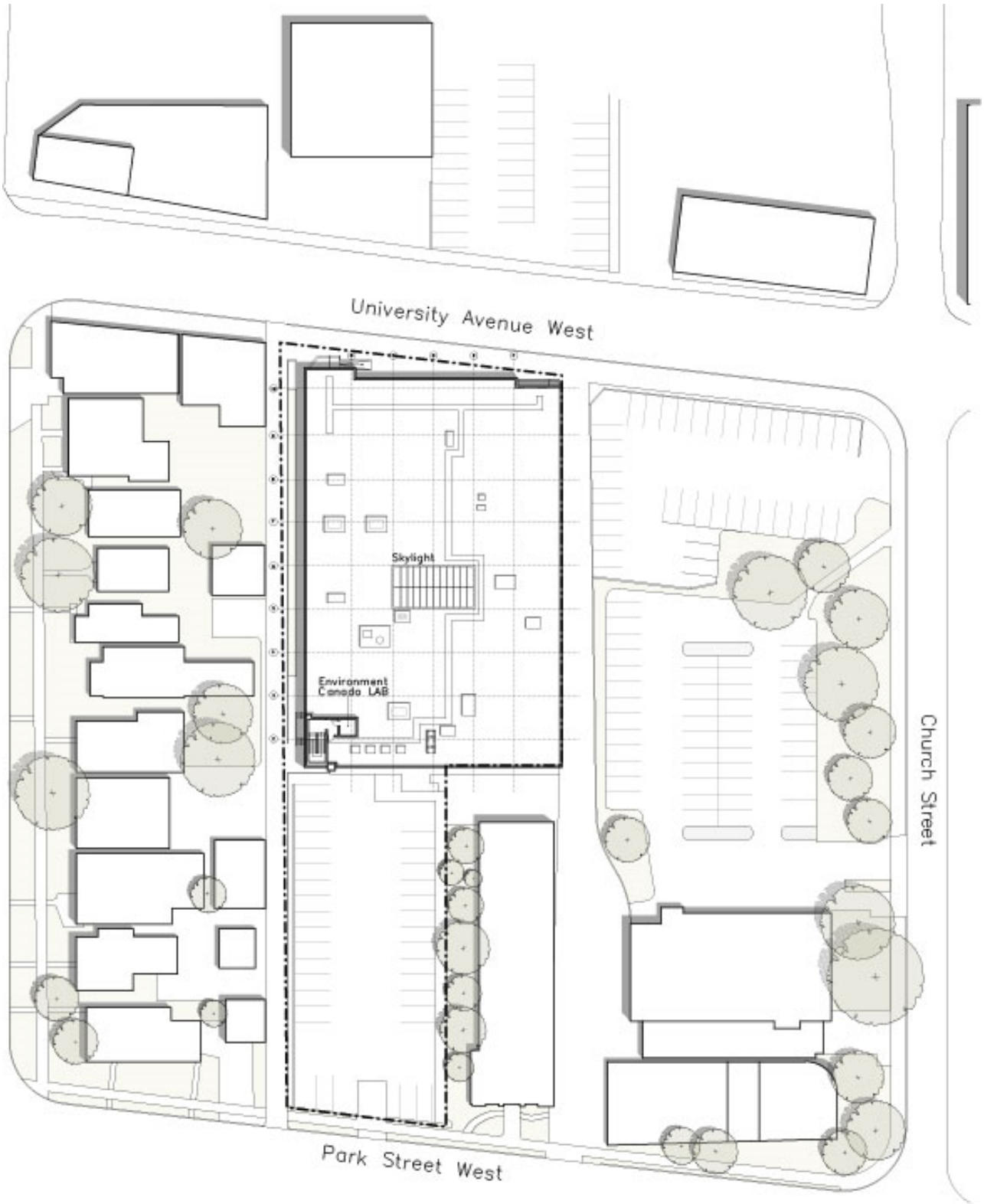
F
0 1m 5m 10m
10
9
8
7
6
5
4
3
2
N.W STAIR
LOBBY
DIR.
OFFICE
E.
ELEV.
OPEN TO
BELOW
MM
UNDES.
EQUIP.
QR
QR
QR
UNDES.
COM.
ROOM
VM
UNDES.
COM.
ROOM
SM
EQUIP.
SM
OPEN TO
BELOW
KITCHENETTE
COM.
ROOM
LM
QR
S.W.
STAIR
ELEC.
EQUIP.
OFFICE
OFFICE
S.E.
STAIR
MAIN COM.
TERMINAL
MALE
W/C
JAN.
FEMALE
W/C

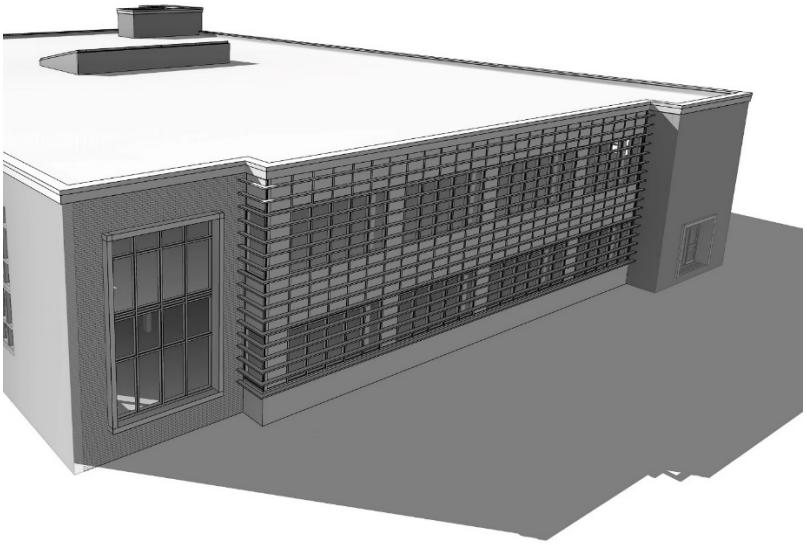

0 1m 5m 10m
B
C
D
E
F
10
9
8
7
6
5
4
3
2
MUA-1
CU-1
CU-1
CU-1
CU-4
CU-5
MUA-2
ENVIRONMENT
CANADA LAB
EXISTING AHU


University Avenue West
Skylight
Environment
Canada LAB
Church Street
Park Street West

5.11.1.3 Option 3

The final design option includes alterations to the building that correct noted deficiencies to the building envelope that will require remediation in the coming years, while also providing a significant impact on the building's presence within the neighbourhood.

As explained in Section 5.1.1, the granite and limestone panels within the centre portion of the building's north façade are displaced and damaged, with a significant number of deteriorated joints. The glazing is nearly 40 years old, and as described in Section 5.1.2 is recommended for replacement to correct both energy efficiency and security concerns. Similarly, the metal flashing and overhang projections that complete the façade are showing signs of weathering and damage, indicating they are approaching their effective life-span. Because of these deficiencies as well as its dated aesthetic, the façade reduces the impact and sense of place of the building's image to staff, users and the public in general. With the likelihood of no exterior wall modifications occurring after the tenant occupies the building, it is recommended that this refurbishment be considered for inclusion at this time.



Option 3 includes demolition and reinstatement of the north façade with a modern wall system that could implement the latest standards in sustainable design and building science. This revision would appropriately communicate the investment being made in the building's extensive renovation, and in so doing establish a new public face for the building that would last for its 25 year life cycle. This refurbishment would cost approximately $390,000, under 4% of Option 3's total cost of $10,289,800. Refer to Section 7 *Feasibility Budget for the GoCB Windsor* and Appendix B for more information.

Figure 35 Perspective of North Façade with new central façade and revised N-E Stairwell façade.

As the architectural layout of Option 2 and Option 3 are identical, refer to Option 2's layout.

Summary of Work Included in Option 3

- All work itemized in Option 1 ($7,223,450)
- All work itemized in Option 2 ($331,900)
- Revision of North Façade ($390,000)

6 Implementation and Procurement Strategy

6.1 Phasing

The GoCB Windsor currently accommodates approximately 50-60 staff of the Canada Revenue Agency (CRA) on the ground floor who occupy approximately 1,600m^2 in an open office environment. It is understood that they will vacate the building during any renovation and will be accommodated elsewhere.

The GoCB Windsor accommodates an air quality monitoring station within the building. The Analysis and Air Quality (AAQ) Branch, Science & Technology (S&T) of Environment Canada operates a laboratory in collaboration with the Ontario Ministry of the Environment (MoE). This station which has existed for over forty years operates in partnership with EC providing the facility and MoE providing the equipment and staff while both departments share the collected data.

The field lab currently occupies a 28m^2 area on the south end of the second floor as well as access to the roof where a 2m x 2m shed and miscellaneous air monitoring equipment is located. A particular feature of the monitoring station is a Plexiglas intake tube which extends from the 2nd floor laboratory area through the roof to collect air samples. The other equipment is mounted on wood pedestals on the roof.

It is understood that the location of the equipment is site sensitive as the sampling collected by the monitoring equipment must be maintained within a fifty meter radius or else the data will no longer be valid. It is understood that if the equipment is moved a transition or overlap period of six months must be provided so that the sampling from the existing site and a new site can be calibrated. It is understood that EC would like to maintain the air sampling system as part of any new renovation of the GoCB Windsor. Therefore, any relocation of the lab and rooftop equipment must be carefully orchestrated in order to maintain the accuracy of the data collection. It is proposed that a new, enclosed access stair to the roof be provided from the existing south west stair. A new 2m x 2m enclosed space with environmental controls will be constructed adjacent to the south east roof stair for the monitoring equipment and to facilitate access for Environment Canada and MoE staff. The existing exterior access stair will be removed once the new stair is completed. It is proposed that this new monitoring station and stair be constructed and commissioned as early as possible during the renovation to enable the existing space on the 2nd floor to be decommissioned and turned over for the fit-up. Environment Canada and MoE staff will access the rooftop equipment from the existing stair during the construction period.

Environment Canada's Wildlife Enforcement Branch

There is an Environment Canada Wildlife Enforcement Branch (WEB) on the Ground Floor which occupies approximately 100m^2 of space that was purpose built for them in 2009. It is proposed that they remain in the current location as the recent fit-up suits their purposes and the suite has direct access to the secure parking area required for their operations. It is understood that minor renovations to this space may be required such as re-demising some rooms and the possible inclusion of a shower space. Because this space is above the basement level, new plumbing facilities should be able to be accommodated fairly readily. The HVAC system for this suite is separate from the rest of the building and it is believed to date from 2002.

It is understood that the Wildlife Enforcement Branch expects to remain operational during a renovation. Therefore, an implementation strategy would have to be developed to accommodate them without incurring undue burden on their operational capability.

It is expected that as part of the renovation of the GoCB that a new HVAC system would be put in place for the entire building, however the unit which serves the EC WEB space will remain operational. There may be some upgrades to their suite security to make sure that it meets Enforcement Branch Directives, RCMP and Treasury Board Standards. Direct access to the secure parking would have to remain during any construction period.

As the project includes extensive renovations to the building's systems, the WEB can expect disruptions in most building services over the course of construction, most notably washroom access, heating, and electricity. The duration and severity of the impacts to WEB operations will vary according to the system being renovated. The least costly option to respond to these complications would involve scheduling a week shut-down period for the WEB where some construction activities with notable service disruptions can be scheduled to occur. If downtime is not permissible, the provision of temporary HVAC and power can be included in the specification to ensure continuity of services. With the washrooms being extensively redesigned, portable washrooms will be required during their reconstruction. Lastly, as the building will remain partially occupied during construction, all life safety systems will need to remain live throughout the course of construction.

If the Wildlife Enforcement Branch can reduce their floor area footprint, an alternate option would involve introducing a washroom within their space during the first project phase. After demolition this would allow the EC space to function as a largely self-contained unit during the full renovation work.

Project Scope Phasing

In order to meet the aggressive schedule for building occupancy, PWGSC has communicated the desire to split the project into two phases. Below is a recommendation for how the project scope could be split to accommodate this request. Please note the values shown below depict base cost only, with no allowance for General Requirements and Fees, Design & Pricing Allowances, Escalation, or costs relative to mobilization as may be incurred from splitting project scopes across two phases. Please refer to Appendix B for a detailed summary of itemized costs.

PHASE 1 ($3,888,295) [47%]

Architectural *($2,443,900)*

- Stair Guardrail Revisions
- Wall, Ceiling & Floor Demolition
- Miscellaneous Demolition
- Asbestos Abatement
- Exterior Brick Wall Refurbishments
- New Exterior/Entrance Doors
- Roof Replacement
- New Roof Penetrations
- Elevator Upgrade
- S-W Stair Extension
- New W/Cs & Kitchenettes
- Site Development
- Revision of North Façade
- Conversion of N-E Stair into Office Support Spaces
- Addition of Skylight

Structural *($175,400)*

- Structural Alterations for Skylight
- Addition of Second Floor Opening
- Upgrades for S-W Stair Extension
- Structural Modifications for RTU

Mechanical *($1,091,605)*

- Demo of existing rooftop units, AHUs, and ductwork (except RTU which serves the EC space)
- Upgrades to incoming gas service
- Installation of new rooftop make-up air units and VRF condensing units
- Installation of new rooftop exhaust fans
- Installation of main duct risers
- Installation of humidifiers
- Demo of existing boilers, radiators, vestibule heaters, and piping
- Installation of new boilers
- Installation of new hot water heating pipe risers
- Installation of new central BMS (field controllers and central workstation)
- Upgrade to incoming water service to accommodate new sprinkler system
- Installation of sprinkler risers in valve room and sprinkler branch piping to provide 'base building' coverage
- Relocation of roof drains and piping to accommodate skylight
- Repairs to storm piping as required

Electrical *($177,790)*

- All electrical demolition scope
- Basement electrical room scope including
    - New 225kva transformer
    - New 600v distribution panels for mech loads
    - New 120/208v distribution panels.
- Power connections for mech. equip, based on approximate 65% of connections

PHASE 2 ($4,360,155) [53%]

Architectural *($1,768,700)*

- New Window Coverings
- Fire Extinguishers
- High-Density Mobile Storage Unit
- Signage
- Rough Carpentry, Misc. Millwork, Misc. Specialties, & Misc. Metals ($84,800)
- New Interior Walls
- New Ceilings & Floors
- New Interior Doors
- Window Upgrade

Mechanical *($1,173, 345)*

- Installation of VRF heat pumps and associated refrigerant piping
- Installation of ductwork branches/grilles and diffusers to suit fit-up requirements
- Installation of new split AC systems to cool LAN rooms
- Installation of zone level controls (space thermostats)
- Installation of hot water piping and radiant panels
- Replacement/modification to plumbing fixtures to suit fit-up washroom and kitchenette layout
- Modification to sprinkler head arrangement to suit space fit-up requirements

Electrical *($1,418,110)*

- New 120/208V panelboards in the fit-out space and associated feeders
- Power receptacles
- Communications equipment, cabling (horizontal and backbone)
- Lighting
- Sound masking
- A/V rough-ins
- Fire alarm work

6.2 Schedule

The scheduling for the Design and Construction of the GoCB will be dependent on the methods selected to provide for Consultants and Contractors. Subsequent to the engagement of a Consultant Team it is expected that the completion of the Construction Documents would be approximately 3-4 months with 2 months for tendering through PWGSC Real Property Contracting and the Buy and Sell public tender.

A renovation of the GoCB is expected to be a six to eight month project depending on the options that are included within the scope of work and the Contractors schedule. As part of this Feasibility Study a number of design and costing options have been developed so that PWGSC and their clients will be in a position to determine how to proceed with the GoCB and over what timeline based on funding.

With any construction project there are a number of options available for undertaking the work but given the size and relative lack of complexity we would expect that it would proceed on a standard procurement. Nevertheless, the pros and cons of each will be reviewed in the sections to follow. Some of the factors which will have to be considered in order to develop the procurement strategy include:

- Maintenance of on-going operations such as Environment Canada Wildlife Enforcement Branch
- Short and long term funding for the project
- Flexibility to meet current and future needs
- Long-term operations
- Staff and User engagement

It is recommended that if PWGSC proceeds to Design and Construction of the GoCB, that a separate early tender to allow for the selective demolition of the building interiors be considered. Typically in these types of renovation projects, the removal of the existing building interiors including demising walls, ceilings and other selected finishes will allow for better pricing and reduced costs during construction due to change orders for unforeseen conditions.

6.3 Procurement Analysis

A range of procurement strategies can be considered for the GoCB. These are listed following and options with a summary of limitations and benefits associated with each.

PWGSC Managed - Design/Bid/Build

This is the traditional method used by PWGSC to obtain design and construction services. Under this type of procurement, a design firm would be retained to undertake the more detailed Design Development and Construction Document Phases for the project. Depending on the schedule developed by PWGSC, one or more tenders would be prepared and bid under the traditional Design/Bid/Build

process. It would be expected that bids from either General Contractors or perhaps pre-qualified General Contractors would be sought through a public tender and competitive bids based on the scope of work outlined in the tender documents. The successful firm would be awarded the contract to undertake the work. PWGSC would maintain control throughout the design and construction phase in accordance with current Treasury Board guidelines.

Pros

- PWGSC and their clients such as Canada Revenue Agency and Environment Canada would have input throughout the design phase
- Design would be able to adapt to changes in programming with client departments
- Design and construction firms set up in check and balance for better quality assurance
- Costs are known once bids close

Cons

- Little opportunity to accelerate the project as construction can start only after design is completed
- If undertaken as a series of contacts, each phase would be distinct with little to no interaction between firms
- No opportunity for discussion on optimal and/or innovative approaches
- Little incentive for lifecycle outcomes
- Delivery delays could lead to extra costs & funding approvals

PWGSC Managed - **Construction Management**

Under this type of procurement, a design firm would be retained to undertake the more detailed Design Development and Construction Document Phases for the project and a Construction Management (CM) firm would be engaged to provide construction oversight during the design phase and to act as a Contractor during the construction phase. The CM firm would competitively tender construction trade packages, as portions of the design are complete. This type of procurement would allow PWGSC to commence with some strategically important such as roofing or window replacement which as seasonally dependent.

Pros

- Project could be fast-tracked
- CM firms provides coordination & flexibility in contracting and procurement
- CM approach allows for overlap between design and construction
- PWGSC/CRA/EC would have design input and control
- Process offers opportunity for contractors to provide input into design phase

Cons

- Overall project costs at start only estimates and would not become fixed until the last work package has been let
- CM firms unless set up as 'CM At Risk' are not accountable for potential cost overruns
- The success of the project would be dependent on experience and skill of the CM and PWGSC oversight

A key to the successful delivery of the GoCB regardless of the procurement strategy that is chosen is selecting experienced design personnel committed to the project with an understanding of renovations and federal government requirements such as Workplace 2.0. The design team must have dedicated,

"hands-on" personnel in order to provide real-time feedback on design, cost and schedule issues as the project progresses. The project team should be able to identify the key issues such as maintaining existing spaces such as the EC WEB during a renovation and to be able to develop a range of potential solutions and quickly make decisions allowing progress to continue unimpeded. Another key component of a successful procurement strategy will be material and equipment selection to expedite the procurement of long lead items such as work stations and high density storage systems as well as available mechanical and electrical equipment in order to meet the in-service dates for the client departments.

7 Feasibility Budget for the GoCB Windsor

The Cost Estimate (Appendix B) for the Feasibility Study has been developed by Hanscomb Ltd. and is intended to provide an assessment of the total project costs associated with the Government of Canada Building Windsor, Ontario as illustrated in this Feasibility Study Report. Accordingly, the Cost Estimate should only be considered within the full context of the above noted documentation. The Cost Estimate is based on the work required to undertake the renovation of the building, as well as upgrades to the existing mechanical and electrical systems serving the building. The cost estimate are not intended to accommodate other work which is beyond the scope indicated in the plans and reviews.

Methodology

Generally, the areas of work projected by the Feasibility Study are estimated using parametric quantities and unit rates considered appropriate for a project of this scope and nature. Costs reported in these estimates provide for all base building construction and include related exterior work; allowances for Special Purpose Spaces as defined by PWGSC guidelines. Provision has also been made where appropriate for such things as building demolition, hazardous materials and designated substances removals, site access and mobilization. Premiums have been carried to cover the costs of a LEED or Green Globes industry-recognized environmental assessment tool to achieve a performance ratings.

Construction Phasing

Allowances have been made to cover premiums for maintaining some occupied spaces such as the Environment Canada Wildlife Enforcement Branch on the ground floor and early construction of the Environment Canada Air Quality Monitoring spaces on the roof level during the renovations. It should be noted that this element of planning has not yet been completely developed and will be contingent upon a more detailed consultation with the client departments at a later stage. An extended phasing of these departments or decanting to another space would have an impact on the capital costs which cannot be predicted at this time.

Cost Estimate Parameters

The Feasibility Study (Class D) cost estimate is an Indicative Estimate based on the GoCB Statement of Requirements, and with an outline of potential solutions as presented in the Feasibility Study. The estimate is used to provide an indication of final project cost and ranking of options being considered. The level of accuracy of the Class D estimate shall be such that no more than a 20% contingency is required.

Cost Considerations

All costs are estimated on the basis of competitive bids (a minimum of 6 general contractor bids and at least 3 subcontractor bids for each trade) being received in September 2015 based on a stipulated sum form of contract. Pricing shown reflects probable costs obtainable in the Windsor area on the effective date of this report and is therefore a determination of fair market value for the construction of the work and not a prediction of the final costs.

The rates in the preparation of this Cost Estimate include labour and material, equipment, subcontractor's overheads and profits. An allowance of 2.5% per year has been carried in the Cost Estimate for construction cost escalation that may occur between September 2015 and the anticipated bid date for the project. With the relatively short period to in-service occupancy assuming fall 2016

completion, no escalation during the construction period is included in the rates used in this estimate. If this period is extended beyond this timeline, a general escalation factor of 2.5-3% per annum should be considered. The costs assume that the modernization will be designed to a minimum of LEED Silver or Green Globe standard in accordance with Federal Government policy and a factor of 3% has been assigned to cover these costs if PWGSC proceeds with this methodology.

A Design and Pricing (D&P) scope allowance of 10% has been included in the Cost Estimate. This allowance is intended to inform the adequacy of construction costing data through the various stages of the more detailed design process, when all items which may impact cost estimates are identified or known. Communications infrastructure including horizontal cabling and data drops for the expected 300 staff has been included but no additional costs associated with information technology has been included. This would include computers, servers, data racks, specialized cooling, UPS and telephone systems.

Special Purpose Space costs which are attributable to the client department have been developed based on the identified occupancy and WP 2.0 Fit-Up Standards. These include walls around Collaborative Spaces, Quiet Rooms, and secure walls around High Density Mobile Storage as well as upgrades to the EC Wildlife Enforcement Branch suite and the EC Rooftop Air Quality Monitoring Station. These have been included in the Base Construction cost and a deduction shown to illustrate the costs. Allowances have been made for a standard configuration of 300 workstations, tables, high density storage systems and operable wall systems as indicated. No allowance has been made to cover construction (post contract construction PCC) unknowns. It is understood that PWGSC carries a factor of 10-15% within their project budget and it is recommended that this amount be carried for the GoCB. No allowance has been included for project ancillaries (soft costs) such as design and project management, although 20% would be a reasonable assumption.

The following items have been specifically excluded from the Feasibility Study Cost Estimate:

a) PWGSC & Clients Department staff and management expenses
b) HST or other value added taxes
c) Information technology such as UPS
d) Audio Visual, special security systems

The following is a proposed funding expenditure for the GoCB Windsor based on the options presented.

OPTION 1

1. Base Construction with SPS	$9,519,900
2. SPS Construction	$ 440,000 (To Be Deducted from Base Construction)
3. Base Construction w/o SPS	**$9,079,900**
4. FFE	$ 1,100,000

The following items could be deleted from the Base Construction costs as a saving if required

Roofing:	-$582,300
Replacement Windows:	-$336,000
Elevator Replacement:	-$105,000
Sprinkler:	-$220,500

OPTION 2

1. Base Construction with SPS	$9,900,500
2. SPS Construction	$ 440,000 (To be Deducted from Base Construction)
3. Base Construction w/o SPS	**$9,460,500**
4. FFE	$ 1,100,000

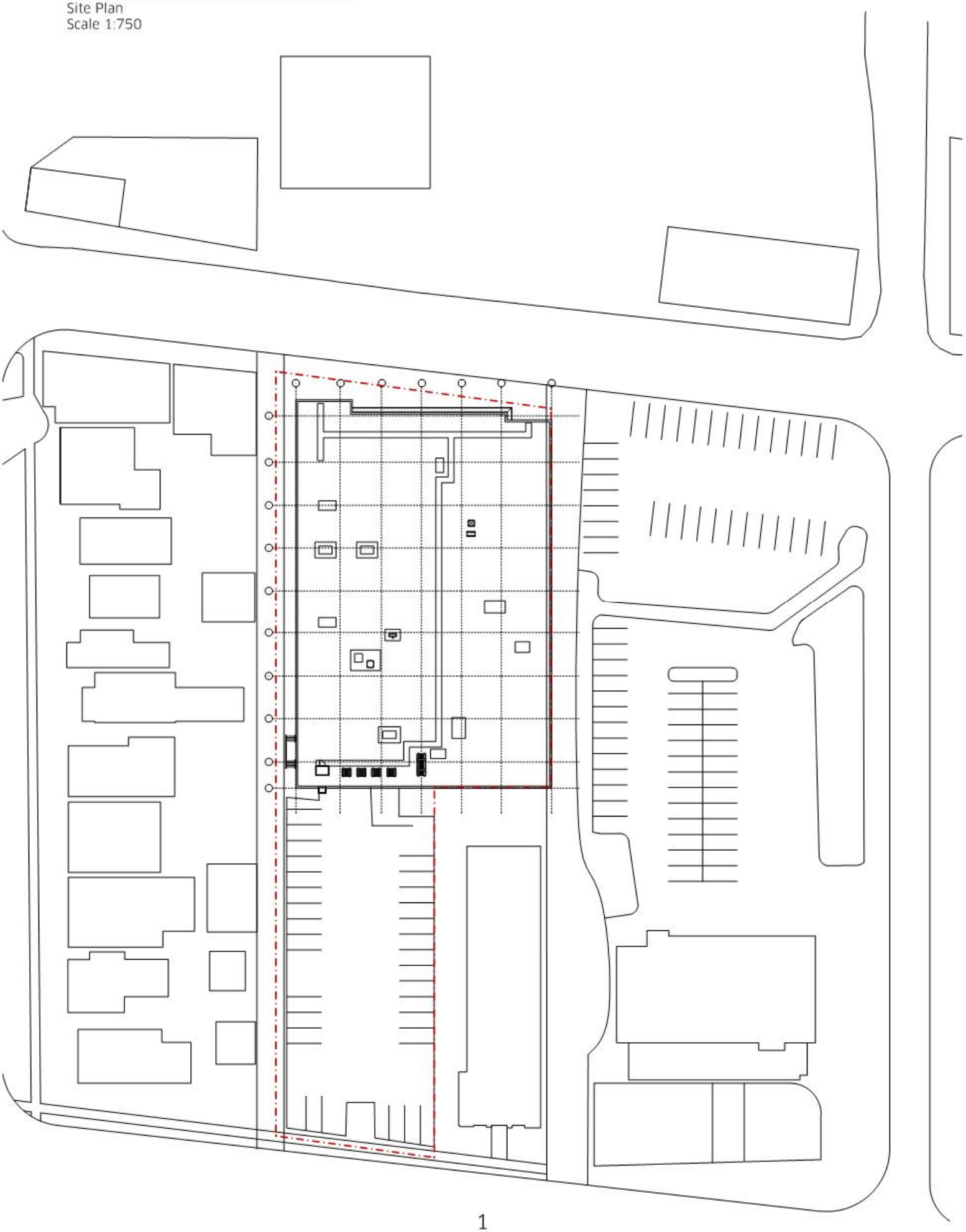
OPTION 3

1. Base Construction with SPS	$10,289,800
2. SPS Construction	$ 440,000 (To be Deducted from Base Construction)
3. Base Construction w/o SPS	**$9,849,800**
4. FFE	$ 1,100,000

441 University Ave W. Windsor, ON

Site Plan

Scale 1:750



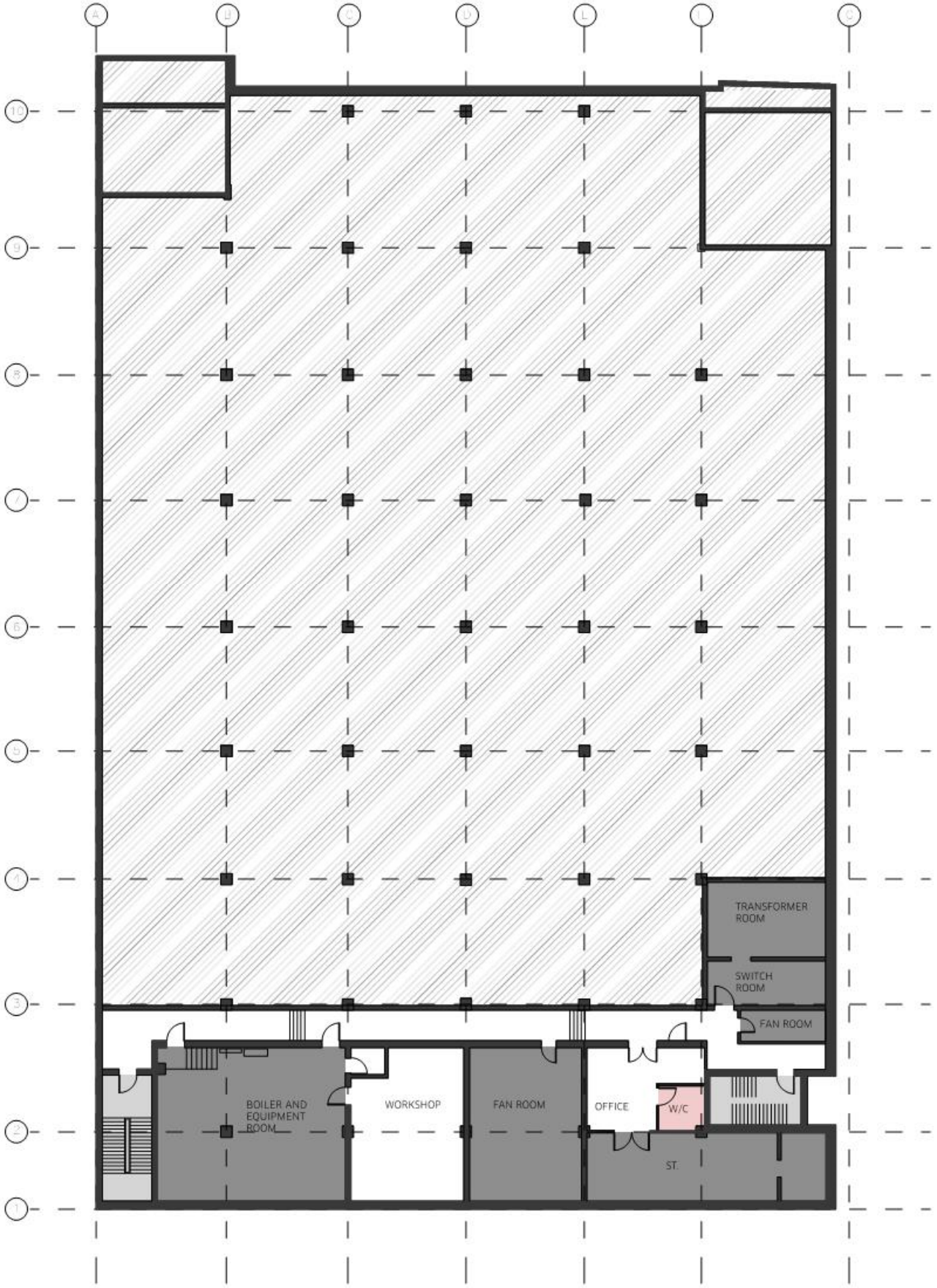
441 University Ave W. Windsor, ON

Basement Plan

Scale 1:300

Vertical Circulation
Washrooms
Service Room
Unexcavated

ST. - Storage
V. - Vent
M. - Mechanical
E. - Electrical



441 University Ave W. Windsor, ON

Ground Floor Plan
Scale 1:300

Vertical Circulation
Washrooms
Service Room
Office Support

ST. - Storage
V. - Vent
M. - Mechanical
E. - Electrical

441 University Ave W. Windsor, ON

Second Floor Plan
Scale 1:300

Vertical Circulation
Washrooms
Service Room
Office Support

ST. - Storage
V. - Vent
M. - Mechanical
E. - Electrical

441 University Ave W. Windsor, ON

Roof Plan
Scale 1:300