Public Works and Government Services Canada
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Environment Canada

CANADA CENTRE FOR INLAND WATERS (CCIW)

Burlington, Ontario

Prepared by:
Maintenance Management Services
PWGSC/RPB/PTP
Ontario Region
September 2009

Canada

Environment Canada

CANADA CENTRE FOR INLAND WATERS (CCIW)

Burlington, Ontario

LEVEL 2 (Life Cycle)
BUILDING CONDITION REPORT

September 2009

FACILITY INTRODUCTION

To whom it may concern,

In response to a request received from EC's Manger of Quality Systems and Science Interface (QS&SI), Cynthia Young, PWGSC's Maintenance Management Services has conducted a Level 2 assessment of Environment Canada's Canada Centre for Inland Waters (Burlington, ON).

The completed reports, with commentary on the need for a repair/replacement program, complete with related costs and priorities, were commissioned to assist with both short and long term facility planning.

The on-site inspection team consisted of:

- Architectural — Colin P. Erwin, MMS, Architectural
- Mechanical (initial) — Joseph DiGiacomo, MMS, Mechanical
- Mechanical (final) — Dan Burlac, MMS, Mechanical
- Electrical — Mark J. Beaulieu, MMS, Electrical
- Life Safety Systems — T.D. (George) vanMierlo, MMS, Life Safety Systems

Present with the inspection team were EC's Dave Gamauche (Manager, Building & Property Technical Services) , Janna Stasiak (Sr. Facilities Technician), and Goeoff Stemble (Sr. Facilities Technician) to whom thanks is given for their assistance and cooperation in providing access and information.

Information on Vertical Transportation was prepared previously by former MMS team member Jay Shields (now retired) after conduction a visit of the site in August 2008.

The Canada Centre for Inland Waters (CCIW) consists of several buildings occupying 41 ha site of reclaimed land located at the western end of Lake Ontario (within Hamilton Harbour/Burlington Bay) in Burlington, ON. Constructed in stages throughout the early-1970's, the facility is Canada's largest freshwater research facility, providing both EC and DFO with shared facilities for environmental research and development, resource management and navigational charting.

EC is the 'Custodial Department' of the CCIW, and self-manages the facility.

The main buildings included within the scope of this report are identified as follows:

- NWRI Building (including Property/Site).
- WTR Building.
- Annex Building.

Separate reports have been prepared for each of the above noted buildings, however the detailed assessment of site elements for the entire facility has been included with the report for the 'NWRI Building'.

Regards,

Maintenance Management Services (MMS).

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EXECUTIVE SUMMARY

ES.1 General

An inspection of the three (3) Environment Canada (EC) buildings, located at the Canada Centre for Inland Waters (Burlington, ON) was carried out through September/October 2009. Subsequently, unforeseen circumstances necessitated replacement of the initial mechanical resource and an additional inspection of the facility was necessary in January 2010. The inspection team was in contact with EC's Manager of Quality Systems and Science Interface (QS&SI), Cynthia Young, who commissioned this report to assist with both short and long term facility planning.

The on-site inspection team consisted of:

- Architectural — Colin P. Erwin, MMS, Architectural
- Mechanical (initial) — Joseph DiGiacomo, MMS, Mechanical
- Mechanical (final) — Dan Burlac, MMS, Mechanical
- Electrical — Mark J. Beaulieu, MMS, Electrical
- Life Safety Systems — T.D. (George) vanMierlo, MMS, Life Safety Systems

Present with the inspection team were EC's Dave Gamache (Manager, Building & Property Technical Services), Janna Stasiak (Sr. Facilities Technician), Geoff Stemble (Sr. Facilities Technician), and Rod Khaled (Facility Technician) to whom thanks is given for their assistance and cooperation in providing access and information.

Information on Vertical Transportation was prepared previously by former MMS team member Jay Shields (now retired) after conducting a visit of the site in August 2008.

Additional 'in-house' assistance was provided by:

- Yvonne M. Rizzi

ES.2 Mandate

To identify and describe existing building systems, assess their current condition and provide commentary on the need for a maintenance and repair/replacement program, with related costs and priorities. It is not intended to 'upgrade' or 'modernize' the building to a higher level to match the standards found in a newer facility.

- Provide recommendations to ensure that the structure and its systems will reach their maximum life expectancy and maintain the required levels of health and safety.
- Recommend further engineering studies where the cause, extent and/or remediation method required for identified deficiencies cannot be determined visually.
- Identify areas where the building does not comply with current code requirements. Some of these items are a result of continuing changes to the codes since the original design/construction of the building.

ES.3 Facility Description

Established by the government of Canada in 1967, the Canada Centre for Inland Waters (CCIW) is located at the western end of Lake Ontario (within Hamilton Harbour/Burlington Bay) in Burlington, ON. The facility consists of several buildings occupying a 41 ha site of reclaimed land, bordered to the east by the 'beachstrip' and Lakeshore Road/Eastport Drive, to the south by the Burlington canal, and to the west and north by the harbour/bay.

Constructed in stages throughout the early 1970's, the CCIW is Canada's largest (and one of the world's leading) freshwater research facility, providing both EC and DFO with shared facilities for environmental research and development, resource management and navigational charting. Canadian and international scientists at CCIW play a critical role in providing the knowledge necessary for the management of the great lakes and other aquatic ecosystems, as well as finding ways of sustaining our freshwater ecosystems. Through ecosystem-based research, the NWRI draws from its scientific knowledge to develop government policies and programs, for public decision-making, and to aid in identifying environmental problems.

For EC, the CCIW houses the central facilities of the National Water Research Institute (NWRI) which focuses on aquatic research and development, as well as other EC programs, including the Ecosystem Monitoring and Assessment Network (EMAN) coordinating office; Ontario regional offices of EC (including those related to Great Lakes and meteorological programs); the Wastewater Technology Centre (WTC), specializing in the advancement of environmentally friendly chemistry technologies as well as technologies for the treatment of municipal and industrial wastewater; and the Global Environment Monitoring System (GEMS)/Water Collaborating Centre.

For the DFO, the CCIW houses the Bayfield Institute, a national centre of expertise in aquatic biology, freshwater fisheries and navigational charting. The institute comprises the Great Lakes Laboratory for Fisheries and Aquatic Sciences (GLLFAS), which, together with a satellite laboratory in Sault Ste. Marie (ON), the Freshwater Institute in Winnipeg, Manitoba, and multiple partnerships with a variety of external stakeholders, provides the federal Fisheries and Oceans Science programs for the Central and Arctic Region, and allows the Institute to be recognized internationally as a site of leading research in freshwater science; and the Central and Arctic region's headquarters of the Canadian Hydrographic Service (CHS), conducting hydrographic surveys for the production of navigational charts and related publications for the Arctic Ocean, Hudson and James Bays, the St. Lawrence River, the Great Lakes, and many navigable inland waters in Ontario, Manitoba, Saskatchewan, Alberta, the Northwest Territories and Nunavut.

EC is the 'Custodial Department' of the CCIW, and self-manages the facility.

The main buildings included within the scope of this report are all located within the building compound, and are typically identified as follows:

- NWRI Building - a multi-storey, heated structure, constructed in stages throughout the early 1970's and comprised of 5 separate structures, as follows: *Administration & Laboratory* (a 7-storey structure housing the main facility entrance, administrative offices, cafeteria/kitchen, auditorium, library, offices and laboratories, with an enclosed 2-storey area interconnecting the A&L, R&D, Hydraulics Lab and Warehouse structures), *Research & Development* (a 2-storey structure housing offices and laboratories/workshops), *Hydraulics Lab* (a 2-storey structure housing laboratories and offices), *Warehouse* (a 2-storey structure housing workshops, storage areas, shipping/recieving areas, offices and laboratories), and the *Boiler Plant* (a 1-storey structure with 2 mezzanine areas housing the main heating equipment for the entire facility).

- WTC Building - a two-storey, heated structure, originally constructed in 1971 with an addition (east side) in 1995, currently housing offices and laboratories/ workshops.
- Annex Building - a two-storey, partially heated structure, originally constructed in 1988 with a partial 2nd storey added in 1991, currently housing offices and storage areas.

ES.4 Facility Condition

The inspection has determined the facility to be in good condition as follows:

NWRI Building -

- ARCHITECTURAL/STRUCTURAL - While many of the architectural/structural elements are considered to be in fair overall condition, with only minor repairs and ongoing maintenance required to ensure continued satisfactory performance for the next 25 years, several significant components are considered to be nearing/at the end of their effective service life (including exterior sealants, roofing, flooring and interior fitments), with recommended life cycle replacements/refurbishments to begin in the short-term, and continuing over several years.
- VERTICAL TRANSPORTATION - The passenger elevators, freight elevators, and the dock levellers are considered to range from good to fair overall condition, and with ongoing maintenance, should continue to perform satisfactorily for the next 25 years.
- MECHANICAL - Mechanical systems in the Main Building are considered to be in good to fair condition. In keeping with normal recommended maintenance schedules, practices and procedures, it is anticipated that the systems will perform to their intended function, with limited risk of catastrophic system failure. Little information on the past maintenance history of the systems was obtained, however, it is recommended that a complete detailed and monitored maintenance program be implemented in the near future to ensure efficient system operation.
- ELECTRICAL - Most electrical elements are considered to be in fair overall condition, with only minor repairs/replacements and ongoing maintenance required to ensure continued performance for the next 25 years. It is recommended that all listed corrections and improvements be implemented as per this report.
- PROPERTY/SITE - Most property/site elements are considered to be in fair overall condition, and with minor repairs and ongoing maintenance, should continue to perform satisfactorily for the next 25 years, with only life cycle replacement of components anticipated. The exception is the pavements, which are recommended for phased replacement beginning in the short-term, but will deteriorate prematurely and suffer reduced effective service lives if preventative maintenance actions are not performed.

- BUILDING AND OCCUPANT FIRE SAFETY - Overall, the building's fire protection, fire prevention and life safety systems identified later in this report are considered to be in fair condition. After evaluation of all available testing and inspection records, emergency planning documentation and site verification, several fire protection, fire prevention, life safety system and/or Canadian Occupational Safety and Health Regulations (COSHR) for building fire safety was found to be non-compliant pertaining to testing, maintenance and/or inspection. A comprehensive inspection and testing program must be established and maintained which incorporates every installed fire protection system, life safety equipment and COSHR requirements.

<u>WTC Building</u> -

- ARCHITECTURAL/STRUCTURAL - Most architectural/structural elements are considered to be in fair overall condition, and with minor repairs and ongoing maintenance, should continue to perform satisfactorily for the next 25 years, with only life cycle replacement of components anticipated, the exception being the exterior sealants, which are considered to be at the end of their effective service life and are recommended for replacement in the short term.
- VERTICAL TRANSPORTATION - The passenger elevator is considered to be in fair overall condition, but is approaching the end of its effective service life, with modernization recommended for just beyond the short-term.
- MECHANICAL - Mechanical systems in the WTC building are considered to be in fair overall condition. In keeping with normal recommended maintenance schedules, practices and procedures, it is anticipated that the systems will perform to their intended function, with limited risk of catastrophic system failure. Little information on the past maintenance history of the systems was obtained; however, it is recommended that a complete detailed and monitored maintenance program be implemented in the near future to ensure efficient system operation.
- ELECTRICAL - Most electrical elements are considered to be in fair overall condition, with only minor repairs/replacements and ongoing maintenance required to ensure continued performance for the next 25 years. It is recommended that all listed corrections and improvements be implemented as per this report.

<u>Annex Building</u> -

- ARCHITECTURAL/STRUCTURAL - Most architectural/structural elements are considered to be in fair overall condition, and with minor repairs and ongoing maintenance, should continue to perform satisfactorily for the next 25 years, with only life cycle replacement of components anticipated.
- VERTICAL TRANSPORTATION - Not applicable to this structure.
- MECHANICAL - Mechanical systems in the Annex building are considered to be in fair overall condition. In keeping with normal recommended maintenance schedules, practices and procedures, it is anticipated that the systems will perform to their intended function, with limited risk of catastrophic system failure. Little information on the past maintenance history of the systems was obtained; however, it is recommended that a complete detailed and monitored maintenance program be implemented in the near future to ensure efficient system operation.
- ELECTRICAL - Most electrical elements are considered to be in fair overall condition, with only minor repairs/replacements and ongoing maintenance required to ensure continued performance for the next 25 years. It is recommended that all listed corrections and improvements be implemented as per this report.

HERITAGE - This facility has not yet been reviewed by the Federal Heritage Building Review Board (FHBRO) through Canadian Heritage. As the maximum age for review is 40 years, a request for review of the 'NWRI Building' and 'WTC Building' should be made as soon as possible, with no interventions carried out until a review has been completed. Requests for review for the 'Annex Building' should be made not later than 2028.

ACCESSIBILITY - While various projects have been carried out to address barrier-free design throughout this facility, it is not fully compliant with current accessibility standards. A recently completed Accessibility Audit (see 'Appendix E - Accessibility Audit') outlines details, including identified deficiencies with parking, walkways, entrances, elevators and stairs, washrooms, tactile signage and 'public' areas when assessed against both the 1995 and 2004 editions of CAN/CSA-B651.

ENVIRONMENTAL - Given the age of the facility, it is likely that building materials and equipment contain hazardous substances. Several suspect materials were observed on-site. It is recommended that all existing environmental information be collected and reviewed to determine what actions, if any, are required, and to ensure that all persons are aware of any possible exposure.

ES.5 Recommended Expenditures

The total estimated Short Term Expenditure (1 to 5 years) cost for this facility is **$9,875,270**, as outlined below:

NWRI Building	$9,365,770
WTC Building	$408,000
Annex Building	$101,500
Short Term Total	$9,875,270

The total estimated Long Term Expenditure (6 to 25 years) cost for this facility is **$13,433,470**, as outlined below:

NWRI Building	$11,897,470
WTC Building	$1,316,000
Annex Building	$220,000
Long Term Total	$13,433,470

Costs indicated are Class "D" (preliminary) estimates, expressed in year 2009 constant dollars (escalation factors not included) and provide an indication (rough order of magnitude) of the project construction. Cost estimates in this report are based on information found within published estimating manuals (RS Means, Yard-sticks for Costing), historical cost data for similar work in the geographic area, general cost information from material/equipment manufacturers and contractors, and past experiences involving similar work.

ES.6 Additional Costs

Costs indicated do **NOT** include any project related “SOFT” costs, including but not limited to, **design, supervision, contingencies, commissioning, project management, consultant fees, moving costs, insurance, bonding, swing space, premium time or applicable taxes**. All Class “D” estimates provided in this report should be verified prior to project implementation.

ES.7 Strategic Planning

Priorities and time frames for recommendation(s) put forward in this report have been determined on an individual (item by item) basis for preliminary planning purposes only. It is recommended that project work from this BCR and or other sources be reviewed in order to identify potential items that can be consolidated for greater value (cost, scope, complexity). The intent is also to avoid repeat work as well as to achieve enhanced savings in time and cost, and to reduce inconvenience or disruptions to occupants.

INTRODUCTION

I.1 Background

In response to a request received from EC's Manager of Quality Systems and Science Interface (QS&SI), Cynthia Young, PWGSC's Maintenance Management Services has conducted a Level 2 Building Condition Inspection of Environment Canada's Canada Centre for Inland Waters (Burlington, ON), with commentary on the need for a repair/replacement program, with related costs and priorities.

I.2 Scope

Maintenance Management Services has assembled a multi-discipline team to review and analyze all existing information in the form of reports, as-built drawings and manuals, conduct on-site inspection, interview building maintenance staff and client representatives in order to provide a comprehensive report on the building systems.

I.3 Cost Estimates

Costs indicated are Class "D" (preliminary) estimates, expressed in year 2009 constant dollars (escalation factors not included) and provide an indication (rough order of magnitude) of the project construction. Cost estimates in this report are based on information found within published estimating manuals (RS Means, Yard-sticks for Costing), historical cost data for similar work in the geographic area, general cost information from material/equipment manufacturers and contractors, and past experiences involving similar work.

Also, the costs indicated do **NOT** include any project related "SOFT" costs, including but not limited to, **design, supervision, contingencies, commissioning, project management, consultant fees, moving costs, insurance, bonding, swing space, premium time or applicable taxes.** All Class "D" estimates provided in this report should be verified prior to project implementation.

I.4 Priority of Work

The Priority of Work is time related with consideration given to the life cycle of the component.

MANDATORY (Man.):
Mandatory items should typically be done on an urgent basis or within a year, or with consideration given to the life cycle of the component (e.g., to meet life safety regulations, building codes or other applicable standards).

CYCLICAL (Cyl.):
Cyclical items should typically be done within 1 to 5 years, again with consideration given to the life cycle of the component (e.g., component or system replacement) in order to extend the useful life of the building.

OPTIONAL (Opt.):
Optional items should typically be done within 5 years or more, but again with consideration given to the life cycle of the component (e.g., component or system updating) in order to upgrade and add capital value to the building and/or to enhance or maintain design standard/ market value. The replacement time frames normally do not have a direct effect on the operation of the building.

I.5 Project Priority System

As per the Project Priority System, priority ratings are explained below:

PRIORITY A - (Emergency) A deficiency or condition which has already occurred and has already or will shortly result in the shutdown of a building/support system.

Examples:
1) *Labour or Building Code requirements not being met.*
2) *Critical building system has become inoperative.*

PRIORITY B - Priority B projects are priority A type emergencies that have not yet occurred but could at any time.

B1 - Health and Safety - A deficiency that poses an imminent risk to health and/or safety if left uncorrected.

B2 - Operational Efficiency - A condition which threatens operational objectives and results in for Real Property's tenants incurring productivity losses which outweigh the cost of the project.

B3 - System Integrity - A condition which will result in the shutdown of a critical support system of a building, if left uncorrected this fiscal year.

PRIORITY C - A condition/deficiency which is not yet a priority B but, if left uncorrected next fiscal year, may result in regulatory violations, operational inefficiencies and increased costs. Corrective action would demonstrate prudence and due diligence.

C1 - Health and Safety - A deficiency which poses a potential threat to health and safety if left uncorrected.

C2 - Operational Efficiency - A deficiency which hampers operational efficiency if left uncorrected.

C3 - System Integrity - A condition which will result in increasing costs if left uncorrected.

PRIORITY D - A deficiency which requires repair or replacement but does not threaten building systems, operations or health and safety. Action should be taken where funding can be made available.

D1 - Asset Maintenance

D2 - Appearance/Image

D3 - Other

PRIORITY X - This priority is for projects for which the key factor is a significant financial benefit to Real Property.

X1 - Return within one year

X2 - Return within two years

X3 - Return within three years or more

I.6 Definitions

The following is an interpretation of common terms used in the report and the Summary of Recommended Expenditures:

Repair (R):
An estimated dollar value applied to a building element or building system to perform normal regular scheduled superficial maintenance practices and repairs. The intent is to provide a minimum level of maintenance in order for the building or building system to operate and perform suitably through a typical effective life cycle.
Also covers engaging the service of a consultant to conducting an engineering study/analysis of specific portion(s) of the building system(s) to troubleshoot and seek best method(s) for remedial actions, upgrades, refits and/or replacements to extend the life of the facility, or to increase tenant comfort.

Capital (C):
An estimated dollar value applied as an investment into a building or portion of the building system for upgrade, refit and/or replacement to extend the life of the facility, or to increase tenant comfort.

Good:
Where the condition of the building requires little or no investment required to the structure, building envelope and related electrical/mechanical systems to life cycle the existing building for 20 years. Most Building Code requirements and Health and Safety issues have been addressed. Very low maintenance/repair costs usually reflect this condition.

Fair:
Where the condition of the building requires a limited cost investment applied to the structure, building envelope and related electrical/mechanical systems to life cycle the existing building for an additional 20 years. Investment may be offset beyond the 5 year time period and applied to the 6 - 10 or the 11 - 15 year time periods. Lower maintenance/repairs expenses also reflect this condition.

Poor:
Where the condition of the building requires a substantial investment applied to the structure, building envelope and related electrical/mechanical systems in the immediate future (1 to 5 years) and to address Building Code requirements, replacement and/or upgrade of building systems to comply with current regulations, Health and Safety issues and deficiencies in the normal operations of the buildings to life cycle the existing building for an additional 20 years. Higher maintenance/repair expenses also reflect this condition.

I.7 References

The following reference materials have been used in this survey and preparation of recommendations:

Codes
- Canada Labour Code, Part II (CLC), R.S., 1985, c. L-2.
- Canada Occupational Health and Safety Regulations (COHSR), SOR/86-304.
- National Building Code of Canada (NBC), Twelfth Edition, 2005.
- Ontario Building Code (OBC) 1997
- National Fire Code of Canada (NFC), Eighth Edition, 2005.
- Ontario Fire Code (OFC) 1997.
- National Plumbing Code of Canada (NPC), Eighth Edition, 2005.
- Canadian Electrical Code, Part 1 (CEC), 21st Edition, 2009.
- Ontario Electrical Safety Code, 24th Edition, 2009.
- National Fire Protection Association (NFPA).

Legislation, Regulations, Polices & Guidelines
- Federal Real Property and Federal Immovables Act
- Federal Real Property Regulations

Treasury Board of Canada Secretariat (TBS):
- Policy on Management of Real Property
- Guide to the Management of Real Property
- Policy on Long-term Capital Plans *(to be replaced April 1, 2011 by the Policy on Investment Planning)*
- Treasury Board Real Property Investment Policy
- Treasury Board Heritage Buildings Policy
- Boiler and Pressure Vessels Directive (Chapter 2-1).
- Fire Protection Services (Chapter 3).
- Treasury Board Real Property Accessibility Policy.
- Guide to the Monitoring of Real Property Management (Chapter 2-3).
- Federal Identity Program.
- Federal Identity Program Manual.

Standards
- CAN/CSA-B651-04 Accessible Design For The Built Environment.
- CAN/CSA C282-M89, Emergency Electrical Power Supply for Buildings.
- CAN/CSA - B44-85, Safety Code for Elevators.
- CAN/ULC - S536-97, Standard for the Inspection and Testing of Alarm Systems.
- CAN/CSA Standard Z94.4-93, Selection, Use and Care of Respirators.
- CAN/CSA - B51-97, Boiler, Pressure Vessel and Pressure Piping Code.
- CAN/CSA - B52-99, Mechanical Refrigeration Code.
- ANSI Standard Z358.1-1998, Standard for Emergency Eyewash and Shower Equipment.

Reports
- None.

Drawings
- Reference drawings (small scale - floor plans, no date, (EDRM various numbers).
- 'As-Built' drawings - partial set (EDRM various numbers).

Other
- Guidelines for Canadian Drinking Water Quality.
- Treasury Board of Canada Secretariat; Directory of Federal Real Property (DFRP), Property:Parcel Number 10251:00 http://publiservice.tbs-sct.gc.ca/dfrp-rbif/property-bien.asp?Language=EN&PN=10251&PPN=00

I.8 Average Useful Life

The following list of systems/components and average useful life years (extracted from PWGSC's 'Capital Asset Planning System (CAPS)' is based on regular preventive maintenance, properly performed at prescribed frequencies. Many factors can affect the average useful life, however, this list serves as a basis for future planning:

Site Improvements	
Area Lighting	20 Years
Area Posts/Bollards	40 Years
Concrete Wall	50 Years
Fence & Gates	20 Years
Flagpole	25 Years
Masonry Wall	35 Years
Monuments, Fountains & Artwork	25 Years
Stone Wall	40 Years
Planters	25 Years
Signage	15 Years
Site Furnishings	20 Years
Slope Protection	60 Years

Site Related Stairs, Plazas & Decks	
Bleachers	15 Years
Handrails & Railings - Site Related	20 Years
Ramps - Site Related	25 Years
Stairs - Site Related	25 Years
Wood Deck	15 Years

Retaining Walls	
Concrete Reinforced Retaining Wall	40 Years
Concrete Pavers Retaining Wall	20 Years
Gabion Retaining Wall	40 Years

Interior Construction - Special Partitions	
Copper Lined Partition	75 Years
Lead Lined Partition	75 Years
Wood Panel Partitions	20 Years

Interior Construction - Interior Doors & Screens	
Glass Doors	30 Years
Aluminum Doors	60 Years
Hollow Metal Doors	60 Years
Wood Doors	40 Years
Other Doors	45 Years
Plastic Doors	?? Years
Interior Door Hardware	20 Years
Interior Screens	20 Years

Interior Construction - Interior Wall Finishes	
Acoustic Wall Treatment	20 Years
Ceramic Wall Tile	40 Years
Lath & Plaster Wall	40 Years
Paint	10 Years
Vinyl Wall covering	10 Years
Stucco Wall Finish	40 Years
Wood Paneled Wall Finish	30 Years
Other Wall Finishes	20 Years
Wall Waterproof Membrane	20 Years

Metal Retaining Wall	35 Years
Stone/Masonry Retaining Wall	30 Years
Wood Retaining Wall	25 Years

Site Utilities

Underground Utilities	50 Years
Aboveground Utilities	40 Years
Signage - Site Related	15 Years
Undeveloped Lands	150 Years
Landscaping	30 Years
Stormwater Management Systems	30 Years
Septic Systems	35 Years
Well Water Systems	40 Years

Paved Surface Systems

Vehicle Areas - Asphalt	20 Years
Vehicle Areas - Concrete, Insitu	20 Years
Vehicle Areas - Concrete, Precast	20 Years
Paved Playgrounds	25 Years
Paved Sports & Recreational Spaces	25 Years
Pedestrian Areas - Asphalt	22 Years
Pedestrian Areas - Concrete, Insitu	25 Years
Pedestrian Areas - Concrete, Precast	25 Years
Pavement Marking	5 Years
Traffic Control Devices	15 Years

Other Surface Systems

Vehicle Areas - Other	10 Years
Playgrounds - Other	10 Years
Sports & Recreational Spaces - Other	10 Years
Pedestrian Areas - Other	10 Years

Foundations

Footings & Foundations	110 Years
Basement Walls	110 Years

Superstructure

Frame - Concrete	110 Years
Frame - Concrete & Steel	110 Years
Frame - Steel	110 Years
Frame - Steel (Prefab)	110 Years
Frame - Wood	65 Years
Frame - Wood (Post & Beams)	75 Years
Slab on Grade - Asphalt	25 Years
Slab on Grade - Concrete	110 Years
Slab on Grade - Wood	75 Years
Suspended Slab - Concrete Joist & Concrete Deck	110 Years
Suspended Slab - Concrete Joist & Steel Deck	110 Years
Suspended Slab - Steel Joist & Steel Deck	75 Years
Suspended Slab - Steel Joist & Concrete Deck	110 Years
Suspended Slab - Steel Joist & Wood Deck	110 Years
Suspended Slab - Wood Joist & Wood Deck	75 Years
Roof Str - Concrete Joist & Concrete Deck	110 Years
Roof Str - Concrete Joist & Steel Deck	70 Years
Roof Str - Steel Joist & Steel Deck	75 Years
Roof Str - Steel Joist & Concrete Deck	110 Years
Roof Str - Steel Joist & Wood Deck	110 Years
Roof Str - Timber Joist & Wood Deck	85 Years
Roof Str - Wood Joist & Wood Deck	85 Years

Miscellaneous Structures

Balconies	35 Years
Entrance/Canopies	40 Years
Exterior Ramps	25 Years
Exterior Stairs	30 Years
Parking Garage	50 Years
Vehicle Ramps	30 Years
Basement Garage	50 Years
Loading Docks	20 Years
Areaways	?? Years

Glazed Wall Coating	15 Years

Interior Construction - Flooring

Asphalt/Asbestos Tile Floor	15 Years
Carpeting (Sheet & Tile)	10 Years
Ceramic Tile Floor	30 Years
Granite Floor	50 Years
Wood Floor - Strip	25 Years
Linoleum Floor	15 Years
Marble Floor	50 Years
Painted Concrete Floor	10 Years
Wood Floor - Parquet	25 Years
Porcelain Tile Floor	25 Years
Quarry Tile Floor	30 Years
Rubber Floor	18 Years
Sealed-Epoxy Concrete Floor	15 Years
Vinyl Tile Floor	20 Years
Vinyl Sheet Floor	20 Years
Terrazzo Floor - Insitu	50 Years
Terrazzo Floor - Tile	50 Years
Special or Other Floor Finishes	40 Years
Raised Floor Systems	25 Years
Floor Toppings & Traffic Membranes	15 Years
Masonry & Stone Flooring	75 Years
Composition Flooring	20 Years
Waterproof Membrane on Floors	20 Years
Floor Control Joints	25 Years
Floor Expansion Joints	25 Years
Lead Lined Flooring	20 Years
Copper Lined Flooring	20 Years

Interior Construction - Ceiling Finishes

Acoustic Tile Ceiling	30 Years
Plaster & Gypsum Board Ceiling	40 Years
Metal Panel Ceiling	30 Years
Painted Ceiling Structures	15 Years
Plaster & Lath Ceiling	40 Years
Suspended Acoustic Panel Ceiling	25 Years
Wood Ceiling	40 Years
Ceiling Paint	10 Years
Other Ceiling Finishes	35 Years
Lead Lined Ceiling	30 Years
Copper Lined Ceiling	30 Years

Interior Construction - Interior Ramps & Stairs

Guards, Handrails & Railings - Interior	75 Years
Ramps - Interior	75 Years
Stairs - Interior	75 Years
Interior Ladders	75 Years

Interior Construction - Miscellaneous Items

Building Signage - Interior	10 Years
Catwalks	40 Years
Fixed Furnishing (Millwork)	20 Years
Fountain	20 Years
Kitchen Equipment	20 Years
Ice Rink & Equipment Accessories	20 Years
Squash Courts & Accessories	45 Years
Swimming Pools, Spas & Accessories	15 Years
Walk-in Freezer/Cold Storage	18 Years
Window Washing Device Anchors	30 Years
Solar Control Systems - Solar Shelves	?? Years
Bird Control Systems	?? Years

Conveying Systems – V & H Movement

Elevators	25 Years
Escalators	25 Years
Freight Elevators	25 Years
Wheelchair Platform Lifts	25 Years

External Walls/Closures - Concrete or Masonry Walls

Ext.W - Aggregate or Texture, Block back-up	40 Years
Ext.W - Brick, Block Back-up	75 Years
Ext.W - Brick, Solid	75 Years
Ext.W - Concrete Block	60 Years
Ext.W - Concrete, Precast Panels	50 Years
Ext.W - Concrete, Insitu	50 Years
Ext.W - Stone	75 Years
Ext.W -, Aluminum or Steel, Block Back-Up	35 Years
Ext.W - Fieldstone, In Mortar	85 Years
Ext.W - Fieldstone, Block Back-up	85 Years
Ext.W - Fieldstone, Solid	85 Years
Ext.W - Ornamented Concrete Block	85 Years
Ext.W - Panels, Brick or Tile	50 Years

External Walls/Closures - Curtain Walls

Ext.W - Concrete & Glass Panels, Precast	50 Years
Ext.W - Metal & Glass Panels	50 Years
Ext.W - Steel Studs & Stucco	40 Years
Ext.W - Stone Panels	50 Years

External Walls/Closures - Pre-Engineered Walls

Ext.W - Prefab Panels, Alum, Steel, Glass	50 Years
Ext.W - Prefab Panels, Stucco, Steel	50 Years
Ext.W - Prefab. Panels, Veneer, Block	50 Years
Ext.W - Sandwich Panels, Alum or Steel	50 Years
Ext.W - Sandwich Panels, Cement Fiber	50 Years
Ext.W - Sandwich Panels, Fiberglass	50 Years
Ext.W - Sandwich Panels, Glass & Metal	50 Years

External Walls/Closures - Wood or Steel Stud Walls

Ext.W - Aluminum or Steel, Siding	35 Years
Ext.W - Asphalt Siding	40 Years
Ext.W - Cement Fiber, Siding or Shingles	40 Years
Ext.W - Hardboard, Siding or Shingles	40 Years
Ext.W - Plywood textures	25 Years
Ext.W - Wood, Shingles or Shakes	40 Years
Ext.W - Stucco	40 Years
Ext.W - Synthetic Plaster on Rigid Insulation	30 Years
Ext.W - Veneer, Common Brick	75 Years
Ext.W - Veneer, Face Block or Concrete Brick	60 Years
Ext.W - Veneer, Stone	85 Years
Ext.W - Vinyl, Siding	40 Years
Ext.W - Wood, Siding	40 Years

External Walls/Closures - Finishes

Ext.W - Paint	15 Years
Ext.W - Sealer	20 Years
Exterior Insulation and Finishing Systems (EFIS)	?? Years

External Walls/Closures - Exterior Doors

Revolving Door	20 Years
Aluminum Doors	50 Years
Glass Doors	40 Years
Metal Doors	45 Years
Wood Doors	40 Years
Overhead Door	20 Years
Other Doors	45 Years
Exterior Door Hardware	15 Years

External Walls/Closures - Windows

Aluminum Windows	50 Years
PVC Windows	35 Years
Steel Windows	50 Years
Wood Windows	40 Years
Aluminum Skylights	50 Years
Plastic Skylights	35 Years
Steel Skylights	50 Years
Wood Skylights	40 Years
Other Windows	40 Years
Window Coverings	15 Years

Conveying Systems - Specialties

Bridge Cranes	25 Years
Chain Hoists	25 Years
Dumbwaiters	25 Years
Loading Dock Equipment	25 Years
Moveable Floors	25 Years
Moving Walkways	25 Years
Scissor Lifts	25 Years

HVAC

Building Heat Transfer System Exchangers	30 Years
Duct Systems	40 Years
Self-Contained AHU - Cool	25 Years
DX Split AHU - Cool	25 Years
Computer Cooling AHU	25 Years
Roof Top AHU - Heat&Cool	25 Years
Window Unit A/C - Heat&Cool	25 Years
Packaged Terminal AC AHU	25 Years
Heat Pumps	40 Years
Central Station AHU	35 Years
Ventilation Fans	25 Years
Humidifiers	25 Years
Make-up Air AHU	25 Years
Heating & Cooling Piping Systems	30 Years
HVAC Pumps	25 Years
Chemical Feed System	25 Years
Boilers	30 Years
Boiler Oil Supply System	20 Years
Boiler Auxiliary System	30 Years
Terminal Units	35 Years
Chillers	20 Years
Cooling Towers	25 Years
Furnace/Forced Air	20 Years
Gas Fired Radiant Heater	30 Years
Gas Piping System	35 Years
Snow Melting System	12 Years

Control Systems

Controls, Electrical or Pneumatic	24 Years
Direct Digital Control	20 Years

Plumbing

Plumbing Piping	40 Years
Plumbing Fixtures and Accessories	30 Years
Plumbing Pumps	20 Years

Tanks

Domestic Hot Water Tanks	20 Years
Water Storage Tanks	35 Years
Water Treatment Systems	30 Years

Special Systems

Stacks & Breaching	25 Years
Compressed Air Systems	75 Years
Medical Air Systems	25 Years
Medical Vacuum Systems	40 Years
Water Distillation Units	40 Years
Sterilization System	15 Years
Vehicle Fuel Storage and Distribution	35 Years
Vacuum Systems	30 Years
Incinerators	20 Years
Compactors	15 Years
Diesel Generator Fuel Supply Systems	30 Years
Swimming Pool and Systems	40 Years
Methane Venting Systems	30 Years
Ice Rink Systems	40 Years

Fire Protection

Fire Pumps	25 Years
Specialty Fire Protection Systems	40 Years
Smoke Protection Fans	40 Years

External Walls/Closures - Soffits

Metal Soffits	?? Years
Gypsum Board Soffits	?? Years
Cement Plaster Soffits	?? Years
Wood Soffits	?? Years
Stone Soffits	?? Years
Other Soffits	?? Years

External Walls/Closures Construction - Miscellaneous Items

Louvres	?? Years
Ladders	?? Years
Grilles	?? Years

External Walls/Closures - Roof Coverings

Metal Roof	30 Years
Atrium type-Glass, frame and glazing	45 Years
Built-Up-Roof	25 Years
Asphalt Shingles Roof	22 Years
Copper Roof	50 Years
1-Ply Membrane Roofing - SBS (Mod.Bit.)	20 Years
1-Ply Membrane Roofing - EPDM	25 Years
1-Ply Membrane Roofing - PVC	25 Years
Slate Roof	50 Years
Tile, Terracotta or Concrete Roof	42 Years
Wood, Shake or Shingle Roof	35 Years
Other Roof Coverings	50 Years
Green Roof	?? Years

External Walls/Closures - Roof Specialties

Gutter	30 Years
Ice/Snow Guard	?? Years
Chimneys	45 Years
Roof Hatch - Access	?? Years
Roof Hatch - Smoke	?? Years

Interior Construction - Masonry Partitions

Concrete Block Partition	75 Years
Concrete Partition	75 Years
Brick Partition	75 Years
Stone Partition	75 Years
Glazed Block (Facing Block) Partition	75 Years
Interior Glazed Opening	40 Years
Tile Partition	50 Years
Glass Block Partition	75 Years

Interior Construction - Frame Partitions

Plaster & Gypsum Board Partition with Studs	40 Years

Sprinkler Systems	35 Years
Standpipe Systems	26 Years
Portable Fire Extinguishers	30 Years
Fire Protection Water Storage Tanks	45 Years

Main Service Electrical

Primary Switch Gear	30 Years
Primary Transformer & Vault	30 Years

Secondary Service Electrical

Distribution	30 Years
MCC	45 Years
Secondary Transformer	30 Years
Electric Power Meter	50 Years
Inverters	45 Years
Rectifiers	45 Years
Cabling Raceways & Bus Ducts	40 Years
Capacitors	40 Years

Lighting Fixtures

General Lighting	30 Years
Exit Lighting	30 Years
Exterior Lighting	15 Years
Emergency Lighting	18 Years

Electrical Service Ground

Grounding Systems	40 Years

Electrical Systems

Fire Alarm System	17 Years
Emergency Power System	35 Years
Communications Systems	25 Years
Security System	20 Years

Special Electrical Systems

Automatic Door Devices	20 Years
Clock Systems	25 Years

Electric Heating Systems

Electric Baseboard Heaters	10 Years
Underfloor Electric Cables	10 Years
In-Ceiling Electric Radiant Heating	10 Years
In-Wall Electric Radiant Heating	10 Years
Snow Melting Cables	10 Years
Electrical Radiant Unit Heaters	10 Years
Fan Powered Unit Electric Heaters	10 Years
Duct Electric Heaters	10 Years

Environment Canada
Canada Centre for Inland Waters (CCIW)
NWRI BUILDING

CONDITION REPORT
September 2009

NWRI BUILDING - Contents

BUILDING DESCRIPTION

The '<u>National Water Research Institute (NWRI) Building</u>' is a multi-storey, heated structure, comprised of 5 separate structures, as follows:

- <u>Administration & Laboratory</u> - a 7-storey structure with a partial basement, crawl space, service penthouses (mechanical and elevator), served by 5 enclosed exit stairs, 2 passenger elevators and a freight elevator. The 1st and 2nd floors house the main facility entrance, administrative offices, cafeteria/kitchen, auditorium and library. The 3rd floor is used exclusively as service space (mechanical/electrical). The 4th through 7th floors are comprised of perimeter offices and interior laboratories, arranged around 2 centre service shafts. An enclosed 2-storey area, referred to as the <u>Mall</u>, interconnects the A&L, R&D, Hydraulics Lab and Warehouse structures at the 1st and 2nd floor levels via 5 open circulation stairs. The 'building area' of this structure (A&L/Mall) is approximately 3247 m^2.
- <u>Research & Development</u> - a 2-storey structure with a crawl space, service penthouse (mechanical), and served by 3 enclosed exit stairs. Both floors are comprised of perimeter offices and interior laboratories. The 'building area' of this structure is approximately 2960 m^2.
- <u>Hydraulics Lab</u> - a 2-storey structure, served by enclosed 2 exit stairs and an interior bridge (between upper office area and upper Mall). The single-storey portion of the structure comprises the laboratory portion, while the two-storey portion comprises the office portion. The 'building area' of this structure is approximately 8000 m^2.
- <u>Boiler Plant</u> - a 1-storey structure with 2 mezzanine areas, housing the main heating equipment for the entire facility. The 'building area' of this structure is approximately 870 m^2.
- <u>Warehouse</u> - a 2-storey fully sprinklered structure, served by 3 enclosed exit stairs and a freight elevator. The 1st floor houses various workshops, storage areas and shipping/ receiving areas, while the 2nd floor is occupied with separate office and laboratory areas. The 'building area' of this structure is approximately 5665 m^2.

Owing to the complexity of uses throughout the facility, the *major occupancy* type, as defined in the National Building Code of Canada 2005 (NBC), Part 3, is difficult to determine. While the laboratory, repair garages, workshops and warehouse/storage functions clearly define the facility as a "Group F - Industrial" major occupancy, the specific level (either Division 1 - High Hazard, Division 2 - Medium Hazard, or Division 3 - Low Hazard) of each area varies depending on specific usage and materials (e.g. chemicals) and equipment involved.

The facility also contains several *minor occupancies*, including Group A, Division 2 - Assembly (cafeteria, auditorium, library); and "Group D - Business and Personal Services (offices, open office areas).

Determination of the occupancy types in each area is at the sole discretion of HRSDC Labour Programme, Fire Protection Engineering *(formerly the Fire Commissioner of Canada),* being the 'authority having jurisdiction' in Federal facilities. Knowing the occupancy types is key in order to ensure proper assessment of required fire separations and exit/egress requirements (see recommendations under '1.7 Code Compliance' below).

Despite consisting of 5 separate structures divided by fire separations, the facility is considered a single building, as it lacks the fire walls and spatial separations required for consideration as multiple buildings.

The total estimated Short Term Expenditure (1 to 5 years) cost for this facility is **$9,365,770**, as outlined below:

Architectural/Structural	$3,722,170
Mechanical	$3,711,000
Electrical	$1,932,600
Short Term Total	$9,365,770

The total estimated Long Term Expenditure (6 to 25 years) cost for this facility is **$11,897,470**, as outlined below:

Architectural/Structural	$7,767,470
Mechanical *	$5,000
Electrical	$4,125,000
Long Term Total	$11,897,470

Note: *For long term Mechanical Expenditures, the assessments and engineering evaluations recommended in the first 1 - 5 years will provide cost estimation for future projects in the next 6 - 25 years.*

PART 1 - ARCHITECTURAL/STRUCTURAL

1.1 Structure

1.1.1 Substructure

The substructure for this facility consists of pilings and pile caps, supporting reinforced cast-in-place concrete grade beams and walls. Some available drawings indicate the presence of insulation (38 mm) at the outer surfaces of the perimeter grade beams - visible insulation (at grade level of A&L stair NE, and at north end of warehouse) indicate that some insulation is present; however, the extent cannot be confirmed. No information with respect to the presence of any dampproofing/waterproofing was available/visible - no reports of dampness/leakage were identified by on-site personnel.

Heated crawl spaces, provided beneath the A&L/Mall structure and the R&D structure are accessed via doors at the A&L partial basement/tunnel access. The heated partial crawl space beneath the boiler room is accessed from the lower boiler room level via a steel access door. Sloped floors with rough finished concrete are provided throughout.

Concrete slab-on-grade floors are provided throughout the boiler room, lower level; the hydraulics (labs and office area) structure, ground floor; and the warehouse, ground floor.

1. Condition

The substructure is considered to be in good overall condition, with no visual signs of settlement or failure; however, some minor issues were identified, as follows:

- Exposed/rusted rebar and spalling concrete - R&D (2 locations), and Boiler Plant (1 location).

- Exposed/deteriorated insulation - R&D stair NE, and north end of warehouse.
- Unexplained void in foundation wall - hydraulics lab, north side (extent unknown).
- Cracks in concrete slab-on-grade floors - throughout areas of exposed concrete (i.e. no flooring).

2. Recent Repairs/Modifications

To our knowledge, no recent repairs/modifications have been carried out on the substructure.

3. Design Problems/Deficiencies

To our knowledge, no design problems/deficiencies exist with the substructure.

4. Effective Remaining Life

The substructure, with few exceptions (i.e. minor additions), dates from the original construction of the facility in the early 1970's. Given its current condition, the sub-structure can likely be expected to perform indefinitely.

5. Major Repairs/Recommendations

Other than normal maintenance (i.e. regular monitoring and minor repairs), no repair/ replacement is anticipated for the substructure.

NOTE: It is presumed that identified minor deficiencies/deterioration (see above) will be investigated/corrected as part of existing O&M operations in order to prevent the spread of existing deterioration and maintain the integrity of the substructure and adjacent components - coordinate with corrective actions required for exterior door concrete sills (see '1.2.4 Exterior Doors' below).

1.1.2 Superstructure

The superstructure for this facility is a mixture of concrete and steel, as follows:

- Framing - reinforced, cast-in-place concrete is used for the A&L/Mall and R&D structures; while steel is used for the A&L and R&D service penthouses, the service link, the Boiler Plant, the Hydraulics Lab (labs and offices) structure, and the Warehouse structure.
- Suspended floors - reinforced, cast-in-place concrete is used throughout the A&L/Mall and R&D structures, the service link, and the Boiler Plant; while concrete filled metal decking is used at the Hydraulics Lab (labs and offices) structure, and the Warehouse structure; low-strength concrete is used along both sides of the A&L service cores to allow for changes to through-slab penetrations; underside of floor slabs are insulated where entrances are recessed from the building perimeter.
- Roof - reinforced, cast-in-place concrete is used throughout the A&L/Mall and R&D structures; while metal decking is used at the service link, the Boiler Plant, the Hydraulics Lab (labs and offices) structure, and the Warehouse structure; roof structures are sloped (concrete at A&L east elevation, above suspended ceilings in office areas; steel framing and decking at A&L west elevation, above Mall) in locations with metal roofing.

NOTE: Although integral with the superstructure, exposed concrete walls and columns at the building perimeter form an integral part of the building envelope and are covered in more detail under '1.2.2 Exterior Walls'.

1. Condition

The superstructure is considered to be in good overall condition, with no visual signs of settlement or failure.

2. Recent Repairs/Modifications

To our knowledge, no recent repairs/modifications have been carried out on the superstructure.

3. Design Problems/Deficiencies

To our knowledge, no design problems/deficiencies exist with the superstructure.

4. Effective Remaining Life

The superstructure, with few exceptions (i.e. minor additions), dates from the original construction of the facility in the early 1970's. Given its current condition, the superstructure can likely be expected to perform indefinitely.

5. Major Repairs/Recommendations

Other than normal maintenance (i.e. regular monitoring and minor repairs), no repair/ replacement is anticipated for the superstructure.

1.1.3 'Other' Structures

There are several 'other' structures present at this facility, as follows:

- <u>Planter</u> - located along the north half of the A&L east elevation, originally designed as a multi-level pool and later converted to use as a planter, a reinforced concrete structure independent of the adjacent A&L structure, with a crawl space below accessed via a door from the A&L crawl space - it is unknown if any of the original pool components (i.e. waterproof membrane, concrete topping, etc.) remain in place and/or what condition they may be in.
- <u>Chimney Base</u> - located adjacent to Boiler Plant west elevation, a reinforced concrete structure supporting the boiler breechings and chimneys.
- <u>Tunnel</u> - located below grade along the Warehouse structure east elevation (below sidewalk), running between the A&L basement and the WTC basement, a reinforced concrete structure with a waterproofing membrane and 12 mm fibreboard all around, intermediate access is provided by a fixed metal ladder and access hatch and by direct access into the guardhouse stair (see next).
- <u>Old Guardhouse</u> - located adjacent to the northeast corner of the Warehouse structure, a reinforced concrete structure integral with the adjacent tunnel (see previous), consisting of a stair and office, roofing is modified bitumen.
- <u>Canopies</u> - located above the five overhead doors (from original construction), steel frame structures (supported from the superstructure) with metal soffits and cladding and modified bitumen roofing.

1. Condition

The 'other' structures are considered to be in fair overall condition; however, several minor deficiencies were identified, as follows:

- Surfaces around the chimney base are badly stained from oxidization of the breechings/chimney.
- Metal siding/soffits at the canopies are in poor condition (see '1.2.2 Exterior Walls' below).
- Roofing at the guardhouse and canopies is in poor condition (see '1.2.3 Roofing' below).

2. Recent Repairs/Modifications

To our knowledge, no recent repairs/modifications have been carried out on the planter, chimney base, old guardhouse, or the canopies.

Epoxy injection crack repairs have been effected at various locations throughout the tunnel; however, surface staining is still evident (on-site personnel indicated that seepage occurs when ground water levels are high).

3. Design Problems/Deficiencies

To our knowledge, no design problems/deficiencies exist with the 'other' structures.

4. Effective Remaining Life

The 'other' structures date from the original construction of the facility in the early 1970's. Given their current condition, the 'other' structures can likely be expected to perform indefinitely; however:

- the tunnel will likely continue to experience water infiltration/seepage, likely with increasing frequency/intensity as the waterproofing membrane ages - water infiltration is being effectively managed at present; however, over the long term replacement of the waterproofing will be required.

5. Major Repairs/Recommendations

Cleaning and repainting of metal soffits and siding at the canopies is included with recommendations for '1.2.2 Exterior Walls'.

Replacement of roofing at the old guardhouse and the canopies is included with recommendations for '1.2.3 Roofing'.

Other than normal maintenance (i.e. regular monitoring and minor repairs), no repair/ replacement is anticipated for the 'other' structures.

NOTE: It is recommended that identified surface staining in the tunnel (see above) be cleaned as part of existing O&M operations in order to facilitate management of water infiltration - monitor ongoing leakage and increased deterioration.

Pending assessment and verification, the tunnel waterproofing will likely require replacement at the end of its effective service life. This work is projected for the 16th year, at an estimated cost of $175,000.

1.2 Building Envelope

1.2.1 Suspended Floors/Soffits

Various soffit types are present on the building, as follows:

- Stucco - consisting of 19 mm thick stucco, galvanized metal latch and furring, air space, and rigid insulation at the underside of the structure - metal louvres are provided at the soffit face to provide ventilation of the air space (note that some drawing details show 140 mm batt insulation atop the gypsum board).
- Wood - consisting of 19 mm cedar slats on 16 mm gypsum board, galvanized furring, air space, and rigid insulation at the underside of the structure (note that some drawing details show 140 mm batt insulation atop the gypsum board).

NOTE: Soffits forming part of the precast concrete wall panels and the overhead door canopies are included with '1.2.2 Exterior Walls' below.

1. Condition

The soffits are considered to be in fair overall condition, with no signs of damage or deterioration outside of some superficial cracking.

2. Recent Repairs/Modifications

To our knowledge, no recent repairs/modifications have been carried out on the soffits.

3. Design Problems/Deficiencies

To our knowledge, no design problems/deficiencies exist with the soffits.

4. Effective Remaining Life

The soffits date from the original construction of the facility in the early 1970's. Given their current condition, the soffits can likely be expected to perform indefinitely.

5. Major Repairs/Recommendations

Other than normal maintenance (i.e. regular monitoring and minor repairs), no repair/replacement is anticipated for the soffits.

1.2.2 Exterior Walls

Owing to the complexity of this facility, there are many detail variations of the exterior walls. The following outlines the main exterior wall types in general terms:

- Concrete (cast-in-place) - located throughout the A&L structure at the north elevation, part of the south elevation, the 3rd floor east and west elevations, and the auditorium, also the perimeter columns and perimeter stairwells at both the A&L and R&D; reinforced concrete (rough board finished) cast integrally with the building structure; interior surfaces finished with 38 mm wood strapping and rigid insulation, metal lath and plaster; perimeter stairwells at the A&L, R&D, Hydraulic Lab and Warehouse structures are similar, albeit without insulation and plaster (exposed concrete - rough board finish); a cementitious coating has been added to the R&D columns (west elevation) and two of the A&L stairwells (CE and SE) for unknown reasons.
- Concrete Panels (precast) - consisting of concrete, vented air space, 38 mm rigid insulation, and concrete structure/concrete block; located at the Hydraulic Lab (offices), and the Warehouse (offices).
- Concrete Sandwich Panels - consisting of 75 mm concrete, 50 mm insulation, and 75 mm concrete; located at the Boiler Plant, Hydraulics Lab, and Warehouse.
- Metal Panels - consisting of prefinished metal cladding, insulation, and galvanized metal liner; located at the A&L mechanical penthouse, the R&D mechanical penthouse, the service link, the boiler room (breeching penetration), and above most overhead doors.
- Metal Siding - consisting of prefinished metal cladding, insulation and a flexible poly liner; located at the boat shop.

Metal louvres (paint finished) can be found at the Hydraulics Lab (south elevation), the Boiler Plant (west elevation), and A&L 3rd floor (east and west elevations).

Siding/soffits on the overhead door canopies (see '1.1.3 Other Structures' above) are the same prefinished metal cladding as the metal panels.

NOTE: Solar siding, located at the Hydraulic Lab (south elevation - upper east end) was installed to provide outside air pre-heating for the mechanical system - it is not a component of the exterior wall - see 'Part 3 Mechanical'.

1. Condition

The exterior walls are considered to be in fair overall condition; however, the following deficiencies were identified:

Concrete (cast-in-place) -

- The cementitious coating at the A&L and R&D columns is filled with cracks - it is unknown if cracks are just in the coating or if they're telegraphing through from structure - cracks render the building envelope components at risk of deterioration from air/moisture penetration.
- A localized area on the interior of the 3rd floor wall (A&L, east side) is showing signs of moisture damage - indicates possible infiltration through the wall assembly.

Concrete Sandwich Panels -

- Joint sealant backer rods are falling out at several locations - owing to slight variations in joint width between panels, some rods were likely not sufficiently oversized - sealants at these locations are subject to premature failure.

Concrete Panels -

- Surfaces are dirty/stained to various degrees throughout - normal accumulation - aesthetic issue only.
- Rust stains have occurred at locations with exposed rebar (i.e. at or near the panel surface - manufacturing defect - aesthetic only at present, however, over

time continued exposure of the rebar will eventually lead to deterioration of the panel.
- Sealants between the concrete panels and the exposed columns/structure show signs of failing (debonding) at several locations - as the sealants are still pliable, this is likely a result of improper surface preparation - open joints render the building envelope components at risk of deterioration from air/moisture penetration.

Metal Panels -
- Deteriorated paint finish and rusting surfaces at all panel bent edges (typical of older prefinished metal) and many field areas (likely a manufacturing defect) - aesthetic at present, however, continued deterioration will eventually result in failure of the components.
- Active leak at service link/upper boiler room - ongoing damage/deterioration.
- Unsealed openings at various locations throughout the R&D mechanical penthouse - definite infiltration of the wall assembly, highly susceptible to damage/deterioration.

Louvres -
- Painted finish in poor condition, with peeling/flaking paint and subsequent rusting of the metal surfaces beneath - normal cyclical deterioration - in addition to aesthetics, continued deterioration will eventually result in failure of the components and required replacements.

2. Recent Repairs/Modifications

Addition of the cementitious coatings to the concrete walls and exposed perimeter columns, and replacement of the sealants at the concrete sandwich panels are presumed to be recent - specific dates unknown.

3. Design Problems/Deficiencies

Concrete walls at the perimeter stairwells are without insulation/vapour barrier. Otherwise, to our knowledge, no design problems/deficiencies exist with the remaining exterior wall types.

4. Effective Remaining Life

The exterior walls, with few exceptions (i.e. minor additions), date from original construction of the facility in the early 1970's. Given their current condition, and with corrective actions, the exterior walls can likely be expected to perform indefinitely; however, sealants will continue to require periodic replacement.

5. Major Repairs/Recommendations

It is recommended that allowance be made for works to reinstate the integrity of the building envelope at the metal panel walls (including repair of the active leak, sealing of wall penetrations, and sealing of wall openings) in order to prevent damage/ deterioration and/or known health issues associated with air/moisture infiltration, as well as to maintain control of the indoor climate. This work is projected for the 1st year, at an estimated cost of $5,000.

It is recommended that an allowance be made for cleaning/painting of the louvres in order to extend their effective service life. This work is projected for the 1st year, at an estimated cost of $3,500.

NOTE: After repainting of the louvres, annual inspection and spot painting should be incorporated into normal O&M procedures.

It is recommended that an allowance be made for restoration of the concrete panel walls (including replacement of sealants, area repairs at exposed rebar locations, and cleaning of stained surfaces) in order to reinstate the integrity of the building envelope, extend their effective service life by correcting deteriorative conditions, as well as facilitating monitoring and restoring some of the facility's aesthetic value. This work is projected for the 2nd year, at an estimated cost of $300,000.

NOTE: It is recommended that advantage be taken during the course of the above noted work to conduct a detailed inspection of otherwise inaccessible components (i.e. window framing and sealants, exposed structure and coating, etc.) which are typically only able to be viewed from the ground.

It is recommended that allowance be made for cleaning/painting (electrostatic) of the metal panel walls (including the overhead door canopy sides/soffits) in order to extend their effective service life by correcting deteriorative conditions, as well as to facilitating monitoring and restoring some of the facility's aesthetic value. This work is projected for the 6th year, at an estimated cost of $165,000.

Pending future assessment and verification, it is recommended that allowance be made for replacement of the concrete sandwich panel wall sealants at the end of their effective service life. This work is projected for the 11th year, at an estimated cost of $340,000.

NOTE: Increased monitoring of the concrete sandwich panel sealants should be incorporated into normal O&M procedures in order to identify premature deterioration at locations with undersized backer rods.

1.2.3 Roofing

A variety of roof coverings are employed throughout the multiple roof levels/areas at this facility, as follows:

- Styrene Butadiene Styrene (SBS) a.k.a. Modified Bitumen - located on all roof areas, except as otherwise noted; a conventional assembly consisting of a fully adhered SBS membrane and flashings over insulation (specific assembly details - i.e. insulation type and thickness, vapour barrier, etc. - unknown); counter/cap flashings are a mixture of aluminum (clear anodized) and prefinished metal.
- Ethylene Propylene Diene Monomer (EPDM) - located at the A&L roof above 2nd floor administration (finance and RDG), the A&L roofs above the 3rd floor louvres/raised storage areas, the R&D main roof areas (each side of penthouse), and the north half of the R&D mechanical penthouse; a conventional assembly consisting of a ballasted EPDM membrane and flashings over insulation (specific assembly details - i.e. insulation type and thickness, vapour barrier, etc. - unknown); counter/cap flashings are a mixture of aluminum (clear anodized) and prefinished metal.

- Metal (prefinished) - located on sloped roof areas on the east and west elevations of the A&L structure; consisting of metal roofing (with batten seams), felt, 38 mm rigid insulation, and a vapour barrier (on decking).
- Metal (galvanized) - unique to the sloped roof at the boatshop, consists of galvanized metal cladding (with lap seams), insulation and a flexible poly liner (laid directly over structure, no deck).

Drainage for small areas is provided by a combination of area drains and scuppers with external copper down spouts discharging at lower roof levels, while large areas rely on area drains connected to the storm water system with internal piping. Sloped, prefinished roofing drains directly onto adjacent roof areas or grade. Drainage for sloped galvanized roofing is provided by prefinished metal eavestroughs and down spouts discharging at grade.
Roof access to most main roof areas is via doors leading directly from adjacent stairwells and service spaces, while access to smaller roof areas (including stairwell roofs) requires the use of portable ladders.

1. Condition

The roofing is considered to be in fair overall condition; however, several deficiencies were noted, as follows:

- Accumulation of debris.
- Vegetation growth.
- Rusting metal components (ladders, equipment supports, guards).
- Deteriorating wood walkway.
- Blocked drains.
- Missing/damaged strainers at drains.
- Deteriorated sealants - cracking, debonding, new applied over old.
- Modified Bitumen - blisters, cracking, wrinkles, loss of granular, membrane shrinkage.
- EPDM - Tenting of membrane at perimeter.

2. Recent Repairs/Modifications

Localized area repairs were noted throughout most roof areas (i.e. newer membrane material at patches, displaced ballast at repair areas).

3. Design Problems/Deficiencies

All flat roof areas have inadequate slope to accommodate good drainage, resulting in standing water throughout, and leading to decreased service life of the roofing and creation of mosquito breeding conditions (West Nile virus).

4. Effective Remaining Life

The age of the membrane roofings is unknown; however, the SBS (modified bitumen) roofings are presumed to range from 10 - 15 years old, and the EDPM roofings are presumed to range from 15 - 20 years old. Given their current condition, the membrane roofings are considered to be approaching the end of their effective service lives, with corrective actions required in the 1st year, and full replacement likely in the 5th year (pending future assessment and verification, replacement can likely be phased over the 5 - 10 year horizon).

The prefinished metal roofing dates from the original construction of the facility in the early 1970's. Given its current condition, It can likely be expected to perform indefinitely.

The galvanized metal roofing dates from the construction of the boathouse (date unknown). Given its current condition, it can likely be expected to perform indefinitely; however, it will require periodic refurbishment, including replacement of seals/gaskets, fasteners, etc.

5. Major Repairs/Recommendations

As the roofings represent a significant cyclical investment, there is potential for significant cost savings in the maximization of their service lives by avoiding premature replacement. However, as an integral part of the building envelope, and arguably the most vulnerable, deferring replacement too long increases the risk of damage, inconvenience and incurred costs due to increasing localized failures. Therefore, it is recommended that prior to replacement of the roofings, that a detailed roofing study (including visual assessment, test cuts, moisture checks, and infrared scanning) be completed to fully assess the various roofing assemblies and the condition of their components. This information will be invaluable in determining both the timing and the scope of work required for upcoming replacements. This work is recommended for the 1st year, at an estimated cost of $22,000.

It is recommended that an allowance be made for replacement of the EPDM roofings at the end of their effective service lives in order to maintain the integrity of the building envelope and prevent damage/deterioration and/or known health issues associated with leakage. Also, correction of identified deficiencies with respect to slope/drainage should be incorporated at this time. This work is projected for the 2nd year, at an estimated cost of $15,000.

NOTE: In accordance with good roof maintenance practices, repairs to the roofing, including repair of blisters, replacement of missing/damaged components, re-securing of loose components, cleaning/repainting of metal components, and removal of accumulated debris/sediment and vegetation, should be corrected as part of existing O&M operations in order to ensure that the roofing maximizes its effective service life (by preventing the spread of existing deterioration) and maintain the integrity of the system components.

Pending assessment and verification, the SBS membrane roofings (include roofing for old guardhouse and the overhead door canopies) will likely require replacement at the end of their effective service lives in order to maintain the integrity of the building envelope and prevent damage/deterioration and/or known health issues associated with leakage. Also, correction of identified deficiencies with respect to slope/drainage should be incorporated at this time. This work is projected for the 6th year, at an estimated cost of $2,375,000.

1.2.4 Exterior Doors

A variety of door types are employed throughout this facility, as follows:

- Aluminum - aluminum (dark bronze anodized), fixed type, with insulating glass units - located at the main entrances and exit stair/vestibule doors.
- Hollow metal - paint finished - located at secondary entrance/exit locations.

A variety of overhead door types are employed throughout this facility, as outlined in the following table:

- Exterior Overhead Door Schedule -				
Name	*Location*	*Type*	*Size (W x H)*	*Operation*
n/a	Hydraulics Lab, East	Rolling *	3665 x 4275 mm	Powered & Manual
A	Hydraulics Lab, Southeast	Vertical Lift	4275 x 4275 mm	Powered
B	Hydraulics Lab, South Centre	Vertical Lift	4275 x 4275 mm	Powered
C	Hydraulics Lab, Southwest	Vertical Lift	4275 x 4275 mm	Powered
16	Boiler Plant, West	Rolling	4125 x 4275 mm	Manual
D	Boatshop 1, North	Vertical Lift	*	Powered
E	Workshop, North	Vertical Lift	*	Powered
F	Outer Rigging Shop, West	Sectional	3055 x 3665 mm	Powered & Manual
G	Boatshop Storage, West	Sectional	3055 x 3665 mm	Manual
H	Ship Storage, West	Sectional	6195 x 4275 mm	Powered & Manual
J	Boatshop 2, South	Sectional	10995 x 6195 mm	Powered & Manual
K	Annex/Ship Storage, North	Rolling	3055 x 2750 mm	Manual
L	Warehouse, West	Sectional	3055 x 3055 mm	Powered
M	Loading Dock, Northwest	Sectional	3055 x 2445 mm	Powered **
N	Loading Dock, North Centre	Sectional	3055 x 2445 mm	Powered **
O	Loading Dock, Northeast	Sectional	3055 x 2445 mm	Powered ***
Notes: * No 'Certificate of Inspection' posted. ** Controls interlocked with dock hoist. *** Door blocked by furniture/equipment - presumed inoperable.				

1. Condition

The exterior doors are considered to be in fair overall condition; however, several deficiencies were noted, as follows:

- Overhead door panels and frames have deteriorated paint finishes and rusting metal surfaces.
- New doors are not identified within the original number/letter designation systems (as per original doors).
- Concrete door sills (Boiler Plant, door No's. 15 & 17; Warehouse, door No. 30) are damaged/deteriorating, with exposed re-bar.

2. Recent Repairs/Modifications

To our knowledge, no recent repairs/modifications have been carried out on the exterior doors.

3. Design Problems/Deficiencies

To our knowledge, no design problems/deficiencies exist with the exterior doors.

4. Effective Remaining Life

Most of the exterior doors date from original construction of the facility in the early 1970's, however several overhead doors (Hydraulics Lab, east side; Boiler Plant, west side; Warehouse, west side) have been added since - specific dates unknown. Given their current condition, and with corrective actions (including cleaning/painting of metal surfaces), the exterior doors can likely be expected to perform indefinitely.

5. Major Repairs/Recommendations

Other than normal maintenance (i.e. regular monitoring and minor repairs), no repairs/replacements are anticipated for the exterior doors over the short-term.

NOTE: It is presumed that 'minor repairs' included under normal O&M operations include annual spot cleaning/painting of metal surfaces to prevent deterioration and maintain the integrity of the components throughout their service life - repair of the deteriorated concrete door sills should be corrected as part of the minor repair work on the foundation (see '1.1.1 Substructure' above).

Pending future assessment and verification, it is recommended that an allowance be made for refurbishment of the older overhead doors in order to extend their effective service life. This work is projected for the 11th year, at an estimated cost of $52,500.

1.2.5 Windows, Sloped Glazing & Skylights

A variety of glazed opening types are employed throughout this facility, as follows:

- The windows throughout the facility are aluminum (dark bronze anodized), fixed type, with insulating glass units.
- The sloped glazing, located at the A&L 2nd floor level above the Mall, administration area and library, are aluminum (dark bronze anodized) with insulating glass units (fixed).
- The skylights, located in each of the 3 A&L east side perimeter stairs (NE, CE and SE) and the R&D west side perimeter stair (RC) are aluminum (clear anodized finish) with opaque acrylic double glazing (fixed).

1. Condition

The windows are considered to be in good overall condition, with no signs of damage or deterioration; however, some deficiencies were noted, as follows:

- Deteriorated sealants - cracking, debonding, extruding under pressure.
- Frame joints opening.
- Interior glazing gaskets falling out.
- Failed seals at insulating glass units - noted throughout.

2. Recent Repairs/Modifications

To our knowledge, no recent repairs/modifications have been carried out on the glazed openings.

3. Design Problems/Deficiencies

To our knowledge, no design problems/deficiencies exist with the glazed openings.

4. Effective Remaining Life

The glazed openings date from the original construction of the facility in the early 1970's. Given their current condition, the glazed openings can likely be expected to perform indefinitely, excepting the insulating glass units and the sealants, which will continue to require cyclical replacement. The insulating glass units will fail randomly without warning and can be replaced on an 'as required' basis. The sealants are considered to be reaching the end of their effective service life and should be considered for replacement in the 6th year.

5. Major Repairs/Recommendations

Pending assessment and verification, window frame sealants (frame to wall) will likely require replacement (cut out old and replace with new) at the end of their effective service life. This work is projected for the 6th year, at an estimated cost of $178,500.

Although glazing sealants (frame to glazing) are also in fair to poor condition, it is recommended that these be replaced in conjunction with the ongoing insulating glass units replacements as a part of normal O&M operations.

NOTE: As most of the windows at this facility are typically only able to be viewed from the ground, it is recommended that advantage be taken during the course of the concrete panel wall restoration project (see '1.2.2 Exterior Walls' above) to conduct a detailed inspection of these otherwise inaccessible components.

1.3 Interior Construction

1.3.1 Flooring

A variety of flooring types are employed throughout this facility, as follows:

- Carpet - in the library, auditorium, administration areas, random offices in lab areas, and the hydraulic lab conference rooms.
- Vinyl Tile - predominant floor finish used throughout - all locations except as otherwise noted.
- Vinyl Sheet - in the cafeteria (new), some A&L 4th floor labs (L411, L413 and L414 - partial), and an A&L 7th floor lab (L730, old).
- Raised Flooring System - in the A&L 1st floor computer rooms.
- Epoxy - in a single A&L 7th floor lab (L752), 4 warehouse area labs, and the 1st floor R&D corridor adjacent to warehouse.
- Ceramic Tile - in the washrooms.
- Quarry Tile - in the main entrance/mall (1st and 2nd floors), kitchen, and exit vestibules.
- Paint - concrete floors in the boiler plant, generator room, electrical room, and janitor rooms.

Concrete floors in service areas (some with sealer), shops, warehouse areas, and enclosed exit stairs are a mixture of sealed and unfinished.

1. Condition

The floorings throughout are considered to be in fair overall condition, except as follows:

- Localized area repairs/replacements of vinyl tile have been carried out using mismatched vinyl tile (at least 3 distinct tile colour/patterns used).
- Newer vinyl tile flooring is not holding up to traffic as well as older (original) tile.
- Vinyl tile and sheet vinyl flooring standing up poorly in some labs - surfaces badly stained and degraded.
- Epoxy floor in one lab is in poor condition.
- Localized area repairs/replacements of ceramic tile have been carried out using mismatched tile.
- Wrinkling throughout carpet flooring in several individual offices.
- Loose/missing vinyl bases - localized throughout

2. Recent Repairs/Modifications

To our knowledge, no recent repairs/modifications have been carried out on the flooring.

3. Design Problems/Deficiencies

Several issues have been identified, as follows:

- Use of mismatched flooring for localized area repairs/replacements greatly reduces aesthetics.
- Flooring material at several locations are not compatible for actual usage.
- Carpet installation over vinyl tile in individual offices is presumed to be either ‘loose-laid’ or inadequately adhered - resulting in wrinkles (increased wear, trip hazard).
- Use of broadloom carpet in lieu of carpet tile in offices and open office areas restricts ongoing maintenance - requiring patches or full replacement.

NOTE: As most lab area offices have vinyl tile flooring, it is presumed that the few instances where carpet flooring has been provided is at the request of the occupant.

4. Effective Remaining Life

The floor finishes date from various times over the life of the facility, and will require cyclical partial replacements based on in-service times and usage:

- Hard surface floorings (<u>ceramic tile</u> and <u>quarry tile</u>) are presumed to date from the original construction of the facility in the early 1970’s, and with normal maintenance, will likely continue to perform indefinitely.
- Resilient flooring (<u>vinyl tile</u> and <u>sheet vinyl</u>) dates from various times over the life of the facility, however, the majority by far dates from the original construction of the facility in the early 1970’s. Given their current condition, the older resilient floorings are considered to be nearing the end of their effective service life and should be considered for replacement.
- The <u>epoxy</u> floorings are presumed to range from 5 - 10 years old, and with normal maintenance, will likely continue to perform over the next 20 - 25 years.
- The <u>carpet</u> floorings are presumed to range from 5 - 10 years old, and will continue to require cyclical replacement on an ongoing basis.
- The <u>painted and sealed</u> concrete floors will continue to require cyclical replacement on an ongoing basis.

5. Major Repairs/Recommendations

Other than normal maintenance (i.e. regular monitoring and minor repairs), no repair/replacement is anticipated for the hard surface floorings (ceramic tile and quarry tile).

It is recommended that allowance be made for the phased replacement of the resilient flooring (vinyl tile and sheet vinyl) beginning with older and high traffic areas. This work is projected to cost an estimated $7,500 in the 1st year (plans and specifications), and then $147,500 in each of the 2nd through 13th years (replacement - based on roughly half a floor per year).

NOTE: Reassessment of flooring types employed in individual labs with respect to specific needs/uses should be completed prior to replacement work in order to standardize, yet keep to a minimum, the number of types required.

It is recommended that an allowance be made for the replacement of approximately 1/3 of the carpet flooring in the older and high-traffic areas. This work is projected to cost an estimated $165,000 in each of the 6th, 11th and 16th years.

1.3.2 Interior Partitions

The interior partitions employed throughout this facility include a variety of types, as follows:

- Frame (fixed) - a mixture of wood and/or metal stud framing s finished with plaster and/or gypsum board.
- Frame (demountable) - metal stud framing finished with gypsum board panels with batten covered seams.
- Concrete Block - standard block - various locations throughout the facility.
- Glazed - hollow metal frames (paint finished) with wired glass - various locations throughout the facility.
- Glass block - A&L 2nd floor (finance).
- Concrete (structural) - rough board finish in open/public areas, unfinished in service areas - various locations throughout the facility.

A variety of finishes are employed throughout this facility, as follows:

- Paint - predominant wall finish used throughout - all locations except as otherwise noted.
- Vinyl Wall Covering - various offices and meeting rooms throughout.
- Ceramic Tile - located at drinking fountain alcoves.
- Wood Paneling - located in the conference room of the Hydraulics Lab office wing.

1. Condition

The interior partitions and their finishes are considered to be in fair overall condition, free of damage and with no visible wear outside of normal wear patterns, except in some high-traffic location wear localized damage has occurred.

2. Recent Repairs/Modifications

To our knowledge, no recent repairs/modification has been carried out on the interior partitions.

3. Design Problems/Deficiencies

The partitions/finishes in some locations are not holding-up against the high-traffic and heavy usage they're subjected to.

4. Effective Remaining Life

Most of the partitions date from the original construction of the facility in the early 1970's; however, localized areas throughout date from various minor addition/ renovation projects over the life of the facility. Given their current condition, the partitions can likely be expected to perform indefinitely.

The 'soft' finishes (paint & vinyl wall covering) date from various times over the life of the facility, and will continue to require cyclical replacement.

The 'hard' finishes (ceramic tile & wood paneling) date from the original construction of the facility in the early 1970's, and given their current condition, can likely be expected to perform indefinitely.

5. Major Repairs/Recommendations

It is recommended that an allowance be made for phased repainting and replacement of vinyl wall coverings in conjunction with flooring replacement works (to minimize tenant disruption). This work is projected to cost an estimated $32,500 in each of the 2nd through 16th years.

1.3.3 Ceilings

The ceiling types employed throughout this facility include a variety of types, as follows:

- Suspended Acoustic (coffered) - metal T-bar with lay-in acoustic tiles, located in the cafeteria, library and conference rooms (floors 4 through 7).
- Suspended Acoustic (flat) - metal T-bar with lay-in acoustic tiles, located in offices, open office areas, board rooms/meeting rooms, training rooms, and laboratories.
- Wood (on plywood) - 19 mm cedar slats (stain finish) on 12 mm fir plywood (paint finished) on suspended metal furring - in the cafeteria servery, Mall (lower levels), auditorium, library, and elevator lobbies.
- Wood (on gypsum board) - 19 mm cedar slats (stain finish) on 16 mm gypsum board on suspended galvanized furring; located in the vestibules (some drawing details indicate 90 mm batt insulation atop the gypsum board).
- Plaster - 19 mm thick plaster on metal lath and suspended metal furring, located in the cafeteria kitchen, the Mall (upper areas, textured finish), and the Hydraulics Lab janitor rooms.

Although no ceiling is provided in the main entrance, the exposed structure of the floors above are constructed as a coffered concrete ceiling (waffle slab) for aesthetic purposes.

Any areas not otherwise mentioned are without ceilings, having exposed structure above (either unfinished or painted).

1. Condition

The ceilings are considered to be in fair overall condition, free of damage and with no visible deterioration.

2. Recent Repairs/Modifications

To our knowledge, no recent repairs/modification has been carried out on the ceilings.

3. Design Problems/Deficiencies

Components for the coffered ceilings are no longer commercially available, with any required repair/replacement items having to be custom fabricated.

4. Effective Remaining Life

Most of the ceilings date from the original construction of the facility in the early 1970's; however, localized areas throughout date from various minor addition/ renovation projects over the life of the facility. Given their current condition, the ceilings can likely be expected to perform indefinitely.

5. Major Repairs/Recommendations

Other than normal maintenance (i.e. regular monitoring and minor repairs, including partial replacements and repainting), no repair/replacement is anticipated for the ceilings.

NOTE: Water stained damaged acoustic units should be replaced ASAP on an ongoing basis as a part of existing O&M procedures, to assist in both monitoring of leaks (continuous and future), and to reduce the risk of possible health issues associated with moisture leakage.

It is recommended that an allowance be made for phased replacement of the coffered ceilings in conjunction with flooring replacement works (to minimize tenant disruption). This work is projected to cost an estimated $3,835 in each of the 2nd, 4th, 6th and 8th years for the conference rooms, $13,800 in the 10th year for the library, and $47,500 in the 12th year for the cafeteria (subject to phasing of work).

1.3.4 Interior Doors

A variety of standard door types are employed throughout the interior of this facility, as follows:

- Aluminum - aluminum framing (various anodized finishes) - located at the SE1 exit stair vestibule, the RDG's office, and the 2nd floor R&D secondary corridor.
- Hollow Metal - pressed metal doors and frames (paint finished) - various locations throughout the facility.
- Wood - solid core, plastic laminate finish, hollow metal and aluminum frames (for fixed and demountable partitions, respectively) - various locations throughout the facility.

Glazing in doors, sidelights and transoms are a mixture of clear and wired glass.

Door hardware throughout is a mixture of exit devices, push/pull hardware, and both lever and knob type latchsets/locksets, with a variety of functions, trims and accessories.

A variety of overhead door types are employed throughout the interior of this facility, as outlined in the following table:

- Interior Overhead Door Schedule -				
Name	*Location*	*Type*	*Size (W x H)*	*Operation*
n/a	Hydraulics Lab / Aquatics Lab	Rolling **	3050 x 3050 mm	Powered
n/a	Mall / Warehouse	Rolling *	3200 x 2665 mm	Powered
n/a	Warehouse / EI Services	Rolling **	2445 x 2895 mm	Manual
n/a	Warehouse / Workshop	Rolling	3665 x 2895 mm	Manual
n/a	Workshop / Welding Shop	Rolling	3665 x 2895 mm	Manual
n/a	Workshop / BS Shop	Rolling	3665 x 2895 mm	Manual
n/a	Workshop / Boat Shop	Rolling	3665 x 2895 mm	Manual
n/a	Boat Shop / Wood Shop	Rolling	2445 x 2895 mm	Manual
n/a	Boat Shop / Engine Shop	Rolling	2445 x 2895 mm	Manual
Notes: * Fire Rated - ULC labeled. ** No 'Certificate of Inspection' posted.				

1. Condition

The interior doors are considered to be in fair overall condition, with no obvious signs of damage or deterioration outside of normal wear.

2. Recent Repairs/Modifications

To our knowledge, no recent repairs/modifications have been carried out on the interior doors.

3. Design Problems/Deficiencies

Various issues with respect to accessibility and general design have been identified (see '1.5 Accessibility' and '1.7 Code Compliance' below).

4. Effective Remaining Life

The interior doors date from various times over the life of the facility; however, most items are presumed to date from the original construction of the facility in the early 1970's. Given their current condition, and with normal maintenance:

- the standard doors can be expected to perform indefinitely, with partial repairs/ replacements carried out on an 'as required' basis.
- overhead doors will likely require refurbishment in order to extend their effective service life.

5. Major Repairs/Recommendations

Other than normal maintenance (i.e. regular monitoring and minor repairs), no repair/replacement is anticipated for the interior doors over the short-term.

NOTE: Consideration should be given to providing doors in high-traffic areas with kick plates for protection - owing to the limited scope, this can likely be undertaken on an 'as required' basis through existing O&M operations.

Pending future assessment and verification, it is recommended that an allowance be made for refurbishment of the older overhead doors in order to extend their effective service life. This work is projected for the 11th year, at an estimated cost of $17,500.

1.3.5 Window Coverings

There are a variety window covering types employed throughout this facility, including: fabric curtains, PVC vertical louvre blinds, vinyl/fabric roller blinds, and metal horizontal louvre blinds. Some office locations have had older window coverings removed and not replaced - presumed to be the occupants' choice.

1. Condition

The window coverings are considered to be in fair overall condition, with no obvious signs of damage or deterioration outside of normal wear.

2. Recent Repairs/Modifications

Small scale replacements of the window coverings are able to be carried out on an 'as required' basis, as most window areas are occupied by individual office spaces.

3. Design Problems/Deficiencies

While the small scale replacement of the window coverings within individual office spaces remains practical from an interior standpoint, the continuing overall effect will result in reduced aesthetics of the exterior views, owing to the variety of window coverings employed throughout.

4. Effective Remaining Life

The window coverings date from various times over the life of the building, with the fabric curtains dating from the original construction of the facility in the early 1970's, the PVC vertical louvre blinds being older replacements, and the vinyl/fabric roller blinds and metal horizontal louvre blinds being newer replacements.

- Depending on usage, the window coverings will continue to require partial replacements on an ongoing basis.

5. Major Repairs/Recommendations

Other than normal maintenance (i.e. regular monitoring and minor repairs), no repair/replacement are anticipated for the window coverings.

1.3.6 Fitments (Fixed Furnishings, Millwork and Manufactured Specialties)

The various fitments employed throughout this facility include:

- Reception desk - main entrance; wood and plastic laminate.
- Vanities - A&L multi-person washrooms; plastic laminate.
- Lab cabinets - laboratories throughout; wood base cabinets with a variety of tops (plastic laminate, stainless steel and butcher block), wood wall cabinets with sliding glass doors, newer plastic laminate shelving units added; A&L 7th floor lab (L752) with all stainless (base/wall and tops).
- Kitchenettes - various locations throughout; plastic laminate cabinets (base and wall) and tops.
- Cabinets - Boiler Plant control room; wood base cabinets with stainless top/sink, and wood wall cabinets with sliding glass doors.
- Metal toilet partitions - multi-person washrooms; paint finished (with stainless steel bases, trim and hardware).

1. Condition

The fitments are considered to range from fair to good overall condition, with no obvious signs of damage or deterioration outside of normal wear.

2. Recent Repairs/Modifications

To our knowledge, no recent repairs/modifications have been carried out on the fitments.

3. Design Problems/Deficiencies

Other than identified accessibility issues (see '1.5 Accessibility' above), to our knowledge, no design problems/deficiencies exist with the fitments.

4. Effective Remaining Life

The fitments date from various times over the life of the facility; however, most items are presumed to date from the original construction of the facility in the early 1970's. Given their current condition, the fitments are considered to be nearing the end of their effective service life and will require refurbishment.

5. Major Repairs/Recommendations

It is recommended that allowance be made for the phased refurbishment of the fitments, beginning with the older and less functional items in order to extend their effective service life. This work is projected to cost an estimated $17,500 in the 1st year (plans and specifications) and then $290,000 in each of the 2nd through 13th years (refurbishment).

1.3.7 Interior Stairs

There are numerous interior stairs employed throughout this facility which provide access and/or egress, as follows:

Administration & Laboratory -
- NW: concrete, ground floor (level 1) to PH roof (level 9), exits to exterior at grade through entrance vestibule.
- NE: concrete, basement (level 0) to 7th floor (level 7), exits to exterior at grade through entrance vestibule.
- SE: concrete, ground floor (level 1) to main roof/PH (level 8), exits to exterior at grade through entrance vestibule.
- SE: concrete, ground floor (level 1) to 7th floor (level 7), exits to exterior at grade through entrance vestibule.
- CC: concrete, ground floor (level 1) to A&L main roof/PH (level 8), exits to exterior at grade through main entrance lobby.
- Main Lobby and Mall: concrete, open circulation between 1st and 2nd floors.
- Auditorium Lobby: concrete, open circulation between main lobby and auditorium lobby - ramp added for b-f access.

Research & Development -
- RN: concrete, ground floor (level 1) to R&D main roof/PH (level 3), exits to exterior at grade through entrance vestibule.
- RC: concrete, ground floor (level 1) to 3rd floor (level 3), exits to exterior at grade through entrance vestibule.
- RS: concrete, ground floor (level 1) to 2nd floor (level 2), exits to exterior at grade through entrance vestibule.

Hydraulics Lab -
- HE: concrete, ground floor (level 1) to 2nd floor (level 2), steel, 2nd floor (level 2) to HL main roof (level 3), exits to exterior at grade through entrance vestibule
- HW: concrete, ground floor (level 1) to 2nd floor (level 2), exits to exterior at grade through entrance vestibule.
- Bridge: steel-concrete filled, open circulation between 1st and 2nd floors.

Warehouse -
- WN: steel-concrete filled, ground floor (level 1) to 2nd floor (level 2), exits directly to exterior at grade.
- WS: steel-concrete filled, ground floor (level 1) to 2nd floor (level 2), exits directly to exterior at grade.
- WW: concrete, ground floor (level 1) to roof (level 3), exits directly to exterior at grade.

Workshop - steel-concrete filled, open circulation between 1st and 2nd floors.

In addition to the above, there are open circulation metal stairs and metal ladders located throughout service areas (boiler plant, 3rd floor A&L mechanical, A&L mechanical penthouse) and warehouse areas which provide access between levels and to equipment.

Concrete stairs have a mixture of integrally cast concrete guards with painted steel handrails, and painted metal guards/handrails. Steel stairs have painted metal guards/handrails. Open circulation stairs in the Main Lobby and Mall have integrally cast concrete stringers, painted metal standards, laminated wood guards, and painted metal handrails.

1. Condition

The interior stairs are considered to be in good overall condition, with no obvious signs of damage or deterioration.

2. Recent Repairs/Modifications

To our knowledge, no recent repairs/modifications have been carried out on the interior stairs.

3. Design Problems/Deficiencies

Various issues with respect to accessibility and general design of the stairs/stairwells have been identified (see '1.5 Accessibility' and '1.7 Code Compliance' below).

4. Effective Remaining Life

The interior stairs date from the original construction of the facility in the early 1970's, and given their current condition, can likely be expected to perform indefinitely.

5. Major Repairs/Recommendations

Other than normal maintenance (i.e. regular monitoring and minor repairs), no repairs/replacements are anticipated for the interior stairs.

1.4 Heritage

As the "Custodial Department" for this facility, EC is responsible for arranging a review and preparation of a "Heritage Character Statement" by the Federal Heritage Building Review Office (FHBRO) through Canadian Heritage, to identify any elements which may have heritage value, and thereafter be responsible for submitting concept proposals and detailed design proposals for and interventions (defined as alteration, demolition or disposal) to FHBRO for review and comment.

- This facility has not yet been reviewed by the Federal Heritage Building Review Board (FHBRO) through Canadian Heritage.
- Given the age of the building (40 years), and as the maximum age for review is 40 years, a request for review should be put through <u>as soon as possible</u>, with no interventions carried out until a review has been completed.

1.5 Accessibility

While various projects have been carried out to address barrier-free design throughout this facility, it is not fully compliant with current accessibility standards. As a Crown facility, accessibility requirements are dictated by the Treasury Board's 'Accessibility Standard for Real Property' (effective Nov. 01, 2006) and its designated technical standard (CAN/CSA-B651 Accessible Design For The Built Environment).

- A recently completed Accessibility Audit (see 'Appendix E - Accessibility Audit') outlines details, including identified deficiencies with parking, walkways, entrances, elevators and stairs, washrooms, tactile signage and 'public' areas when assessed against both the 1995 and 2004 editions of CAN/CSA-B651.

NOTE: A draft version of the next edition, currently in the review stage, is expected to be issued in 2011.

1.6 Environmental

Given the age of the building (40 years), it is likely that building materials containing hazardous substances (e.g. lead, asbestos, etc.) are present. Suspect materials observed on-site include resilient tile and sheet floorings, plaster, gypsum board (and joint filler), paint, textured ceiling finishes, and acoustic tiles. The presence of some asbestos containing materials (ACM) has already been confirmed (insulation material on the mechanical pipes, and boilers/tanks). Other environmental and special workplace concerns associated with this building include: above ground storage tank, CFCs, and flammable liquids.

All information regarding previous surveys/testing for hazardous materials available for review ('Environmental Audit Screening Report, Canadian Environmental Assessment Act', prepared by PWGSC Environmental Services; and 'Environmental Audit Report' prepared by Oakhill Environmental) date from 1995. Ongoing ACM abatement projects throughout the facility are carried-out on a 'piecemeal' basis.

- All existing environmental information should be collected and reviewed to determine what actions, if any, are required.
- It should be ensured that all on-site personnel, as well as all independent contractors, are aware of any possible exposure to hazardous substances.

It is recommended that an allowance be made for the commission of a Designated Substances Survey (DSS) to identify any hazardous substances present on-site, including their locations and concentrations (mandatory under Ontario regulations). The scope of this survey should include: site inspection to establish likely presence of designated substances; collection of representative samples and laboratory analysis; estimation of quantities of substances present; and recommendations to address the presence of the designated substances, including remediation and/or managing/monitoring. This information allows persons working on site (e.g. construction demolition/renovation, maintenance activities, repairs, etc.) to take appropriate actions in controlling exposure to themselves and others. Designated substances include: acrylonitrile, arsenic, asbestos, benzene, coke oven emissions, ethylene oxide, isocyanates, lead, mercury, silica (free crystalline silica), and vinyl chloride monomer (not PVC). This study should be completed in the 1st year, at an estimated cost of $65,000.

1.7 Code Compliance

Compliance issues identified throughout the facility are described within the report under their applicable components.

- It is recommended that these items be addressed on an urgent basis.
- Due to the extensive nature of correcting some of the identified items, it is further recommended that the 'Authority Having Jurisdiction' (being HRSDC Labour Programme, Fire Protection Engineering), be consulted to determine what interim measures, if any, can be employed to ensure that occupant health and safety is not compromised.

In addition, several compliance issues with respect to the 'general design' of the facility have been identified, as follows:

- NBC 3.1.8.1. - Service core doors are not fire rated (located in required fire separations).
- NBC 3.1.8.11. - Not all service core doors are not equipped with self-closing devices (some corridor doors, all lab doors).

- NBC 3.3.1.3.(8)(b)(i) - Required second exit from the 4th - 7th floor service cores lead through adjacent laboratories (some through posted hazard areas, some doors blocked by equipment or sealed off).
- NBC 3.3.1.9.(7) - A dead end corridor exists at the 2nd floor Hydraulic Lab office area.
- NBC 3.1.8.4., 3.1.8.11., 3.1.8.12, and 3.1.8.13. - Issues with doors in fire separations throughout - some not rated, some not closing/latching unassisted, some propped/ wedged open, some binding in open position, some exit devices dogged open, some hold-open hardware, some with push/pull hardware, some with electric strikes with unconfirmed operation (fail-safe or fail-secure).
- NBC 3.1.8.1. and 3.1.9.1. - Fire stopping in the A&L service cores - penetrations without sealant, items removed and not sealed, no visible firestopping between service core and labs/corridors.
- NBC 3.4.4.1. - The fire separation at Stair HW is not continuous - opening above ceiling between corridor and exit stair/vestibule.
- NBC 3.4.4.4.(7) - Exit stairs opening directly into service rooms (3rd floor and penthouse).
- NBC 3.4.4.2. - Exit stairs lead through entrance vestibules, essentially making them ‘exit lobbies’ - only a single ‘exit lobby’ is permitted (in this facility it’s Stair CC in the main entrance).
- NBC 4.4.4.2.(2)(f) - Entrance vestibules which form part of the ‘means of egress’ (i.e. between exit stairs and the exterior doors) offer various levels of separation from the main building areas - some without door latching hardware, some with unrated framing (aluminum), some without wired glazing.
- NBC 3.2.8.5. - Vestibules are not provided at the 1st and 2nd floor where exit stair CC2 and the passenger elevators open into an interconnected floor space (lobby/Mall).
- NBC 3.1.8.14. - Area of wired glass in doors/sidelights at exit stairs (including vestibules at 1st floor exit lobbies) and glazed openings in fire separations throughout the Mall, may exceed allowable limits.
- NBC 3.4.4.2.(2)(b) - The travel distance of exit Stair CC through the lobby is approximately 25 m (max. permitted is 15 m).
- NBC 3.4.4.2.(2)(d) - The lobby through which exit Stair CC leads is an interconnected floor space (lobby/Mall).
- NBC 3.1.13.2 - Combustible material in the exit stairwell lobbies/vestibules may not meet allowable flame-spread rating - wood ceilings.
- NBC 3.4.6.4.(7) and 3.4.6.5.(5) - Stair handrails do not have adequate extensions and returns, while guards have unprotected openings.

Many of these identified issues may be a result of continual changes in applicable code requirements over time, and therefore may not apply retroactively. It may be enough to be aware of these conditions and risk manage them (implement corrective actions as/when practicable) as opposed to taking immediate corrective actions; however, this determination is solely at the discretion of the ‘authority having jurisdiction’. Also, without first confirming the particulars of the facility with respect to classification and occupancy, it would be impractical to make any recommendations without proper assessment of required fire separations and exit/egress requirements.

It is recommended that an allowance be made for the commission of a fire protection study that will define the major occupancy and classification of the facility, identify individual occupancy types at locations throughout, and identify the locations and ratings of required fire separations. In addition, this study should evaluate existing fire separations, egress conditions, and fire protection systems against those required (gap analysis), and provide recommendations for corrective actions (including associated costs and priorities). This study should be completed in the 1st year, at an estimated cost of $55,000.

PART 2 - VERTICAL TRANSPORTATION

2.1 Elevating Devices

2.1.1 Elevators, Passenger

Two (2) duplexed passenger elevators are located in the front lobby:
Elevator 1 - Installation No. 10885
Elevator 2 - Installation No. 10886

- Type: Geared traction VVVF (Variable Voltage Variable Frequency AC).
- Controllers: 3200 Normic with Northstar 9000 dispatching
- Capacity: 1135 kg/14 persons (2,500 lbs.)
- Rated Speed: 2 m/sec. (400 ft./min.)
- Stops/Openings: Car 1 - 7 stops, 7 openings - 1st to 7th floor
  Car 2 - 6 stops, 6 openings - 1st to 7th floor, no access to 3rd floor
- Cab Dimensions: 2000 x 1200 mm (width x depth)
- Cab Interiors: grey patterned hang-on wall panels with stainless steel handrails, reveals, access walls and car doors; flooring is smooth grey patterned linoleum; lighting is by three separate fluorescent fixtures.
- Doors: Type - centre opening; Width - 1050 mm wide; Protection - solid state infrared with nudging.

Car 1 has a keypad on its car operating panel (COP) to provide coded, restricted access to the 3rd floor (mechanical room).

The duplex system has phase one and phase two operation. Phase one (firemen's recall) key switch is located in the lobby riser at the main floor lobby, a fireman’s key switch is located in the COP of number one elevator. At the main floor hall rise is also a key switch to choose which elevator is to be placed on emergency power when conditions warrant.

1. Condition

The passenger elevators are considered to be in good overall condition, being well maintained and operating well. Stops and starts are smooth, cars level accurately at every floor. The elevators are under complete maintenance contracts with Thyssen Krupp Elevator (specific contract details and expiry date unknown).

2. Recent Repairs/Modifications

The passenger elevators were completely modernized in 2001 (included new machines, controllers and door operators).

3. Design Problems/Deficiencies

Other than identified accessibility issues (see ‘1.5 Accessibility’ above), to our knowledge, no design problems/deficiencies exist with the passenger elevators.

4. Effective Remaining Life

The passenger elevators date from the original construction of the facility in the early 1970's (manufactured and installed by Otis Elevator) but were completely rebuilt in 2001 with new machines, controllers and door operators, and utilizing Thyssen Krupp's Northern technology (installed by Niagara Elevator). Given their current condition, and with continued good maintenance, the passenger elevators can likely be expected to perform over the next 25 years.

5. Major Repairs/Recommendations

Other than normal maintenance, no major repair/replacement are anticipated for the passenger elevators.

2.1.2 Elevators, Freight

There are two (2) freight elevators in this facility:

<u>Elevator 3 - Installation No. 10887</u> - located at the north end of the A&L structure.
- Type: Geared traction, VVVF (Variable Voltage Variable Frequency) AC
- Controller: Normic 3200
- Capacity: 3175 kg (7,000 lbs.)
- Rated Speed: .176 m/sec. (350 ft./min.)
- Stops/Openings: 8 stops, 8 openings - 1st to 7th floor
- Cab Dimensions: 2400 x 1725 mm (width x depth)
- Cab Interior: hang-on panels with stainless steel reveals, access wall, handrail and a lower bump rail; ceiling is white painted steel panels; flooring is one piece linoleum 'non-skid' surface; lighting consists of eight single fluorescent tubes.
- Doors: Type - centre opening; Width - 1200 mm; Protection - solid state with nudging.

Phase one key switch is located in the riser at the ground level floor, fireman's key switch is located in the cab. Access to third floor is through coded keypad.

<u>Elevator 4 - Installation No. 10842</u> -
- Type: Otis Single speed AC, basement drum machine 2:1 hitch
- Controller: Otis
- Capacity: 1135 kg (2,500 lbs.)
- Rated Speed: .25 m/sec. (50 ft./min.)
- Stops/Openings: 2/2; 1st to 2nd
- Cab Dimensions: 2260 x 1825 mm (width x depth)
- Doors: Type - bi-parting manual, through & through cab, 'Boswick' gates; Width - 1575 mm; Protection: n/a.

1. Condition

The freight elevators are considered to be in good overall condition, being well maintained and operating well.

2. Recent Repairs/Modifications

Elevator 3 was completely modernized in 2003 (included an entire new machine, controller and door operator).

To our knowledge, no recent repairs/modifications have been carried out on Elevator 4.

3. Design Problems/Deficiencies

To our knowledge, no design problems/deficiencies exist with the freight elevators.

4. Effective Remaining Life

Elevator 3 dates from the original construction of the facility in the early 1970's, but was completely rebuilt in 2003 with new machines, controllers and door operators. Given its current condition, and with continued good maintenance, the passenger elevators can likely be expected to perform over the next 25 years.

Elevator 4 dates from original construction of the facility in the early 1970's. It is a simple, rugged design, and with continued good maintenance can likely be expected to remain in service indefinitely.

5. Major Repairs/Recommendations

Other than normal maintenance, no major repair/replacement are anticipated for the freight elevators.

2.1.3 Escalators

There are no escalators in this building.

2.1.4 Dumbwaiters

There are no dumbwaiters in this building.

2.2.5 Platform Lifts

There are no platform lifts in this building.

2.2 Dock Hoists

2.2.1 Scissor Lifts

There are no scissor lifts in this building.

2.2.2 Dock Levellers

There are two (2) dock levellers at this facility, located in recessed pits at the warehouse area overhead doors (M and N):

- Manufacturer: Blue Giant
- Installer: Unknown
- Capacity: Unknown

1. Condition

The dock levelers were found to be in fair overall condition, with no obvious damage/deterioration and no problems identified by on-site personnel.

NOTE: The dock levelers were not operated at the time of inspection.

2. Recent Repairs/Modifications

To our knowledge, no recent repairs/modifications have been carried out on the dock levelers.

3. Design Problems/Deficiencies

To our knowledge, no design problems/deficiencies exist with the dock levelers.

4. Effective Remaining Life

The age of the dock levelers is unknown; however, given their current condition, with normal maintenance, these units can typically be expected to perform indefinitely.

5. Major Repairs/Recommendations

Other than normal maintenance (i.e. regular monitoring and minor repairs), no repairs/replacements are anticipated for the dock levelers.

PART 3 - MECHANICAL

The location of this building allows that advanced engineering solutions be taken into consideration before replacing the major mechanical systems. An engineering and feasibility study will investigate the potential usage of renewable energy (wind, solar energy, geothermal). The study is recommended to be taken in the second year before major decisions for capital replacements are made. This should lead to energy efficient and ecological solutions applicable to major retrofits. The estimated value of this complex study is estimated at $200,000.

3.1 Primary Services

3.1.1 Heating

The main group of building consists of: Administration/Laboratories, Research & Development, Ecotoxicology Laboratories, Workshop/Warehouse; WTC building is part of the same central heating system but will be referred to under a separate section.

The central heating system for the Administration/Laboratories, the Research &Development, the Ecotoxicology Laboratories Workshop/Warehouse, hydraulic wet laboratories & offices is provided from a jacket water co-genarator loop, a waste feed steam boiler, a direct contact hot water heating boiler (Sofame - not fully commissioned), and three steam boilers.

The primary equipment and their associated distribution components are in the boiler/chiller room, in the lower boiler room, and in the mezzanine mechanical room located on the ground floor. The output of each unit is connected respectively to the high/low pressure headers located on the mezzanine mechanical room, to the glycol loops, and to the steam/ hot water heat exchangers located in the mechanical rooms on the third floor.

Systems and distribution taken from site are as follows:

A high pressure steam main is supplied to the R&D 3rd floor in the Administration/ Laboratories mechanical room, to the workshop/warehouse building, and to the hydraulic mechanical room.

Two pressure regulators are installed in the high pressure headers to decrease the steam pressure from approx. 75 to 15 lbs. The low pressure steam is generated to serve the building steam unit heaters, the steam to hot water heat exchangers, the steam to glycol heat exchangers, and the decommissioned direct steam spray humidification system installed in air handling units. The direct spray humidifiers were disconnected due to concerns in regard to the dispersion of volatile chemical steam treatment in all occupied space.

The perimeter induction units are installed in the main building on 4th, 5th, 6th, and 7th floors. The steam unit heaters are located in the mechanical room (2 units) and in the staircase or door areas as follows: A&L - 20 units, R&D - 13 units, hydraulics - 19 units, waste water - 27 units. The steam to hot water heat exchangers steam to glycol heat exchangers are located in mechanical rooms. The steam to glycol heat exchangers are located in the mechanical rooms.

The jacket water co-generator loop consists of a water loop circulated through the co-generator engine and three heat exchangers reclaiming and distributing hot water and the glycol to main mechanical rooms. The heat exchangers were manufactured by Alfa Laval.

The waste heat steam boiler consists of a high pressure steam boiler manufactured by Cain Industry. It is operated by E.S.G.I. C.T.B. panel board capable of monitoring the power on/off, high or low water cut off, excess steam pressure, and low air pressure capacity. It appears that the existing units were installed in 1994. The Cain boiler is designed to produce 1000 lbs. steam per hour generated from cogen flugas.

The direct contact hot water heating boiler consists of a Sofame high efficiency, packaged with gas fired, force draft burner, evaporator, a heat exchanger, three circulating pumps, and one expansion tank. The heating boiler has a maximum firing rate of 3,810 kW (13,000 MBH). The existing equipment was installed in 2007 and looks oversized. Operating at full capacity, it may produce steam in excess, but is suspected that there are no conditions for operation at full capacity and from this reason is not fully operational to date.

The steam boilers consists of three high-efficiency low nox burner, Thermogenic Thermocoil Steam Boilers complete with economizers. Each has a minimum capacity of 655 kW (2,200 MBH) and a maximum capacity of 3,224 kW (11,000 MBH) capable of supplying steam up to 75 lbs. The unit accessories consists of a steam drum, an economizer, a circulating pump and air blower pump. The existing units were installed in 2006 - 2007.

Treated water for the boilers is provided by the Reverse Osmosis system (R.O.) and associated chemical treatment system. The equipment and associated components are located on the 2nd level mezzanine floor. The units are maintained at a regular basis by Environment Canada property management. Installation date for the R.O. system is 2001 and de-aerating tank is 2004. R.O is feeding the Lab section.

Three base mounted feed water pumps are installed to provide the force circulation of the feed water throughout the steam boilers. They are located in the lower boiler room.

Primary control of the boilers and heating components is controlled and monitored by a Delta Direct Digital Control (DDC) system.

Steam-to-glycol heat exchangers are located in the 3rd floor mechanical rooms and are serving the preheat coils in the air handling units.

Main glycol pumps are installed to provide the force circulation to secondary glycol pumps a each air handling unit.

An expansion tank is dedicated to the glycol loop system, and is ceiling mounted.

Variable speed drives have been installed on the primary heating water pumps for enhanced operational efficiency.

The existing components of the hydronics heating system are a combination of new and original components. Unless otherwise noted, all the system pipes, valves and heating equipment are from the original construction, built in 1970.

1. Condition

The existing equipment and associated components are from the original construction (1970) are considered to be in fair condition, based on their age and operating environment.

The existing equipment and associated components installed in 1980 and 1994 are considered to be in fair to good condition, based on their age and operating environment.

The existing equipment and associated components installed in 2004 and after are considered to be in good condition.

The existing steam direct spray humidification system is not in operation. It has been decommissioned for quite some time.

Unless otherwise noted, the existing heating equipment and associated components are considered to be adequate for the facility based on the existing occupancy.

2. Recent Repairs/Modifications

Recent modification to the heating equipment included the replacement of the steam boilers in 2006 - 2007, and the installation of the direct contact hot water boiler in 2007.

3. Design Problems/Deficiencies

To our knowledge, no design problems/deficiencies exist with the current steam distribution systems, glycol or hot water heat exchangers, based on the original design intent.

Efforts made to correct deficiencies on the Sofame system. If the system cannot be used in the near future (1 - 2 years) consideration shall be given to reassess the design and future options.

The steam humidification system is decommissioned due to the direct steam main connection capable to carry chemical treatment into the air handling air supply outlet distributed to the occupied spaces. The existing humidification is not in compliance with the Federal Labour Code B29 requirements for humidification of workplace occupied space, or ASHRAE Standard 62, which is intended to provide 20 - 30% Relative Humidity during heating season, to mitigate growth of allergenic or pathogenic organisms.

4. Effective Remaining Life

Based on present day industry standards, the existing steam boilers installed in 2006 - 2007, and direct hot water boilers installed in 2007 have a useful economic life of 25 - 30 years, based on ASHRAE guidelines, if proper maintenance practices and repairs are conducted.

The waste feed steam boiler (Cain) installed in 1994 is currently inoperable and slated for replacement in winter of 2010.

It is anticipated that the existing Alfa Laval (3) heat exchangers reclaiming heat from the co-generator system should be in operation for the next 5 year time period. However, it is recommended that a complete detailed assessment for replacement be conducted in 2014, at an estimated cost of $5,000.

Based on present day industry standards, the existing condensate tanks have a useful economic life of 30 years, based on ASHRAE guidelines. The existing units have been in operation for 39 years. They have passed the end of their normal life expectancies. It is recommended that consideration for replacement of the secondary condensate tanks be executed over a period on 5 years, at an estimated overall cost of $400,000 ($80,000 per year). This action may be delayed or reconsidered if the steam supply will be substituted in favor of hot water distribution.

Based on present day industry standards, the existing spray humidification system have a useful economic life of 30 years, based on ASHRAE guidelines. It appears that the existing units and components are from the original construction in 1969 -1970. They have exceeded their life expectancy. It is recommended that a complete detailed engineering evaluation/report of the existing system and new design be conducted in the year 2010-2011. Our estimated cost for the engineering evaluation and new design is $100,000. The Reverse Osmosis system to be reassessed when designing the new humidification system as applicable.

Consideration should be given to change the old shell/tube heat exchangers to plate heat exchangers. A study/assessment should identify the volume of replacement and type of replacement. This identification should be executed in the 2nd year, at an approximate cost of $30,000.

5. Major Repairs/Recommendations

The Reverse Osmosis system to be reassessed when designing the new humidification system.

3.1.2 Cooling

The primary cooling for the Administration/Laboratories, the Research & Development, the workshop & warehouse hydraulic laboratories & offices, and Wastewater Technology building is provided by two 700-ton centrifugal water chillers located in the boiler/chiller room. The chillers were manufactured by Trane, designed to operate only during the summer season, and using refrigerant HCFC-123 in the refrigerant circuit. The existing units were installed in 1990 - 1991 and converted to from CFC-11 to HCFC-123 in 2000.

The existing chillers are complete with a purge alarm and pressure relief valve piped to the exterior.

A leak detector and refrigerant monitoring system are installed in the vicinity of the chillers. They are connected to the DDC panels and monitored by the operator terminal installed in staff operational rooms.

A dedicated exhaust system is installed for removal of refrigerant gas in the event of a system leak.

Heat rejection for the main building cooling systems (and cogen) is provided by the bay water. The primary pumps provide the required force circulation to secondary condenser water pumps in boiler room which remove heat from chiller (and cogen). Current design is underway for two cooling towers.

Two base mounted pumps provide the required force circulation of the chilled water to air handling units and perimeter rads.

Mechanical Filtration packages are dedicated to the chilled water system and majority of hot water heating loops. They consist of base mounted pumps, filters and control panels. The units are located in the boiler/chiller room and 3rd floor mechanical room A&L.

An expansion tank dedicated to the chilled system is ceiling mounted. The existing tank was installed in 1970.

The cooling for the wet laboratories fresh water is provided by two chillers, two air cooled condensers, two cooling plate exchangers, and two heating plate heat exchangers. The required force circulation of the hot and chilled water throughout the systems is provided by centrifugal water pumps. The chillers are located in the lower boiler room. The condensers are located on the ground level along the north wall of the boiler/chiller room. The plate exchangers are located in the mechanical room L140. The existing equipment have been recently installed. They have an anticipated effective life of 16 - 20 years, if proper maintenance practices are applied.

Please refer to Appendix C for a list of equipment with over 5.4 tons cooling capacity.

1. Condition

The existing condenser tubes at centrifugal chillers are in poor condition. 30 to 40% of the tubes are plugged, thus reducing the overall efficiency of the chiller system.

2. Recent Repairs/Modifications

Recent modifications to the chillers included the refrigeration conversion from R-11 to R-123; internal inspection, and the compressor overhauls were completed also in 1999 - 2000.

3. Design Problems/Deficiencies

It is suspected that the use of bay water in condensers bundle of the chillers generated failure of tubes over time.

4. Effective Remaining Life

The normal anticipated life expectancy for the existing chillers is in the 30 year range, based on ASHRAE guidelines. Condition of the chillers should be reassessed based on condition of the evaporator and condensers. Failure of condensers is anticipated in the short term.

5. Major Repairs/Recommendations

It is to be determined through an assessment which is the most feasible solution: Replacement of the condenser bundles with increased maintenance of chillers over the next 5 - 10 years, or replacement of the two chiller systems, complete with new piping, pumps and all associated components in order to match the sizing of the new cooling tower in process to be installed.

The assessment is estimated at $60,000, to be executed in the first fiscal year. The potential replacement of the chillers and related components is anticipated in second year, at an estimated cost of $2,250,000.

3.2 Secondary Services - Heating/Cooling

3.2.1 Hydronic Heating System

Secondary heating of each facility is by perimeter wall induction units, radiation wall fin units, vestibule fan coil units, steam and hot water unit heaters, glycol coils, hot water coil mounted in the air handling units. All the heating units in the facility are directly reliant upon the existing boilers and cogen, piping and circulating pumps in order to operate as intended.

Secondary heating units such as electric baseboard heaters or force flow heaters are installed in limited quantities for supplemental heating in problem areas.

Secondary heating units such as passive solar heating panels are installed in the Hydraulic Laboratories & offices. The heat reclaiming coil is interconnected with air handling unit number 44 in the Hydraulic Laboratories & offices. The existing panels are installed on the southwest walls.

The existing components of the hydronic heating system are a combination of new and original components . Unless otherwise noted, all the system pipes, valves and heating equipment are from the original construction, built in 1970.

1. Condition

In most cases, the existing units are suspected to be from the original construction of the facility and are considered to be in fair condition.

2. Recent Repairs/Modifications

No recent major repairs or modifications were noted on the systems.

3. Design Problems/Deficiencies

To our knowledge, no design problems/deficiencies exist with the hydronic heating system.

4. Effective Remaining Life

It is anticipated that the existing perimeter wall induction units, radiation wall fin units, vestibule fan coil units, steam and hot water unit heaters should be in operation for the next 5 years with relative limited risk.

However, consideration should be given of in depth assessment of physical condition and design for replacement of the new system.

5. Major Repairs/Recommendations

Assessment of physical condition of the rads is recommended in the first year, at an estimated amount of $50,000 in all areas of the CCIW. Design for replacement/new radiation system should be considered in the second year at an estimated amount of $100,000.

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3.2.2 Supplemental Heating Units

Only small quantities of electric baseboard heaters are installed throughout CCIW.

3.2.3 Primary Air Supply

The air delivery system consists of several air handling units located in the Administration/ Laboratories mechanical room, in the R&D mechanical rooms, and on the roof of the Administration/Laboratory building, in the Wastewater Technology penthouse, and on the roof of the Annex Building. These units supply conditioned and fresh air to the occupied space via air ducts or variable air volume (VAV) boxes installed throughout the facility. The majority of air handling units are typically fitted with inlet/exhaust/bypass dampers, mixing plenum, filters, preheating glycol coil, hot water heating coil, cooling coil, smoke and carbon dioxide detectors, supply and return air fans and low pressure dedicated distribution ducting system. These units use centrifugal type fans for the supply, return and exhaust of the building air.

The penthouse mechanical rooms also contain the required exhaust units dedicated to the client fume hood exhaust units. All the fume exhaust ducts are terminated with a cone fitting 3 meters above finished roof.

Variable speed drives have been installed on some primary supply and return fans for enhanced operational efficiency.

The existing components of the air supply system are a combination of new and original components. Unless otherwise noted, all the equipment, system ducts, dampers, and diffusers are from the original construction built in 1970.

<u>Equipment installed in Administration/Laboratories mechanical room on third floor is as follows:</u>

The air handling unit numbers were taken from site.

<u>Administration and Laboratories</u>:

- Air handling unit number 21, capacity 10,300 C.F.M. The unit is ducted overhead with ceiling diffusers supplying the air distribution system in the cafeteria.
- Air handling unit number 22, capacity 18,675 C.F.M. The unit is ducted overhead with ceiling diffusers supplying the air distribution system in the computer room.
- Air handling unit number 23, capacity 10,900 C.F.M. The unit is ducted overhead with ceiling diffusers supplying the air distribution system in the auditorium.
- Air handling unit number 24, capacity 14,900 C.F.M. The unit is ducted overhead with ceiling diffusers supplying the air distribution system in the library.
- Air handling unit number 25, capacity 25,170 C.F.M. The unit is ducted overhead with ceiling diffusers supplying the air distribution system in the Administration area.

- Air handling unit number 26, capacity 9,600 C.F.M. The unit is ducted overhead with ceiling diffusers supplying the air distribution system in the Mall.

- Air handling unit number 27, capacity 42,800 C.F.M. The unit consists of dual ducts supplying the air distribution system in the south laboratory.

- Air handling unit number 28, capacity 61,240 C.F.M. The unit consists of dual ducts supplying the air distribution system in the north laboratory.

- Air handling unit number 29, capacity 40,900 C.F.M. - not in function- will be removed March 2010 - The unit is ducted overhead and used to supply the fume hoods make-up air distribution systems. It is recommended to disconnect and remove the existing unit, the associated components/controls and the supply/return ducts installed in the mechanical room and in the laboratories service corridors. All floor wall openings are to be filled in with fire rated materials. .

- Air handling unit number 30, capacity 40,900 C.F.M. - decommissioned.

- Air handling unit number 31, capacity 21,850 C.F.M. - serves the perimeter system.

<u>Equipment installed in R&D mechanical rooms on the third floor is as follows</u>:

The air handling unit numbers were taken from site.

- Air handling unit number 1 (1st & 2nd floor Offices), capacity 66,180 C.F.M. The unit consists of dual ducts supplying the air distribution systems on the first and second floor offices in the R&D building.

- Air handling unit number 2, Shop unit 1st floor, capacity not available. The unit is ducted overhead supplying the air distribution systems in the ship area machine shop High Bay.

- Air handling unit number 3, Wildlife 1st floor, capacity 2,200 C.F.M. The unit is ducted overhead supplying the air distribution system in the wild life enforcement.

- Air handling unit number 4, Ecotox storage 2nd floor, capacity not available. The unit is ducted overhead supplying the air distribution system in the battery room/volatile room on the first floor, and chemical storage W204 on the second floor.

- Air handling unit number 5, Calibration lab 1st floor, capacity 5,290 C.F.M. The unit is ducted overhead supplying the air distribution system in the calibration laboratory.

- Air handling unit number 6, 2nd floor - Ships wing, capacity 8,740 C.F.M. The unit is ducted overhead supplying the air distribution system in the ships wing workshop offices.

- Air handling unit number 8, Boiler Room, capacity not available. The unit is ducted overhead supplying the combustion system air in the boiler plant.

- Air handling unit number 9, Boiler Room, capacity not available. The unit is ducted overhead supplying the air distribution system in the boiler plant engineer‘s offices.

- Air handling unit number 10, Receiving area office, capacity not available. The unit is ducted overhead supplying the air distribution system in the warehouse offices.

Exhaust fans for the washrooms are installed in the mechanical penthouse and on the building roof. It appears that the existing units were installed in the mid-1970's.

Elevator machine rooms' exhaust fans are roof mounted. It appears that the existing units were installed in the mid-1970's.

A ceiling exhaust fan is installed for the spray booth located on the mezzanine floor in the ship's warehouse.

Some of the laboratory fume hoods and equipment cabinets in the main Administration/ Laboratories, and Research & Development, are ducted and connected to the exhaust fans located in the penthouse mechanical room on the eight floor. The existing exhaust fans are from the original construction in 1969-1970. Their normal life is in the 25 - 30 year range, based on ASHRAE guidelines.

The existing fans have exceeded their normal life expectancy. With normal maintenance practices applied, the existing equipment should perform to their intended function over the next 5 years. It is recommended that a complete detailed engineering evaluation of the existing equipment be conducted in the 2nd year. Our estimated cost for the engineering evaluation and design specification is $200,000. The replacement construction cost will be determined and provided by the consultant engineer.

<u>Equipment installed on the roof of the Ecotoxicology Laboratories and Workshop/ Warehouse</u>:

- Air handling unit number 11, Ecotox, capacity not available. The unit is ducted overhead supplying the air distribution system into the Ecotoxicology laboratory.

- Air handling unit number 12, Boat shop, capacity not available. The unit is ducted overhead supplying the air distribution system in the boatshop.

- A rooftop heating/cooling unit is serving the machine shop on the ground floor in the warehouse. The existing unit was installed in 2009. Based on its age and operating environment, it is considered to be in good condition, has an anticipated effective life of 16 - 20 years if proper maintenance practices are applied.

- A rooftop heating/cooling unit is serving the mail room on the ground floor in the warehouse.

- A rooftop heating/cooling unit is serving the shipping/receiving offices on the first and second floor in the warehouse.

- A rooftop cooling unit is serving room 219 A on the second floor in the Ecotoxicology Laboratory.

- A rooftop cooling unit is serving room 224 G on the second floor in the Ecotoxicology Laboratory.

Ecotoxicology fume hoods exhaust fans are installed on a steel frame mounted above the building roof. They were installed in 1996. Their operational condition is considered to be fair. It was noted that their enclosures are corroded due to the weather exposure and acid fumes. An assessment to replace or repair this system will be considered in the first year, at an estimated cost of $8,000.

Exhaust fans for the workshop/warehouse are installed on the building roof. It appears that the existing units were installed in the mid-1970's. The existing units have a useful economic life of 30 years, based on ASHRAE guidelines, and have exceeded their normal expected life. Assessment of condition and recommendation for replacement to be executed in 2nd year, at an estimated cost of $8,000.

1. Condition

The Air Handling Units air units are from the original construction of the facility and are considered to be in fair condition; however, most units have exceeded their normal anticipated life expectancy.

2. Recent Repairs/Modifications

Other than normal maintenance, to our knowledge, no other recent repair/modification works have been conducted on the main air handling units.

3. Design Problems/Deficiencies

To our knowledge, no design problems/deficiencies exist.

4. Effective Remaining Life

The life expectancy of the primary/secondary air handling units (except fumehood/ exhaust systems) is in the 30 - 35 year range. Based on the age of the units, they have exceeded their normal anticipated life expectancy. It is anticipated that the existing units will be in operation for the following 5-10 years, if proper maintenance practices and procedures are applied. It is recommended that a complete detailed engineering evaluation/ report of the air handling units be conducted in the second year (2011). This value added engineering will prove effective in the selection of a new system/capital repairs/upgrades and will ensure system capacities, compatibility, life expectancy, operational life cycle cost analysis, environmental and indoor air quality considerations are taken into account, and will provide working drawings and specification. Our estimated cost for the engineering evaluation is $200,000. The replacement construction cost will be determined and provided by the consultant engineer.

5. Major Repairs/Recommendations

The construction work for Air Handling Units - replacement/capital upgrades - will have to be scheduled in a specific order of priority.

A complete IAQ is recommended for the Main Building office spaces during the winter time and correlated with the study to convert/replace the existing humidification system for specific air handling units serving the office space. The value of this study will be included in the general amount for designing a new humidification system.

3.2.4 Supplemental Air Conditioning

Additional supplemental space cooling units are installed to meet the specific client requirements. All units are independently controlled. They are able to operate 24 hours per day, seven days a week, during winter and summer.

In most cases, these are small capacity units. Please refer to Appendix C for a list of equipment with under 5.4 tons cooling capacity.

A 2 x 5 tons Hyross cooling unit with water cooled condensers is installed in the main server room. The unit has two circuits (one compressor per circuit). The fresh air is supplied by the main air handling unit. It appears that the existing unit was installed in 1970, and revitalized in mid-1980. The unit is considered to be in fair condition

It is recommended that a complete detailed engineering evaluation/report be conducted to determine the cooling requirements for server room due to increase in electronic equipment. This value added engineering will prove effective in the selection of a new system and will ensure system capacities, compatibility, life expectancy, operational life cycle cost analysis, environmental and indoor air quality considerations are taken into account, and will provide working drawings and specification. Our estimated cost for the engineering evaluation is $10,000. This work shall be completed in the first year (2010). The replacement construction cost will be determined and provided by the consultant engineer.

1. Condition

The existing systems are from various installation dates based on client fit-up. Condition of the units varies depending on their age and application.

2. Recent Repairs/Modifications

No recent repairs or modifications were reported or noted on the systems. Regular maintenance/servicing/repair of the units is conducted by the operational staff under O&M, as well as by specialized outside contractors,

3. Design Problems/Deficiencies

To our knowledge, no design problems/deficiencies exist with the supplemental cooling system.

4. Effective Remaining Life

A number of small capacity units (approximately 90) such as air dryers, air conditioners, ice machines, walk-in freezers and coolers are contained in the inventory list. The repairs and conversions will be carried out under O&M budget.

5. Major Repairs/Recommendations

Other than normal maintenance, no other specific actions are anticipated over the effective remaining life of the systems.

The replacement of CFC systems will considered with priority where applicable. Updates on halocarbon logs in reference to inventory and record keeping, as well as reporting procedures should be considered.

3.3 Control System

A variety of controls are used in the building HVAC systems for operating the mechanical units. The existing is a combination of electric and pneumatic controllers for the sensing and modulation of various flow control devices, as well as the start/stop operation. The HVAC systems and associated components are controlled by the original Delta Direct Digital (DDC) system. The existing EMCS system is in the process of being converted and upgraded. The master control PCs are located in the building operators' offices, and mechanical room. The existing system is accessible via telephone for remote diagnostics.

Dry compressed air for the operation of pneumatic controls is supplied by three compressors. The existing units were manufactured by Ingersol Rand. They were installed in 2008 - 2009 and are considered to be in good condition. The horizontal air receiver is suspected to be from 1970.

1. Condition

The existing system is of the latest generation, PC driven systems available from Delta/Orca. This new direct digital control is operating as intended and considered to be in good condition and suitable for the application, and capable of future expansion.

2. Recent Repairs/Modifications

Other than the present upgrading and normal maintenance, to our knowledge, no repairs have been conducted on the existing control system.

3. Design Problems/Deficiencies

Based on the original intent and design criteria, no deficiencies were noted or reported.

4. Effective Remaining Life

The effective remaining life of the existing DDC system is anticipated to be in the 15 - 20 year range if proper maintenance practices and procedures are applied. An assessment for a new DDC control system will be considered in the next 15 years.

3.4 Storm Sewer System

The building and grounds storm sewer system are from the original construction of the building and are discharged into Hamilton Harbour.

Roof drains for the building, including penthouse mechanical room roofs, are connected to the building storm sewage system. This piping system is anticipated to be from the original construction of the building.

Visual inspection of the system was limited to that in exposed areas in and around the building. It is assumed that limited PVC piping was used in the construction of the storm drainage system during renovations and client fit-up.

1. Condition

The piping appears to be in fair condition, with no indication of leaks or deterioration. It is anticipated that the existing will be in operation for the following 10-15 years, with no unexpected failures, if proper maintenance practices and procedures are followed.

Catch basins on the grounds and in the parking area appear to be operating as intended with no reported problems. It is anticipated that these units will be in operation for the following 25 years, with no unexpected failures if proper maintenance practices and procedures are followed.

2. Recent Repairs/Modifications

Some minor repairs to the building storm drains have been conducted in conjunction with roof repairs.

3. Design Problems/Deficiencies

To our knowledge, no design problems/deficiencies exist with the system.

4. Effective Remaining Life

It is anticipated that the storm sewer system will remain in operation for the following 10 - 15 years, based on the normal anticipated effective life of approximately 50 years. An assessment/investigation of existing catch basins is recommended in year 2, at an estimated cost of $10,000.

3.5 Sanitary Sewer System

The drainage from all the washrooms, lunchrooms, mechanical rooms, janitor's closets, and emergency showers and labs is connected to the building sanitary sewage piping system. All piping available for inspection was noted as being metallic.

All the drains from the laboratory equipment is collected into glass pipes and connected to two acid neutralization tanks. One tank is located in the Mall area underneath the stair on the ground floor. The other one is located in the workshop/warehouse on the ground floor. The tank outlets are connected to the building sanitary sewage system. All piping available for inspection was noted as being glass. The CCIW building sewage mains are connected to one pumping station containing two submersible pumps. The pump outlets are connected to the services of the local municipality and are considered to be working as intended.

Visual inspection of the system was limited to that in exposed areas in and around the building. It is assumed that limited PVC piping was used in the construction of the storm drainage system during renovations and client fit-up.

The drains from the weeping tiles and the elevator pits are pumped by submersible pumps into the building sanitary system. The pumps have been replaced over the life of the facility.

1. Condition

All piping available for visual inspection was noted as being metallic. It is assumed that no PVC piping was used in the construction of the sanitary drainage system.

The piping appears to be in good condition, with no indication of leaks or deterioration.

2. Recent Repairs/Modifications

To our knowledge, no modifications have been conducted on the sanitary drainage system.

3. Design Problems/Deficiencies

To our knowledge, no design problems/deficiencies exist with the system.

4. Effective Remaining Life

It is anticipated that the existing will be in operation to serve it's intended purpose for the following 10-15 years, if proper maintenance practices and procedures are applied.

5. Major Repairs/Recommendations

Other than normal maintenance, no major repairs are anticipated over the remaining life of the system.

3.6 Domestic Hot Water System

Domestic hot water is generated through one, low pressure steam-to-hot water converter located in the mezzanine floor and cogen with the steam back-up. Buster pumps are located on the third floor mechanical room. The hot water in the building is provided in washrooms, laboratories, janitors closets and cafeteria. The existing storage tank was installed in 1969 - 1970.

1. Condition

The hot water piping is considered to be in good to fair condition, with no problems reported.

2. Recent Repairs/Modifications

Some minor repairs to the domestic hot water system have been conducted in conjunction with a tenant upgrade.

3. Design Problems/Deficiencies

To our knowledge, there are no design problems/deficiencies associated with the domestic hot water system.

4. Effective Remaining Life

Based on present day industry standards, the existing hot water heaters have a useful economic life of 20 - 25 years. It is anticipated that the existing unit within the main building will serve for the next 10 years if proper maintenance and repairs are conducted.

An assessment of the system is recommended in the 5 - 10 year range, at an estimated cost of $5,000.

5. Major Repairs/Recommendations

Other than normal maintenance, no major repairs are anticipated over the remaining life of the system.

3.7 Plumbing System

The plumbing system in this facility provides potable water and drainage to the laboratories, washrooms, janitor's closets, refrigerated drinking water fountains, cafeteria and mechanical rooms in the facility. Specialty drainage systems installed for this facility are the grease traps in the cafeteria and a waste water neutralization system for the labs. Typical occupancy and use application is for a combination of labs and office space.

The typical washroom and janitor's closet fixtures are of the original construction, with some minor exceptions, and considered to be in fair condition.

City water pressure is boosted by two base mounted pumps. The units are dedicated to increase the pressure of the domestic cold and hot water from the 5th floor to the 8 ht floor. The existing systems are complete with flex connections, gate valves, and check valves.

1. Condition

The building plumbing system is considered to be in good to fair condition. The existing fixtures are from the original construction, with minor exceptions, and operating as intended. Water for the facility is purchased from the local community system and it is assumed that the supply quality meets the applicable guidelines.

2. Recent Repairs/Modifications

To our knowledge, no recent repairs or modifications have been conducted on the building plumbing system.

3. Design Problems/Deficiencies

To our knowledge, there are no design problems/deficiencies associated with the plumbing system.

4. Effective Remaining Life

Based on present day industry standards, the existing plumbing fixtures have a useful economic life of 25 - 30 years, based on AHRAE guidelines. The fixtures have been in operation for 39 years. They have passed the end of their life expectancies.

It is recommended that a complete detailed engineering evaluation of the existing plumbing fixtures and associated components be conducted prior to replacement. This value added engineering will prove effective in the selection of a new system/components and will ensure system capacities, compatibility, life expectancy, operational life cycle cost analysis.

Our estimated cost for the engineering evaluation is $60,000. This work should be completed in the 3rd year. The engineering evaluation will provide an estimation of the work that will have to be completed in the future.

3.8 Fire Protection System/Life Safety Systems

3.8.1 Water Supply, Standpipes, Fire Hoses

Fire hoses in cabinets are installed throughout the facility. Portable extinguishers were installed in each cabinet. Monthly inspection tags were provided and inspections of the units were dated and signed as required.

As per the National Fire Code of Canada, the building is fitted with standpipes and fire hoses installed in recessed wall mounted cabinets. The condition of the system is considered to be good. Monthly inspection is carried out and tags are attached. The existing hoses through-out the facility were manufactured in 10-92 and retested in 1998. Based on this information, it is recommended that hoses be hydrostaticaly tested in the first year. The standpipes are considered to be in good condition and are anticipated to be operational for the following 20 - 25 years, if proper maintenance practices and repairs are conducted.

3.8.2 Sprinkler System

Only the warehouse and Ecotox are sprinkled. Spare sprinkler heads and wrenches are provided in a cabinet for the system.

There are 5 specialized fire suppression systems:

- One fire suppression in A&L using FM200 (HFC-227ae) is serving the computer rooms L112A and L112B and Telephone Room L224;
- One dry fire suppression in A&L kitchen with K chemical for oil;
- One in A&L penthouse for floor 7 North - chemical storage using 5 cylinders with CO_2;
- One in W205 - Ecotox - using dry chemical - was disposed;
- One in R&D room R245 - as pre-action water sprinkler system.

To ensure full compliance with the Fire Commissioner of Canada, it is recommended that the following testing and verification of the systems over and above the expected monthly inspections be conducted:

Completed reports are to be filed for all test results and attached to the equipment. Copies are to be left on site for viewing and verification as needed.

It is recommended that the fire suppression system located on 7th floor be reassessed in the first year at an estimated cost of $10,000.

It is recommended that the need for a new fire suppression system/extension of sprinkler system be assessed for the Ecotox space. This will be completed in the first year, at an estimated cost of $10,000.

3.8.3 Portable Fire Extinguishers

The building has portable fire extinguishers installed, either stand alone or inside fire hose cabinets. The existing portable fire extinguishers are provided according to anticipated hazards, based on the normal occupancy type.

Monthly inspections are to be conducted on the portable fire extinguishers as required by the applicable Codes. Existing fire extinguishers are to be replaced on “as and when needed” basis, based on the monthly inspection reports. Replacement of these units is considered to be a maintenance item and not a capital expenditure. The testing, recharging and replacement of the extinguishers is included in other annual maintenance and service contracts issued by this department for fire protection systems.

No Code violations were noted regarding the installation of the fire fighting system in this facility.

3.9 Ozone Depleting Substances Management (ODS)

The attached refrigerant inventory for cooling equipment is contained in Appendix “C”.

PART 4 - ELECTRICAL

PREAMBLE - The following is a list of deficiencies noted to be consistent throughout each facility located within the 3 visited facilities located on the CCIW property in Burlington. Reference to these deficiencies will be listed under each facility to which they apply. Repairs or corrections undertaken should be considered globally and not necessarily on a per building basis.

A/ The current single line diagrams are outdated and require more detail to clearly indicate where each panel (shops, corridor and office area lighting and receptacle panels), Motor Control Centre (MCC) and components, transformers, emergency power panels, out building panels/electrical services, fuel supply pumps, etc. are all fed from. The Canadian Electrical Code (CEC) 2009 - Section 36-006 (4b) requires an accurate single line diagram be posted at all switching locations, clearly identifying each point of connection. PWGSC - Maintenance Management Services recommends that an updated detailed single line diagram be developed and posted in the main electrical room, the diesel generator room, and a copy kept within the facility maintenance office at all times. A large master all inclusive SLD drawing is recommended to be developed and kept in the property management office area.

It is also recommended that the following guidelines be utilized in the development of SLD's:

<u>Single Line Diagrams</u>
Full size - 762 mm X 1067 mm
Half size - 540 mm X 400 mm

<u>Color Code</u>
Red - Red items are fed by Emergency power
Orange - items fed by UPS (base building systems)
Black - Black items are fed by Normal power
Blue - Blue items are fed by High Voltage power (750 Volts and up).
Black - Low voltage metering is represented in Black

<u>Distribution Procedure</u>
Normal power - Stops at last panel board (LP or RP) & all equipment on MCC.

Emergency power - Stops at last panel board (LP or RP) & all equipment on MCC.

<u>Legend</u> - The legend we utilize is based on ANSI Y32.2-1975 and subsequent revisions.

<u>Posting Locations</u> - Posted at every key switch points. i.e. - High (Medium) Voltage Gear. Low Voltage Switch Boards. Transfer Switch located in all locations.

Estimated cost to update and produce new single line diagrams for this facility would be $25,000 if completed locally.

B/ In several locations (i.e. - main electrical rooms, diesel emergency generator room, shops, corridors, out buildings, storage areas), storage of shop equipment, building materials, cleaning equipment and many other non-electrical products, are stored blocking access and/or resting against electrical distribution equipment. The CEC 2009, Section 2-308 requires a 1 m clearance with secure footing be maintained at all times. Section 2-312 also stipulates that passageways and working space around electrical equipment shall be kept clear of obstruction, and arranged to give authorized persons ready access to all parts requiring attention. PWGSC - Maintenance Management Services recommends that all stored materials in each building, around electrical distribution equipment be relocated to maintain clearances listed above. It is also recommended that either physical barriers and/or signage be posted to ensure these areas are kept clear at all times. Estimated cost for removal of storage would be general housekeeping costs. Costs for signage and guards in exposed locations would be approximately $10,000 for all locations.

C/ Exit lighting throughout the facilities were noted to be a large mix of many types and styles of fixtures. Several units noted were either not functioning, were English only, or did not meet letter sizing requirements of 144 mm high x 19 mm strokes as stipulated by the National Building Code 2005. It was also noted that several inefficient compact fluorescent and incandescent lamp type fixtures were utilized in older areas of the facilities and mechanical areas. Current exit lighting layout appeared in some cases to be lacking and did not clearly identify all emergency exit routes as required. PWGSC - Maintenance Management Services recommends a two stage approach to correct these issues. First, is to complete an exit light survey of all emergency exit routes to verify if and where signage is lacking. Additional signs should be supplied and installed as per survey results and shall be approved by the HRSDC Fire Commissioners Office. Second is to remove and replace all existing exit signs with brushed aluminum, bilingual (EXIT/SORTIE) fixtures with LED type lamps ensuring connection to the emergency power system. The intent is to provide a uniform exit light system that is easily and affordably maintained, draws little energy from the electrical system, has maximum service life and is easily distinguishable from all other signage in the facility. Estimated cost for the survey would be approximately $7,000 and replacement of existing exit signs would be $165,000. Additional signage costs would be determined based on survey results.

D/ Emergency lighting levels throughout the facility were unknown at the time of site visits. Emergency lighting is provided mainly by general fixtures connected to the emergency generator throughout floor spaces and back up battery packs with remote light heads in some stairwell and mechanical room areas. As per the Canada Labour Code - Schedule III, emergency egress and exit routes shall be illuminated at all times with a minimum of 10 lux average lighting levels. PWGSC Maintenance Management Services recom- mends a two stage approach to correct these issues. First, is to complete an emergency light survey of all emergency exit routes to verify lighting levels for these areas. Second, additional lighting should be supplied and installed as per survey results and shall be approved by the HRSDC Fire Commissioners Office. Cost for the survey is estimated at approximately $5,000. Additional funds would be required based on survey results.

4.1 Electrical Power

The main power to the facilities is supplied from the Local Distribution Company at 27.6 kV via an underground cable and duct bank configuration to the high voltage compound located at the southwest corner of the facility. The main conductors enter a main 600 A, 27.6 kV outdoor switchgear unit which feeds three (3) 600 A, 34 kV, load break switches. Each load break switch supplies primary power to three transformers as listed below:

(a) T1 - 3000 kVA, 27.6 kV to 600/347 volt, 3 phase, 4 wire. Oil cooled, pad mounted.
(b) T2 - 3000 kVA, 27.6 kV to 600/347 volt, 3 phase, 4 wire. Oil cooled, pad mounted.
(c) T3 - 3000 kVA, 27.6 kV to 4160/2400 volt, 3 phase, 4 wire. Oil cooled, pad mounted.

Transformers T1 and T2 provide power into the facility via parallel runs of TECK cable installed on a cable rack system into the main 600 volt switchboard within the main electrical room. Each transformer feed terminates at 4000 amp rackable style breakers (2), located within the main switchboards. The current setup has one of the switchboards operating on T1 and the second operating on T2.

Transformer T3 provides 4160 volt power to a main 5 kV switchboard also located within the main electrical room area. Power from this switchboard is distributed via the crawl space to the tunnel and on to the Wastewater Treatment Center (see WTC report). Underground conductors and ducts from T3 out to the yard area also supplies 4 pad mount, oil cooled transformers TX1-S1, TX1-S2, TX1-N1 and TX1-N2 which in turn provide power to all shore power kiosks located along the wharf area. These transformers provide power as listed below.

(a) TX1-S1 - 500kVA, 4160 to 480 volts, 3 phase
(b) TX1-S2 - 225kVA, 4160 to 120/208 volts, 3 phase
(c) TX1-N1 - 500kVA, 4160 to 480 volts, 3 phase
(d) TX1-N2 - 225kVA, 4160 to 120/208 volts, 3 phase

Panelboards fed from these transformers are located within the wharf kiosks and provide power to shore power receptacles for marine and other equipment use.

The current low voltage (600 V) distribution within the main building was engineered from the original design to provide double redundancy from both T1 and T2 transformers throughout the facility via the twin switchboards located in the main electrical room. The main distribution boards located throughout the main building are compartmented in two halves and are fed as such. Two main breakers (1 from T1 switchboard and 1 from T2 switchboard) provide power to each main distribution switchboard and a tie breaker with key interlock devices installed to operate the switchboard from either T1 and/or T2 feeders. This setup was noted in the following distribution substation boards:

(a) Boiler room distribution substation located in main substation room
(b) R&D - Workshop/Warehouse Distribution substation located in the third floor R&D (west) mechanical area.
(c) Main Lab distribution substation located in the 3rd floor A&L (east) mechanical area.
(d) Chiller distribution substation located in the boiler room area.

Power is further distributed to individual areas of the main facility in the following manner:

Boiler room distribution substation panel feeds the Hydraulics area bus duct (1000 A, 600 V), MCC#1 (1600 A, 600 V), boiler room 120/208 volt Distribution Panel via 112.5 kVA transformer (1600 A, 600 V), Panel DPW (1200 A, 600 V), MCC #9 (300 A, 600 V) and a regular power supply source to the boiler room emergency power transfer switch (300 A, 600 V).

The 120/208 voltages utilized in office and general power requirement areas are supplied from local step down, dry type transformers and small panelboards of various ratings. Panelboards for lighting and receptacle loads were noted to be located within corridor, office and riser areas.

R&D - Workshop/Warehouse Distribution substation panel feeds power panel #1 located in room W230 of the second floor workshop/warehouse area (600 A, 600 V), R&D area 120/208 volt distribution panel via a 450 kVA transformer (600 A, 600 V), Workshop/ Warehouse area distribution panel #2, (600 A, 600 V), a regular power supply source to the R&D emergency power transfer switch (120 A, 600 V), Workshop/Warehouse area 120/208 volt distribution panel #1 via a 450 kVA transformer (600 A, 600 V), MCC #3 (350 A, 600 V) and MCC #4 (200 A, 600 V).

The 120/208 voltages utilized in workshop and warehouse offices and workshop and warehouse areas are supplied from third floor west main 120/208 distribution boards and small panelboards of various ratings located throughout this portion of the facility. Panelboards for lighting and receptacle loads were noted to be located within corridor, office and shop and warehouse areas.

Main Lab and Administration distribution substation panel feeds Power Panel #1 (400 A, 600 V), MCC #6 (600 A, 600 V), 120/208 volt north distribution panel via a 1000 kVA transformer (600 A, 600 V), a regular power supply source to the laboratory emergency power transfer switch (300 A, 600 V), 120/208 volt south distribution panel via a 1000 kVA transformer (600 A, 600 V), MCC #7 (600 A, 600 V), and MCC #8 (600 A, 600 V).

The 120/208 voltages utilized in the administration offices and laboratory areas are supplied from the 3rd floor east main 120/208 distribution boards and small panelboards of various ratings located throughout this portion of the facility. Panelboards for lighting and receptacle loads were noted to be located within corridor, office and in each lab room area.

Chiller distribution substation located in the boiler room area feeds chiller and associated equipment.

The majority of high voltage feeder cables are TECK cables of varying sizes installed in cable tray and/or cable rack systems. The 600 volt and 120/208 volt distribution cables are a varying mix of teck cable, conduit/wiring and bus ducts.

Branch wiring consists of two different systems. For lighting, the wiring is fed from panelboards, with conduit home runs to junction boxes and then from fixture to fixture with armoured cable (in the ceiling space) or EMT conduits for surface applications. For receptacles, armoured cable drops are run through walls to flush mounted devices and EMT conduits are used for exposed applications. Down feed service pack poles are utilized in office areas of the facility.

1. Condition

The primary high voltage underground feeder cables and main sub- station equipment were replaced within the last 5 years and based on a cursory inspection, appeared to be in good condition.

The majority of the low voltage 600 V and 120/208 V distribution equipment is of original construction and appears to be in fair working condition. The majority of the interior distribution equipment is 38 years old and is nearing the theoretical end of its useful service life. There is a large number of pieces of equipment that fall within this range, therefore, a staged replacement approach would be recommended.

Lighting and receptacle panels, small transformers disconnects and other small power devices are noted to be of varying ages, pending space fitups and other client requirements. Several older panelboards (38 years) have been noted throughout this facility and will require replacement within the next 5 to 10 years.

General cleaning of all interior, exterior and ventilation surfaces for all panels, transformers, MCC's and distribution equipment was severely lacking and should be made one of the top priorities for the next maintenance shutdown. Exterior surface cleaning can be completed throughout the year and should be considered, as debris and dust is one of the major contributing factors to premature equipment failure. Cleaning of electrical equipment should only be completed by qualified electrical personnel.

It was noted that all distribution panels and lighting/receptacle panelboards located in common areas have been left unlocked. This allows for unauthorized personnel to have access to breakers, which poses a safety concern for both the non-qualified individual and/or equipment being fed from the devices contained within. It is recommended that all appropriate keys be obtained and locks be maintained on these units at all times.

Please also refer to Electrical Preamble for deficiencies noted in this facility.

2. Recent Repairs/Modifications

The primary 27.6 kV underground main feeder, main isolation switchgear, main transformers and secondary feeders from the transformers to the indoor distribution equipment were replaced in 2004-2005.

3. Design Problems/Deficiencies

At the time of site visit, there appeared to be no major problems or deficiencies with the main high and low voltage distribution equipment. A preventative maintenance program is in place and is currently contracted to RONDAR Inc. Maintenance specifications were also noted to be in place; however, updating is required prior to next contract award to keep current with the latest maintenance principles, codes, acts and regulations. It is recommended that the latest revision of the International Electrical Testing Association (NETA) Maintenance Specifications be utilized for this purpose.

4. Effective Remaining Life

With ongoing regularly scheduled maintenance, the high voltage equipment could be expected to perform satisfactorily for the next 25 - 30 years.

With regular maintenance and minor repairs, the low voltage distribution equipment should operate as intended for the remaining life expectancy of 10 - 15 years. The estimated cost for its replacement at the end of its useful life is $1,500,000.

As the lighting and power panels are of mixed ages, varying years of replacement planning is required. Replacement of these units should be considered on a cyclical basis, and a budget of $35,000 per annum should be established over the next 10 year time frame. Panelboards shall be scheduled for replacement based on age, condition and the availability of replacement parts.

Motor Control Centres are mostly all of original age to this facility. The MCC's are nearing the end of their anticipated useful service life and should be considered for replacement over the next 5 to 10 years. Availability of spare components may soon become difficult to obtain and a failure may cause prolonged down time of critical mechanical equipment. An estimated cost to replace all MCC's within the facility over 10 years would be approximately $1,000,000 or $200,000 per annum for 5 years. It is recommended that this project be implemented starting in 2012.

5. Major Repairs/Recommendations

Update single line diagrams. Update all existing maintenance specifications to meet current codes and best practices. It is recommended that the latest version N.E.T.A. Maintenance Specification manuals be utilized for reference purposes. Replace low voltage distribution equipment and panelboards as recommended in this section. Clean exterior and interior surfaces of all equipment. Remove all stored materials away from all electrical rooms and other electrical equipment. Ensure panelboards located within common areas remain locked at all times to ensure only qualified electrical personnel have access to these units.

4.2 Emergency Power

This facility is equipped with a KOHLER 605 kW (756 kVA, 600/347 V) diesel powered emergency generator, located in the generator room within the southwest boiler room area. The generator feeds a main 500 A transfer switch located outside the generator room. From the main transfer switch, power is supplied to a main 600 V emergency power distribution switchboard, which in turn provides power to 5 secondary transfer switches located in the following areas:

A/ WTC - PH electrical room (200 A, 600 V)
B/ Boiler room area - Boiler area (300 A, 600 V)
C/ R&D area - 3rd floor mechanical west (100 A, 600 V)
D/ Main Lab area - 3rd floor mechanical east (300 A, 600 V)
E/ DPEWL area - location not found (300 A, 600 V)

The generator provides power via several distribution panels and small panelboards for emergency lighting, building mechanical equipment, fire alarm system and currently some of the tenants operational lab, UPS systems and other equipment. At the time of site visits, a project was underway to separate all tenant load from the emergency generator to provide backup power from the Co-Generation unit. The Co-Gen will be retooled to operate at all times to ensure consistent backup power is provided.

An 810 kW, 600 V, Co-Generator is also installed within this facility. The unit is installed within the main boiler room area outside the diesel generator room. The Co-Gen unit currently supplies power back to the main 600 V distribution board located within the main electrical room. The Co-Gen also provides heat recovery to mechanical systems (refer to mechanical portion of this report for details).

1. Condition

The existing generator set and its auxiliary equipment are in fair condition. The majority of emergency power equipment was labeled with red lamacoid nameplates for easy identification of emergency power supplies.

The Co-Gen unit is also in fair condition at the time of site visit.

2. Recent Repairs/Modifications

At the time of site visit, it appears that there have been no major repairs or modifications to the generator in the last two years; however, a project is underway to shed client load from this unit and re-feed via the Co-Gen unit. Modification to the operation of the Co-Gen will be required to ensure power is available when power is lost from the local utility.

3. Design Problems/Deficiencies

The following deficiencies were found with the generator, generator room and Co-Gen unit:

A/ As per CAN/CSA 282-05, auxiliary battery operated emergency lighting pack(s) capable of providing 50 lux for 2 hours at the engine, engine controller and all transfer switch areas throughout the premise must be provided. Light heads should illuminate the control areas for the device, it is installed for. The majority of small transfer switches do not have emergency lighting packs installed for them and the current unit installed by the generator is rated for 30 minutes. Additional battery operated lighting is required in the event of generator power failure. Estimated Cost would be $4,000. It is recommended that a same unit be installed in the Co-Generation area.

B/ Details of maintenance and testing are not known at this time; however, as per CAN/CSA 282-05, mandated weekly, monthly, semi-annual and annual maintenance and testing procedures are required. It is recommended that a CAN/CSA 282-05 logbook be purchased and maintained within the generator room, as the levels of maintenance are clearly defined and will ensure this site is in compliance with mandated testing and maintenance protocols (also refer to LIFE SAFETY portion of this report). Estimated cost for the logbook would be $100.

C/ There currently is no signage on the generator room doors. As per CAN/CSA 282-05, signage stating a warning that automatic starting equipment is present within the room and may start at any time. A sign should also be placed by the Co-Gen unit once converted to also provide standby power. Estimated cost would be $500.

4. Effective Remaining Life

The building generator and the transfer switch are of original construction and could be expected to perform effectively, with regular service, for the next 10 to 15 years. The same can be expected of the existing Co-Gen unit.

5. Major Repairs/Recommendations

It is recommended that the existing generator be considered for replacement within the next 10 - 15 year time frame. An estimated cost for this unit would be approximately $600,000. It is also recommended that the associated transfer switches also be replaced, as they are of relatively the same age as the generator unit. Estimated cost for the replacement of the main transfer switch and five secondary transfer switches would be approximately $175,000.

It is also recommended that the existing Co-Gen and associated controller be considered for replacement wthin the next 10 - 15 year time frame. An estimated cost for this project would be approximately $800,000.

4.3 Exterior Lighting

Exterior lighting is provided from wall mounted, high pressure sodium type fixtures rated at 150 to 200 watts depending on location, and pole mounted high pressure sodium roadway lights rated at 200 watts. The wall units are operating at 347 volts and the pole lights are operating at 220 volts. All exterior lights are controlled by local photocells and contactors.

1. Condition

All of the exterior lighting appeared to be in fair working condition. As this was a daytime inspection, no measurement was taken as to the amount of light the current setup will provide. It was noted that several of the lenses were quite dirty and require cleaning, as this will greatly diminish the lighting output of the current fixtures.

2. Recent Repairs/Modifications

At the time of site visit, there appeared to have been no recent major repairs or modifications to the exterior lighting system within the last two years.

3. Design Problems/Deficiencies

At the time of site visit, there appeared to be no deficiencies or design problems with the exterior lighting system. A lighting survey and measurement project is required to determine actual lighting levels.

4. Effective Remaining Life

The exterior lighting system should continue to perform satisfactorily, with minor repairs, for another 6 - 10 years.

5. Major Repairs/Recommendations

General exterior lamp and ballast replacement is required and periodic lense cleaning on a cyclical basis is required to ensure maximum light output.

In the next 6 - 10 years, it is recommended that a project to replace the current units with new LED technology be investigated. These new units will be virtually maintenance free for several years beyond regular lamp and ballast replacements and will provide the utmost in energy efficiency. It is recommended that an exterior lighting survey be completed to ensure that a minimum of 10 lux average lighting level is present around the facility walkways, entrances and parking areas as stipulated by the Canada Labour Code - Schedule II & III requirements. Caution should be exercised to ensure proper lighting and positioning be applied in areas where security cameras are operating. Additional fixtures and costing would be pending survey results. The estimated cost for the survey would be approximately $4,500.

4.4 Interior Lighting

Interior lighting in the Main Building is provided from fixtures of varying types, as follows:

<u>Shop areas</u> - Industrial high bay fixtures equipped with 1000 watt, multi-vapour lamps operating at 347 volts and controlled by building automation.

<u>Office Areas</u> - Varying types of fluorescent fixtures, both recessed and surface mount, containing T8 lamps and electronic ballasts.

<u>Lab Areas</u> - Varying types of fluorescent fixtures, both recessed and surface mount, containing T8 lamps and electronic ballasts. Some LAB areas contain explosion proof fixtures and fittings with incandescent style lamps, operating at 120 volts and controlled by local wall switches and building automation.

<u>Warehouse Areas</u> - Industrial high bay fixtures equipped with 400 watt mercury vapour lamps operating at 347 volts and controlled by building automation and local switches at aisle entrances.

<u>Stairwells, machine, boiler rooms</u> - Varying types of fluorescent fixtures, suspended and surface mount, containing T8 lamps and electronic ballasts.

<u>Crawlspace & tunnel</u> - Incandescent style fixtures containing 100 watt standard bulbs in crawl space, fluorescent fixtures surface mounted, containing T8 lamps and electronic ballasts in tunnel, operating at 120 volts and controlled by building automation.

Average levels of illumination were taken in several areas and results are as follows:

Location	*Actual*	*Required*
General office	300 to 500 lux	500 lux
Laboratories	400 to 600 lux	500 lux
Stairwells	300 to 450 lux	100 lux
Warehouse	50 to 75 lux	150 lux
Electrical Rooms	150 lux	100 lux
Mechanical Rooms	40 to100 lux	50 lux
Boiler room	130 lux	75 to 150 lux
Ground Floor Main Corridor (Mall)	30 to 40 lux	100 lux
Shop Areas (Garages and tradeshops)	175 to 250 lux	300 lux
Washrooms	150 to 200 lux	200 lux
Elevator Lobbies	50 to 75 lux	100 lux
Main Entrance - Security Desk	75 to 125 lux	100 lux

1. Condition

The general condition of the interior lighting can be considered to be fair to good; however, several areas in the main hall (mall area), elevator lobbies, ware- house and shop areas were noted not to meet the required illumination levels prescribed by the Canada Labour Code - Schedules II & III. It was noted that many existing fixtures were either turned off or de-lamped as an energy saving measure. It is recommended that lighting in noted dark areas be re-energized and retrofitted with higher efficiency methods in order to comply with lighting legislative requirements.

2. Recent Repairs/Modifications

At the time of site visit, there have been no recent repairs or modifications to the interior lighting system in the Main Building within the last two years. The majority of fluorescent fixtures have been retrofitted to T8 lamps and electronic ballasts in the mid-1990’s.

3. Design Problems/Deficiencies

Several areas were noted not to meet the illumination levels required by Canada Labour Code - Schedules II & III. Relamping existing fixtures where feasible and providing additional lighting units is required in the areas noted in the light level chart above.

4. Effective Remaining Life

The interior lighting system should continue to perform satisfactorily, with general ballast and lamp replacement, over the next 25 years; however, it is recommended to further conserve energy by exploring new lighting technologies as they arise (i.e. - LED type).

5. Major Repairs/Recommendations

PWGSC - Maintenance Management Services recommends the following actions occur to improve current interior lighting conditions at CCIW:

A/ Re-lamp and re-energize existing fixtures in the main floor elevator lobby area using the latest T8 lamp technology and/or compact fluorescent lamps. Estimated Cost: $500.

B/ Re-lamp and re-energize existing fixtures in the main floor Mall area using the latest LED high bay technology in existing high bay fixture location. Day lighting control can be utilized to de-energize fixtures when light levels from windows provide sufficient lighting at ground level and staircase areas. Estimated Cost: $25,000.

C/ Complete detailed lighting study to improve current lighting in warehouse and shop areas. It is recommended that the study focuses on replacement of existing fixtures in the shops and warehouse areas with new LED high bay technology in existing high bay fixture locations, plus providing additional units where required to bring lighting levels to stipulated requirements. Reuse existing control. Estimated cost for this study would be approximately $6,000. Costs and details of actual lighting refit would be determined based on study results.

4.5 Emergency Lighting

The emergency lighting is provided from emergency panels fed from the in-house generator via step down transformers. The emergency panels supply power to dedicated fluorescent and industrial fixtures located throughout the building. Emergency lighting battery pack, two-lamp units and remote heads were also noted in some mechanical, electrical and stairwell areas.

No test of the emergency lighting system was performed as to the amount of light they provide.

1. Condition

The emergency lighting system appeared to be in good working condition.

2. Recent Repairs/Modifications

At the time of site visit, there appeared to have been no recent repairs or modifications to the emergency lighting system in the last two years.

3. Design Problems/Deficiencies

At the time of site visit, there appeared to be no design problems or deficiencies with the emergency lighting system other than already mentioned diesel generator room and transfer switch area battery pack requirements.

4. Effective Remaining Life

The dedicated fluorescent lighting fixtures for the emergency lighting should continue to perform satisfactorily over the next 25 years. Battery operated emergency lighting units have a limited life span of 5 to 10 years.

5. Major Repairs/Recommendations

Refer to Executive Summary - Section D for details.

It is recommended that all emergency lighting fixtures receive a marking to clearly indicate which fixtures are fed from emergency power, as these units were not easily identified during the recent site visit walk-through. It is also recommended that a detailed set of floor plans be developed and/or updated to clearly indicate emergency lighting and exit lighting configurations. These drawings should be filed with similar life safety systems drawings. Estimated cost for this work would be approximately $20,000.

4.6 Exit Lighting

Exit lighting throughout the facilities was noted to be a large mix of many types and styles of fixtures. Several units noted were either not functioning, were English only, or did not meet letter sizing requirements of 144 mm high x 19 mm strokes as stipulated by the National Building Code 2005. It was also noted that several inefficient compact fluorescent and incandescent lamp type fixtures were utilized in older areas of the facility and mechanical areas.

1. Condition

The existing lights comply with the current building code, NBC/OBC 2005 as to their size. Varying ages of the units were noted, from original construction of the facility to current day type units, installed as part of office and/or lab area refits.

2. Recent Repairs/Modifications

There have been no major recent repairs or modifications to the exit light system within the last two years. Exit lighting is repaired as required.

3. Design Problems/Deficiencies

Exit lighting appeared to be lacking throughout several areas of the whole facility. This was especially noted within the warehouse, workshops and hydraulics lab area. Exit lighting is to be installed to clearly define intended emergency exit routes. It is recommended that at least one exterior exit light device be installed at each exit stairway that accesses the roof areas, to ensure service personnel working in these areas will be able to clearly define exit routes from the rooftop.

4. Effective Remaining Life

The current exit light system should continue to perform, with minor repairs, over the next 5 to 10 years. Replacement as per recommendations in the executive summary should be considered at this time.

5. Major Repairs/Recommendations

Please refer to Electrical Preamble for details.

4.7 Fire Alarm System

The building is equipped with an Edwards EST, two stage, multi-zone fire alarm main panel which monitors heat and smoke detectors, manual pull stations, sprinkler flow, anti-tamper devices on control valves, and fire suppression systems located in computer room, telephone room and laboratory chemical storage areas. The main system in this building also monitors a remote signal from the WTC facility. Upon activation, alarm bells and mag lock door closures are activated and HVAC shutdowns occur.

Six (6) Edwards EST panels were noted throughout the main building and one panel was noted in the WTC building.

The main fire alarm system also incorporates a voice communication system that consists of speakers installed throughout floor spaces and emergency telephones located at each stairwell area.

Main control (bypass, reset, etc.) Is provided by a Fireworks fire alarm control computer and software package rack mounted in a separate cabinet located within the maintenance personnel control room at the front entrance of the facility.

1. Condition

Based on a cursory inspection, the system appears to meet with the NBC, Part 2. The fire alarm system was in good condition at the time of site visit.

2. Recent Repairs/Modifications

The main fire panels have been replaced within the last 5 - 10 years and a small annunciator has been installed for monitoring purposes, at the front security desk.

3. Design Problems/Deficiencies

It was noted that minimal signal devices were located at the rooftop areas of this facility. Service personnel working on rooftops may not hear alarm conditions, therefore, it is recommended that at least one exterior signal device be installed at each exit stairway that accesses the roof areas.

4. Effective Remaining Life

The theoretical anticipated life expectancy for fire alarm systems is typically 17 - 20 years, based on technology changes and condition of installed equipment. It appears that the current main panels for this fire alarm system were replaced in the last 10 years and are in good condition. It is anticipated that the fire alarm system installed at this facility will not require major replacement for at least another 15 years.

5. Major Repairs/Recommendations

It is recommended that at least one exterior signal device be installed at each exit stairway that accesses the roof areas to ensure service personnel working in these areas will be able to hear fire alarm signals. Estimated cost for this would be approximately $25,000.

Replacement of the main panels may be required in approximately 15 years. Estimated cost for all panels would be approximately $400,000. This would include software revisions/replacement to the Fireworks system.

Refer to Life Safety portion of this report for required testing and maintenance requirements of this system.

4.8 Security System

The security for the main facility is provided by monitored door contacts via the Delta facility system, CANSEC CP40 Card access system, 13 CCTV cameras connected to monitors, switchers and digital recording equipment, and a manned 24/7 security posting. Camera monitors and control are located within the security desk area. The Delta computer system is located in the maintenance personnel office located at the front lobby area.

It was noted that a separate intrusion alarm system was installed in the second floor administration area.

For security purposes, detailed descriptions of this equipment will not be provided in this report.

1. Condition

The intrusion alarms, door contact monitoring, card access, and CCTV system are in fair condition.

2. Recent Repairs/Modifications

To the best of our knowledge, no major recent repairs or modifications have been made to the security systems in the last 2 to 5 years.

3. Design Problems/Deficiencies

Some cameras were noted to provide poor picture quality and are stationary units. Exterior lighting in some camera areas may not allow for best quality viewing/recording.

4. Effective Remaining Life

The theoretical anticipated life expectancy for security systems is typically 17 - 20 years, based on technology changes and condition of installed equipment. The card access and door monitoring systems could be expected to perform satisfactorily for the next 10 years. The CCTV system should be upgraded within the next 5 years.

5. Major Repairs/Recommendations

It is recommended that the current cameras that are stationary be replaced with full Pan/Tilt/Zoom (PTZ) digital colour models that will provide utmost picture viewing quality and recording capabilities. It is also recommended that digital recording and camera control equipment also be upgraded at this time. Estimated cost for this work would be $45,000.

It is also recommended that consideration be given to installing a fully integrated main security system that will provide full intrusion, all card access, all door monitoring and all CCTV functions throughout the main building, as well as the WTC and Annex facilities. Estimated cost for such a system would be approximately $800,000.

4.9 Telephone & Communications System

The main telephone line enters the building via underground cables to the second floor main telephone room located at the south end of the mall area. The main front end equipment is Nortel Networks Meridian 1 - Intelligent Peripheral System. Distribution from the main system is via a multi-line BIX board type installation for phone lines and fibre optic cables to main computer room areas. Telephone lines are installed to distribution cabinets/rooms out on floor spaces which provide service to end user locations via zone conduits and open plenum area wiring.

A main computer room is located on the first floor area adjacent to the main lobby and mall areas. The majority of communications for this entire facility are connected to this location. Several LAN towers and rack mounted computer equipment located within the main computer room provide communications to all floors via conduit risers and Fibre Optic trunk lines to local LAN racks installed in mechanical core, communication closet and tenant areas. A separate fibre optic line was noted to be installed through the tunnel area to the WTC building. Several fibre optic lines are installed under the crawl space of the main facility.

1. Condition

The telephone & communications system was found to be in good working condition and appeared to satisfy the needs of current technologies utilized.

2. Recent Repairs/Modifications

At the time of site visit, it appeared that no major recent repairs or modifications have been made to the telephone/communications systems other than normal operational repairs and/or relocations to suit tenant fitups.

3. Design Problems/Deficiencies

It was noted that bonding to ground of all LAN towers in the main computer room, mechanical core areas and other tenant locations is not present as required by Section 60-302 of the Canadian Electrical Code 2009.

Although a grounding grid was present under the raised computer room floor, it was also noted that no physical bond to ground was made between the floor and grid system as per Section 10-406(6) of the Canadian Electrical Code 2009. It is recommended that every fourth pedestal be bonded to existing ground grid within the floor space area.

4. Effective Remaining Life

Telephone and communications equipment is constantly upgraded, repaired and replaced as needed to suit current technology needs. Typical systems of this type would be expected to last 25 years. It appears that the current systems are of new technology.

5. Major Repairs/Recommendations

As the majority of telephone/communications systems are tenant owned, the upgrade, replacement and repair will be the responsibility of the tenants and typically are not funded as a base building system.

It is recommended that bonding of all LAN towers, cable tray and computer room flooring be completed as soon as possible to meet current code requirements as stated above. Estimated cost for this work would be $15,000.

PART 5 - PROPERTY/SITE

NOTE: This Part includes assessment of site elements for the entire CCIW facility, including those elements adjacent to buildings described elsewhere (see individual reports for ‘WTC Building’ and ‘Annex Building’, prepared under separate cover).

NOTE: It is recommended that current O&M operations be modified to include semi-annual inspection and annual minor repair of property/site components.

5.1 Improvements

5.1.1 Site Fixtures

Despite the size and complexity of the facility, site fixtures included within the scope of this report are relatively few, including:

- Site Signage - painted metal post & panel FIP site identification sign located near the street entrance; paint finished cut aluminum letters (Canada) "Wordmark" sign, wall mounted on the A&L structure north elevation; and various wall and post mounted traffic/parking control signage throughout the site.
- Retaining Walls - reinforced concrete at the A&L structure loading dock, and reinforced concrete overlaid with stone (dry-laid) with a painted metal guard near the west end of the WTC building.
- Fencing - chain-link fencing (galvanized, 1800 mm height) and access gates located at the east end of the NWRI hydraulics lab, around the generator fuel storage tank area at the south side of the boiler plant, at the west end of the Annex building, and at the northeast corner of the WTC building.
- Flagpole - 1 freestanding aluminum with concrete base, located at the raised 'medallion' at the NWRI main entrance.
- Planters - 5 freestanding, cast-in-place concrete, located along the NWRI east elevation adjacent to the main entrance (and fixed planter/former pool, see '1.1.3 Other Structures').
- Stairs and Ramps - 19 freestanding, cast-in-place concrete stairs with integral walls, connecting the various parking areas with adjacent walkways; a cast-in-place concrete stair and ramp with integral walls at the NWRI R&D northwest entrance; and a cast-in-place concrete stair and ramp adjacent to the NWRI loading dock retaining wall.
- Benches - ?? Wooden bench seats with concrete bases, located along the west side of the NWRI R&D building.
- Guards - concrete-filled metal bollards and metal guards (paint finished) at various locations throughout paved areas of the site to provide protection from vehicle damage.

NOTE: Other site fixtures throughout the facility (including portable buildings, outbuildings, wharfs/quays, docks, and piers) are not included within the scope of this report.

1. Condition

Site fixtures are considered to be in fair overall condition, free of damage, but with some minor deterioration, as follows:

- Painted metal surfaces (including bollards, guards, and stair/ramp handrails) are in poor condition, being flaked and rusting).
- Wood components of the benches are showing signs of deterioration/rot.

2. Recent Repairs/Modifications

To our knowledge, no recent major repairs/modifications have been carried out on the site fixtures.

3. Design Problems/Deficiencies

Other than accessibility issues identified with the stairs and ramps (see '1.5 Accessibility' above), to our knowledge, no design problems/deficiencies exist with the site fixtures.

4. Effective Remaining Life

The age of the various site fixtures is unknown, dating from various times over the life of the facility. Given their current condition, with corrective actions and continued normal maintenance, they can be expected to perform indefinitely.

5. Major Repairs/Recommendations

Other than normal maintenance (i.e. regular monitoring and minor repairs), no repair/replacement is anticipated for the site fixtures.

NOTE: It is recommended that identified minor deterioration (see above) be corrected as part of existing O&M operations in order to prevent the spread of existing deterioration and maintain the integrity of the components.

5.2 Surface Treatments

5.2.1 Pavements

The vehicle pavements for this facility consist of:
- Asphalt paved access road and driveways (from the main road and inter-connecting the buildings and site areas).
- Asphalt paved areas for various purposes, including vehicle parking, loading, equipment storage, and outdoor work space (adjacent to access driveways and buildings throughout the facility).

Paved vehicle areas are bordered with poured concrete curbs, and drained via catch basins.

The pedestrian pavements consist of:
- Concrete walkways (both broom finished and exposed aggregate finished).
- Precast concrete unit paver areas (between the concrete walkway and the paved parking area adjacent to the Mall north entrance - high-traffic area).

1. Condition

The vehicle pavements are considered to range from poor to fair overall condition, with identified deficiencies as follows:
- Significant surface cracking/alligatoring is occurring throughout the asphalt paved areas.
- Minor surface deterioration is occurring at localized areas throughout the asphalt paved areas.
- Significant surface deterioration (to various degrees) is occurring throughout wharfside storage/work areas.
- Concrete unit pavers adjacent to the Mall north entrance are settled/sunken.

The pedestrian pavements are considered to be in fair overall condition, in most cases with no damage or deterioration.

2. Recent Repairs/Modifications

To our knowledge, no recent major repairs/modifications have been carried out on the pavements.

3. Design Problems/Deficiencies

Identified design deficiencies include:
- Some parking areas (east to the NWRI warehouse, and east of the WTC building) have be resurfaced with ‘residential grade’ asphalt pavement (i.e. HL2).
- Exterior exit doors from NWRI warehouse stairs WN and WS open onto very uneven surfacing (broken stone) along the east elevation.

4. Effective Remaining Life

The age of the vehicle pavements is unknown, dating from various times over the life of the facility; however, they are presumed to range from 10 - 20 years old. Several older areas are well beyond their effective service life and require replacement, while newer asphalt areas, with corrective actions and normal maintenance (including annual surface crack repairs) may continue to perform over the next 5 years.

The age of the pedestrian pavements vary, with the concrete walkways dating from original construction, and the precast concrete unit pavers be recent additions. Given their current condition, with normal maintenance the pedestrian pavements can be expected to perform indefinitely.

5. Major Repairs/Recommendations

It is recommended that an allowance be made for general pavement repairs (including small area replacements, surface crack filling, repair/replacement of broken concrete, and resetting of uneven unit pavers) in order to extend their effective service life (by preventing the spread of existing deterioration) and reduce surface hazards. This work is projected for the 1st year, at an estimated cost of $25,000.

NOTE: After general repair of the pavements, annual inspection and minor repairs, including small area replacements and surface crack filling, should be incorporated into normal O&M procedures.

NOTE: The asphalt pavements throughout this facility are extensive (approximately 60,000 m^2) and represent a significant cyclical investment, as well as potential for significant cost savings in the maximization of their service lives - normal maintenance of asphalt pavements includes sealing of surface cracks (cleaning/ routing and filling with hot-poured rubberized sealer) as the single most cost effective maintenance procedure, potentially doubling the pavements’ life span.

It is recommended that an allowance be made for the phased replacement of all the asphalt pavements as they reach the end of their effective service lives. This work is projected to cost an estimated $540,000 in each of the 2nd, 4th, 6th, 8th and 10th years.

NOTE: The above recommendation is based on full removal and replacement of the asphalt pavements - development of plans & specifications to complete these works may consider resurfacing (i.e. milling and replacement of surface course only over existing base course) as a more cost-effective approach in some areas where/if it can be determined that remedial repairs to the existing base course will render it reusable.

5.2.2 Landscaping

Landscaping throughout the site is extensive, consisting predominantly of large areas of maintained lawn (including a sports field) with mature specimen trees and shrubs, with formal garden areas located near the main site entrance, the NE corner of the NWRI building, and the entrance to the WTC building. Formal plantings are also found in the planter areas adjacent to the NWRI entrance. The area along the NWRI warehouse, and the curbed median islands separating the driveways from the wharfside work/storage areas, are surfaced with broken stone. Remote areas at the site's north and east perimeter are maintained in a 'naturalized' state.

1. Condition

Landscaping is considered to be in good overall condition, free of infestation (weeds/ insects) and dead material.

NOTE: It is presumed that construction debris and damaged lawn areas adjacent to the NWRI hydraulics lab (east end) are from an ongoing construction project, and will be removed/repaired as part of same.

2. Recent Repairs/Modifications

To our knowledge, no recent major repairs/modifications have been carried out on the landscaping.

3. Design Problems/Deficiencies

Vegetation at various locations is growing too close to and touching the building faces of the NWRI and WTC - holding moisture/preventing air circulation, restricting visibility for monitoring/inspection, and impeding access for repairs.

4. Effective Remaining Life

With normal maintenance, the landscaping can be expected to perform indefinitely.

5. Major Repairs/Recommendations

It is recommended that existing vegetation adjacent to the NWRI and WTC buildings (i.e. within 1500 mm) be removed/relocated, and replaced with less obtrusive materials that will permit access and ventilation (e.g. mulch, wood chips, stone, various ground cover vegetation, etc.). This work is projected for the 1st year, at an estimated cost of $40,000.

NOTE: It is recommended that current landscaping maintenance practices be modified to include pruning back of vegetation in order to maintain a 900 mm clearance from the building face to facilitate adequate access and air flow.

5.3 Site Services

5.3.1 Power and Lighting

Refer to PART 4 - ELECTRICAL ‘4.1 Electrical Power’ and ‘4.6 Exterior Lighting System’.

5.3.2 Waste Water Treatment

Refer to PART 3.0 - MECHANICAL ‘3.5 Sanitary Sewer System’.

5.3.3 Storm Water Treatment

Refer to PART 3.0 - MECHANICAL ‘3.4 Storm Water System’.

PART 6 - BUILDING AND OCCUPANT FIRE SAFETY

0.00 PREAMBLE

There are three major elements in any fire/emergency defence program: emergency preparedness, fire prevention, and fire protection. In other words, one has to prevent fires, but also has to be ready for fires that do occur. Most fire hazards and emergencies can be prevented or mitigated early by eliminating or controlling fire hazards, installing and maintaining life safety systems, installing and maintaining signs and posted information, and establishing a fire safety plan in those occupancies where it is considered necessary.

Inspections are essential to maintain a satisfactory standard for fire safety in buildings and to ensure the protection, conservation and consequent minimization of risks to life, property and the Government's financial position. Inspections limit the risk of life and property losses from fire by identifying and causing the correction of those conditions which contribute to the occurrence and spread of fire.

A cursory evaluation was conducted on all life safety systems, fire protection systems, site access and services and any available inspection/testing records for the building. An overall visual observation was conducted during the evaluation, and no life safety system/device or fire protection system/device was physically tested or operated during the site visit.

It is important to note that the conducted site visit and this subsequent report are not to be considered as orders of compliance or directions from the Authority Having Jurisdiction. The following is a general report of code compliance, observations, findings and existing site conditions with regards to the operation, maintenance and compliance testing in conformance with the requirements of the *Canada Occupational Health and Safety Regulations* (COSHR), *National Building Code* (NBC) and *National Fire Code* (NFC), and any other prescribed standards these codes have adopted.

1.00 ADMINISTRATIVE PROVISIONS

This part provides information on the level of conformity to the National Fire Code and other Federal legislation with regards to a building owners' administrative responsibilities.

1.01 Responsibility - Ownership/ Custodianship & Facility Management

GENERAL - The "responsible person" is someone who has control, or a degree of control, of the premises or fire prevention systems within the premises. If you are the responsible person, you must make sure that everyone who uses your premises can escape if there is an emergency. The people you need to think about include anyone who might be granted access to your premises, including employees, visitors or members of the public. You need to pay particular attention to those who may need special help, such as elderly or disabled persons or children. If you are the responsible person, you must make sure that a fire-risk assessment is carried out. You can appoint some other competent person to do the actual assessment, but you are still liable by law.

The enforcing authority, which is usually the local fire services for the private sector, and HRSDC Labour Programs for Crown owned, must be satisfied with your safety measures. If not, they will tell you what you need to do. If they find major problems, they can restrict the use of your premises or close them altogether until you deal with the problems they find.

CODE REQUIREMENTS - ***(Reference: NFC, Division C, Part 2.2.1.1 & COSHR Part 17.9.1)***
Unless otherwise specified, the owner or the owner's authorised agent shall be responsible for carrying out the provisions of all acts, regulations, codes and standards as applicable to building and occupant fire safety. Building owners are responsible to arrange for the inspection, testing and maintenance of all fire protection equipment and systems in properties under their control and administration in accordance with the National Building Code (NBC), and the National Fire Code (NFC).

INSTALLED COMPONENTS - The construction and occupancy of this facility was designed to house the Department of Environment. Several additional occupancies are housed in this facility which conduct marine navigational equipment maintenance construction and repair shops, and a private sector Organization occupies the Water Treatment Centre, therefore, the requirements of the Canadian Occupational Health and Safety Regulations as pursuant to the Canada Labour Code Part II, apply and are enforceable. The Occupational Health and Safety Standards as prescribed by Treasury Board of Canada Secretariat are also applicable and enforceable at this site.

Code Compliance - The property and structures at this facility are owned by the Crown and managed by Department of Environment who are considered to be the custodians of the property. There appears to be no jurisdictional issue with regards to the ownership of this facility, therefore, Department of Environment shall be responsible for carrying out the provisions of all acts, regulations, codes and standards as applicable to building and occupant fire safety.

1.02 Records & Documentation Retention

General - Records contain vital information which are often linked to administrative actions such as testing and/or inspection requirements of fire protection equipment. Testing/ inspection documents provide evidence of conformity to legislated requirements, and demonstrate due diligence.

Code Requirements - ***(Reference: NFC, Division C, Part 2.2.1.2 & COSHR Part 17.9.2)***
The initial verification or test reports for each system shall be retained throughout the life of the system. Where references identified in this report require that records of inspections, maintenance procedures or tests be retained for examination by the authority having jurisdiction, such records shall be retained during the required time interval between the inspection, maintenance procedure or test, or for a minimum of two years, whichever is greater.

Installed Components - Visual observation of equipment and any inspection tags where affixed were reviewed in addition to discussions with operational staff to verify if inspection testing requirements were being satisfied. There was no central records centre or log book to assist with records retention. A third party service provider (Rondar) has been retained to perform various property, facility, operational and maintenance tasks. Records are maintained electronically for the tasks which Rondar performs, and all other available documentation is retained in the Property Management Office records.

Code Compliance - Several testing, inspection and/or maintenance documents were not available for review at the time of site visit. Records that were not available for review are identified in each applicable section below. A hard copy log book or record centre can be a great asset and used as a tool to centralize and assist with the collection and retention of legislative testing and inspection records. Alternatively, electronic records can be retained and shall be available for review by the authority having jurisdiction.

1.03 Fire Safety Plan

General - Fire Safety Planning prevents the occurrence of fire by the control of fire hazards in a building, ensures operation of fire protection systems by establishing maintenance procedures, and provides a systematic method of safe and orderly evacuation of the building in the event of a fire or other emergency. Therefore, the importance of implementing a fire safety program and informing occupants of the building fire safety procedures, is essential. A building owner has a legal duty to ensure that the building complies with the regulations at all times, even if the building has not been inspected by fire authorities.

Code Requirements - ***(Reference: NFC, Division B, Part 2.8.2)***
Fire Safety Planning shall be prepared in accordance with the NFC and shall incorporate the requirements of the Treasury Board Standard for Fire Protection for the protection of public civil servants, and federal real property assets. The plan shall be developed in co-operation with the local fire authority as per the requirements of the above identified references, and it is recommended that the fire safety plan be forwarded to the District Office of HRSDC Labour Programs, Fire Protection Engineering for review and acceptance prior to implementation.

The Fire Safety Plan shall be kept in the building for reference by the fire department, supervisory staff and other personnel. Fire Safety plans shall be reviewed at intervals not greater than 12 months to ensure that it takes into account changes in the use and other characteristics of the building.

Installed Components - Basic emergency procedures were posted in various areas of the three structures, typically located at each entry/exit door to the building. A Fire Safety Plan was reported to have been prepared by the facility's Building Emergency Organization (BEO) for the NWRI Building, and it was reported that it was under review and modification. The document is posted on the internal Environment Canada web site, dated May 2003 and is accessible to all building staff. The document was not reviewed at the time of site visit, and it could not be confirmed that the document had been submitted for review and acceptance by HRSDC Labour Programs; however, it was reported that it had been done so by the Chief of the Building Emergency Organization.

Code Compliance - The current fire safety plan must be reviewed and revised in cooperation with the local fire authority, and signed off by the most senior officer. It is also strongly recommended that the document be submitted to the District Office of HRSDC Labour Programs, Fire Protection Engineering for review to ensure it meets the requirements of the National Fire Code, and COSHR. This process should occur as soon as possible to ensure all staff are aware of the emergency procedures and their responsibilities in the event of an emergency. It is unknown if the current document includes fire safety and emergency evacuation plans for the WTC Building and Annex Building. Under the requirements of the National Fire Code, these structures also require these emergency planning documents.

1.04 Persons Responsible for Fire Safety & Emergency Preparedness

General - Trained supervisory staff (when possible) can be of great value in directing, and assisting the orderly movement of people in the event of a fire, and performing fire control until the fire department arrives. Evacuation procedures rely heavily on supervisory staff and are complex, in that such staff require continued ongoing training, frequent drilling, and must be continuously on the premises in order to fulfil their responsibilities during an emergency. The fire safety plan identified above may also incorporate the establishment of a Building Emergency Organization for buildings, as prescribed in Part XVII of the Canada Occupational Health and Safety Regulations. This document may incorporate additional procedures for all other non-fire related emergencies which could occur in a building.

Code Requirements - ***(Reference: NFC, Division C, Part 2.2 & COSHR Part 17.9.2)***
A fire emergency organization is required in all buildings that are more than three storeys, including storeys below grade, or when the occupant load usually in a building exceeds the

number given in Part XVII of COSHR or HRSDC Labour Programs, Fire Protection Engineering requires a fire emergency organization to accommodate unique situations. During the preparation and implementation of emergency procedures, the fire safety plan referred to above shall be prepared as an independent document which can make up part of the entire Emergency Procedures Manual.

Installed Components - The current fire safety plan identified members of the Building Emergency Organization and procedures for other emergency conditions; however, is it very likely the membership requires review and revisions much like the fire safety plan.

Code Compliance - As per the Major Classification identified in Section 2.01 below, the *Centre for Inland Waters* with a current occupant load of more than 50 persons, is required to have a Building Emergency Organization comprising of a minimum of a Chief Fire Emergency Warden, a Deputy Chief Fire Emergency Warden, and a minimum of one Warden and one Deputy Warden for each floor level or separate occupied area. Like the fire safety plan above, it is unknown if the document has been submitted to HRSDC for review and acceptance.

1.05 Fire Drills

General - Fire drills are important exercises and provide an opportunity for fire evacuation plans for buildings and personnel to be developed, confirmed or modified if necessary. Fire drills also give the opportunity for building occupants who have specific duties during the course of a fire evacuation to exercise their duties and report any problems they may encounter.

Code Requirements - ***(Reference: NFC, Division B, Part 2.8.3)***
As per the requirements of the NFC, at least one scheduled evacuation drill involving all occupants shall be conducted annually in all Government of Canada buildings or occupied areas of buildings. All evacuations, false alarms and scheduled drills shall be recorded and the results maintained on file for a period of two years. A post mortem or follow-up report shall be completed after each fire drill, recording the results, and be retained on file for a period of two years.

Installed Components - The buildings at this facility are required to conduct a scheduled evacuation drill on an annual basis at a minimum. The overall responsibility of conducting fire drills in this facility lies with Environment Canada; however, the Building Emergency Organization shall take the lead and schedule, conduct and prepare post the drill report for the evacuation drills.

Code Compliance - The last recorded drill for the NWRI Building could not be confirmed at the time of our site visit; however, it is reported that due to the number of false alarms, the last scheduled drill occurred approximately two years ago. All evacuation drills shall be documented and the results maintained on file for a period of 2 years. A scheduled evacuation drill must be conducted as soon as possible to ensure building occupants are aware of the emergency procedures and their responsibilities in the event of an emergency. Scheduled evacuation drills must also occur in the WTC and Annex Buildings.

2.00 BUILDING AND OCCUPANT FIRE SAFETY

This part provides information on the level of conformity to the National Fire Code and other Federal legislation as applicable for the safety of occupants, the elimination or control of fire hazards, and the installation and maintenance of certain life safety system.

2.01 Classification & Major Occupancy of Building

General - The occupancy classification can be defined as the use to which the occupants or tenants use all or a portion of the building. The premise upon which occupancy classifications are based is that certain occupancies, by their very nature, will have higher fire loads and greater numbers of occupants within them. Occupancy classifications can be found in the National Building Code.

Code Requirements - ***(Reference: NFC, Division B, Part 2.1.2. & NBC, Division B, Part 3.1.2)***
For the purpose of applying the NFC, every building or part thereof shall be classified according to its major occupancy in conformance with the NBC. The buildings at this facility are classified under the National Building Code of Canada 2005 (NBC), Part 3, as a mixed use facility and are identified below.

Installed Components - The Canada Centre for Inland Waters facility has multiple structures, three of which are the National Water Research Institute (NWRI) Building comprising of 5 separate structures, the Water Treatment Centre, and the Annex Building comprising of an administration section and a warehouse section. A full description of these three buildings is identified in the Architectural section of this report, however, a brief description of each building is as follows:

National Water Research Institute (NWRI) Building

Administration & Laboratory - a 7-storey structure with a partial basement, crawl space, service penthouses (mechanical and elevator), served by 5 enclosed exit stairs, 2 passenger elevators and a freight elevator. The building area of this structure is approximately 3247 m^2.

Research & Development - a 2-storey structure with a crawl space, service penthouse (mechanical), and served by 3 enclosed exit stairs. The 'building area' of this structure is approximately 2960 m^2.

Hydraulics Lab - a 2-storey structure, served by 2 enclosed exit stairs and an interior bridge (between upper office area and upper Mall). The 'building area' of this structure is approximately 8000 m^2.

Boiler Plant - a 1-storey structure with 2 mezzanine areas, housing the main heating equipment for the entire facility. The 'building area' of this structure is approximately 870 m^2.

Warehouse - a 2-storey fully-sprinkled structure, served by 3 enclosed exit stairs and a freight elevator. The 'building area' of this structure is approximately 5665 m^2.

<u>Water Treatment Centre (WTC)</u>

The WTC is a two-storey structure, with a partial basement and a mechanical penthouse, originally constructed in 1971 with an addition (east-side) in 1995, and is currently serving as a laboratory. The 'building area' of this structure is approximately 2210 m².

<u>Annex Building</u>

The Annex Building is a two-storey structure, originally constructed in 1988 with a partial 1st storey/full 2nd storey addition in 1991, and currently serves as both office space and a storage garage. With an approximate 'building area' of 570 m², it is classified under the National Building Code of Canada 2005 (NBC), Part 9, as a “Group F, Division 3 - Low Hazard Industrial” major occupancy (storage garage), with a “Group C - Business and Personal Services” minor occupancy (offices) (NBC Table 9.10.2.1).

Code Compliance - Owing to the complexity of uses throughout the NWRI and WTC facilities, the major occupancy type, as defined in the National Building Code of Canada 2005 (NBC), Part 3, is difficult to determine. While the laboratory, repair garages, work-shops and warehouse/storage functions clearly define the facility as a “Group F - Industrial” major occupancy, the specific level (either Division 1 - High Hazard, Division 2 - Medium Hazard, or Division 3 - Low Hazard) of each area varies depending on specific usage and materials (e.g. chemicals) and equipment involved. The NWRI and WTC facilities also contain several minor occupancies, including Group A, Division 2 - Assembly (cafeteria, auditorium, library); and “Group D - Business and Personal Services (offices, open office areas).”

Based on building drawings and construction of each facility, it is assumed that no major changes in occupancies have occurred. Knowing the occupancy types is key in order to ensure proper assessment of required fire separations. It is highly recommended that a review be conducted by HRSDC Labour Programme, Fire Protection Engineering to determine the occupancy types in each area of the facility.

2.02 Fire Separations

General - A fire wall or fire separation is a wall with a specific degree of fire resistance that is designed to prevent the spread of fire within a structure or between two structures. Because fire walls/separations are designed to protect against the spread of fire, no combustible construction is permitted to penetrate these walls. Fire walls/separations are also self-supporting so that they can maintain their stability.

Code Requirements - ***(Reference: NFC, Division B, Part 2.2. & NBC, Division B, Part 3.1.2)***
Where a building contains more than one major occupancy, such occupancies shall be separated from each other in conformance with the NBC. Where rooms or spaces within a building contain a high hazard occupancy, such occupancies shall be separated from the remainder of the building by fire separations.

Installed Components - Despite consisting of 5 separate structures divided by fire separations, the NWRI facility is considered a single building, as it lacks the fire walls and spatial separations required for consideration as multiple buildings. This facility is considered to be occupied by a single major occupant, Environment Canada, and a small private sector occupancy is also present in the R&D area of the building. The WTC and Annex buildings are also occupied by Public Service employees and a private sector Organization.

Code Compliance - Fire separations are required between Public Service Employees and the private sector Organization, and any high hazard occupancy areas, differences in major classifications, electrical, mechanical areas and primary egress routes. Inspections were not focused specifically on fire separations during the site visit, only fire separations easily visible during the cursory walk-through were evaluated and/or reported on. Most of the original fire separations between the shops, warehouses and office areas appeared to be in place, where visible. A further in-depth study should be conducted to determine that all fire separations are in place where required, and existing separations are repaired where damaged to ensure their integrity.

2.03 Closures

General - Two of the most important functions of closures, in terms of life safety, are to act as a barrier to fire and smoke, and to serve as a component of a means of egress. Openings in fire separations shall be protected with closures in conformance with the NBC, so that the integrity of the fire separation is maintained. When doors are used as closures and serve as a component of a means of egress, they must be constructed so that the way of exit travel is obvious. They shall be kept closed, they may be latched but not locked against the egress, otherwise, occupants will not be able to use them unless they have a key.

Code Requirements - ***(Reference: NFC, Division B, Part 2.2. & NBC, Division B, Part 3.1.8)***
All closures in fire separations shall be tested at intervals not greater than 24 hours to ensure that they remain closed unless the door is equipped with a hold-open device conforming to the NBC. Doors in fire separations shall also be operated at intervals not greater than one month to ensure that they are properly maintained, not obstructed, blocked, wedged open, or altered in any way that would prevent the intended operation of the closure. Where vestibules or stair shafts are pressurized as a means of smoke control, all doors in the path of exit travel shall be tested to ensure that they can be operated as required when the entire smoke control system is being tested on a quarterly basis. Where doors are equipped with approved hold open devices, they shall be tested no greater than monthly to ensure they release upon a fire alarm. All doors should have a clear path for opening and closing and should move easily. All window glass and hardware should be in place and in good repair. All doors should close tightly and latch properly to provide an effective barrier against fire and smoke, should there be a fire situation. Doors with self closing devices must automatically return to the closed and latched position after being opened.

Installed Components - As identified above in sentence 2.1, the NWRI building is divided into 5 main sections, each is provided with primary exit doors at every entry/exit point to an exit stairway, and at each discharge point to the exterior from the exit stair. Various secondary exit points are provided around the perimeter of the structure at grade level. Doors in fire separations are installed in various areas such as doors at the connecting fire separation between the wings, mechanical service spaces, electrical rooms, janitor's closets and all shops, warehouses, shipping area, and storage rooms off the main corridor. A fire hatch or vent is also located over the volatile chemical storage room W205 to release upon fire or products of combustion. Large overhead steel rolling doors separate the shops/ warehouse wing from the main structure, and the warehouses from the shops area, and are all equipped with lead fusible links so the doors will release on fire conditions and close to prevent the spread of fire.

Fire doors and closures are also installed in the Water Treatment Centre, and the Annex Building to separate the laboratory areas and office space from storage/warehouse space and the water treatment process areas from mechanical spaces.

Electromagnetic locks and hold open devices were observed in various areas of all three structures.

CODE COMPLIANCE - Most closures observed at the time of site visit appeared to function correctly; however, most of the steel overhead doors separating the shops wing from the main structure and warehouse were observed as being open. It is reported that Rondar provides inspections through a third party service provider on the overhead steal roll-up doors. There was no evidence to suggest that an inspection program was in place to ensure all other closures remain operable and in good condition for which they were intended, as per the above code requirements. There was also no evidence of an inventory list of installed closures in the facility.

2.04 Fire Dampers, Fire Stop Flaps

GENERAL - Fire dampers and fire flaps are also used as closures in fire separations to prevent transmission of flame and smoke where air ducts penetrate fire separations. A fire damper can be installed in a vertical or horizontal assembly of materials designed to restrict the spread of fire in which openings are protected. The NBC specifies where fire dampers are required and the fire/flame spread rating for each wall/floor assembly.

CODE REQUIREMENTS - ***(Reference: NFC, Division B, Part 2.2.2.4.(5) & NBC, Division B, Part 3.1.8.9)*** All fire dampers, smoke dampers and fire stop flaps shall be inspected at intervals not greater than 12 months to ensure that they are in place and are not obviously damaged or obstructed. As per the requirements of the NBC reference above, a tight fitted access door shall be installed for each fire damper to provide access for the inspection of the damper and to reset the fusible link release mechanism. It is recommended that all dampers be inventoried or identified on building drawings to ensure inspections are performed on all the devices within a 12 month cycle.

INSTALLED COMPONENTS - A review of building drawings and building walk-through provided sufficient evidence and indication that fire dampers are located in ductwork and venting throughout each of the facilities where they pass through vertical and horizontal fire separations.

CODE COMPLIANCE - At the time of site visit, only dampers which could be easily seen were observed for damage, obstructions and/or correct installation. Fire dampers observed during the walk-through such as devices installed between the service cores and labs, and area of open ceiling spaces appeared to be installed correctly, with no obvious damage. There was no evidence to suggest that an inspection program had been implemented. An inventory of all devices should be conducted using building drawings and site verification to ensure inspections are performed on all the devices. An inspection program shall be implemented and records maintained for all fire dampers and fire flaps as soon as possible, to comply with the requirements of the NFC.

2.05 Fire Hazards

A fire hazard is any situation in which there is a greater than normal risk of harm to people or property due to fire. A fire risk assessment helps you identify all the fire hazards and risks in your premises. You can then decide whether they are acceptable or whether you need to do something to reduce or control them.

2.5.1 Accumulation of Combustible Materials and Waste Handling

GENERAL - Proper housekeeping, including the prompt removal of waste and keeping the workspace free of unnecessary combustible materials, will help to prevent or reduce the severity of fires. This can include anything from municipal trash to hazardous or biological materials, and construction materials. Excess garbage or materials that contribute to an increased fire load or which impede egress cannot accumulate in a work space.

CODE REQUIREMENTS - ***(Reference: NFC, Division B, Part 2.4.)***
Combustible waste materials in and around buildings shall not be permitted to accumulate in quantities or locations that will constitute an undue fire hazard. Combustible materials, other than those for which the location, room or space is designed, shall not be permitted to accumulate in any part of a means of egress, service room, or service space. Where storage rooms are provided for the storage of combustible waste materials, such rooms shall conform to the NBC. Outdoor storage receptacles, such as dumpsters, used for combustible materials shall be located so that they do not create an undue fire hazard to surrounding buildings.

INSTALLED COMPONENTS - The NWRI building, Annex Building and the Water Treatment Centre appeared to have no areas of great concern or significant accumulation of combustible materials for which the area was not designed. There appeared to be no rooms or areas in the three structures designed and/or constructed specifically for the purpose of storing combustible waste materials.

CODE COMPLIANCE - Waste handling and removal is provided by a cleaning service provider and removed from the building on a daily basis and placed in waste containers located to the exterior of the buildings on the southeast side near the shipping/receiving areas of the workshops. The Hydraulics Lab wing was under construction during the site visit and was observed as having multiple building construction materials in the area of work. These combustible materials should be kept to a minimum at all times.

2.06 Access to Buildings

An extremely important aspect of life safety is the accessibility to the site for fire fighters and fire fighters' apparatus. If fire fighters are unable to position their apparatus in a functional position close to the involved structure, the success of the fire fighting operations can be severely affected.

2.6.1 Fire Department Access to Building

General - A concern for fire fighting personnel at any given location is the ability to place fire fighting apparatus in a position where it can operate effectively during emergency operations. While it is primarily an issue at the time of construction concerning the layout, the dimensions of the driveways, access lanes, parking lots, and surface load capacities, concern and consideration must be given to the ongoing condition and maintenance of these access areas.

Code Requirements - ***(Reference: NFC, Division B, Part 2.5. & NBC, Division B, Part 3.2.5)***
Fire department vehicles shall have direct access to at least one face of every building by means of a street, yard or roadway in conformance with the NBC. Streets, yards and roadways provided for fire department access shall be maintained so as to be ready for use at all times by fire department vehicles.

Installed Components - The buildings and structures at this property (CCIW) can be accessed by local fire services by means of two municipal roadways, Lakeshore Road and Eastport Drive which cross one another at the entrance to the property on the northeast side. Fire access lanes are provided around and/or near all the structures on the property, and primary parking areas are located on adjacent sides of each structure. The City of Burlington Fire Services responds to emergencies at this facility via the Lakeshore entrance and responds to directions provided by Commissioners posted in this area during emergencies. Roadways and access lanes are clearly marked and designated as fire access routes where applicable. .

Code Compliance - At the time of evaluation, most roadways and access areas around the NWRI structure appeared to be in fair to good condition, with no obstructions. There was no evidence of signs or roadway markings which designate or identify areas of the roadway as fire access lanes so as to allow for a clear, unobstructed access to the building at all times.

The WTC building appeared to have clear access aisles around the structure; however, many pieces of old and abandoned equipment were stored at the rear of the building, possibly causing an obstruction to fire fighters in the event of an emergency. There was also no evidence of signs or roadway markings which designate or identify areas of the roadway as fire access lanes so as to allow for a clear, unobstructed access to the building at all times.

The Annex building appeared to have a clear access aisle on the front and north end of the structure; however, the rear area was an inaccessible grassy area, and the southwest corner contained multiple pallets of steel structures, mechanical equipment and buoys. This area should be better organized to provide fire fighter access to the southwest elevation of the building and provide a clear unobstructed access to the fire hydrant. Here too was observed as not having signs or roadway markings which designate or identify areas of the roadway as fire access lanes.

It is recommended that signs be posted at or along all access lanes to identify them as fire access lanes, and they shall remain clear at all times.

2.6.2 Access and Maintenance of Fire Department Connections

General - Fire fighter's connections, or more commonly known as siamese connections because of their appearance, are physical connections to the building's water based fire protection systems, i.e. sprinkler, standpipe. These connections allow fire fighting personnel to connect apparatus to the building's sprinkler or standpipe and provide water when municipal supplies are not available or when additional water is required.

Code Requirements - ***(Reference: NFC, Division B, Part 2.5. & NFPA 25, NFPA13 & NFPA14)*** Design, construction and installation of fire fighter's connections shall be in conformance with the above references. Access to fire department connections for sprinkler or standpipe systems by fire fighters and their equipment shall be maintained free of obstructions at all times.

Installed Components - Fire fighter's connections are provided for the supply of water to the sprinkler system in the Warehouse, Ships Wing and Ecotoxicology Laboratories in the NWRI building. This connection is located on the north end of the warehouse structure adjacent to the shipping docks. A second fire fighters connection is located on the main tower structure adjacent to the entrance doors at the end of the Mall. This connection serves the standpipe and hose system throughout the NWRI. Fire fighter's connections are installed on the WTC building located on the west end of the structure to serve the standpipe and hose system. All connections can be easily accessed from the roadways and access lanes around the structures.

Code Compliance - The identification plate on the connections indicates the systems that they serve, therefore, it is assumed the entire facility is served by the connections they are connected to. At the time of evaluation, connections were in good condition, with no apparent water accumulation, and caps in place. Additional signage should be considered to identify these connections more easily by fire fighting personnel on approach to the building.

2.07 Service Equipment

Although there are a variety of fire scenarios that can be attributed to service equipment such as HVAC systems, chimneys, or commercial cooking equipment, the two primary hazards they pose are fires caused by the appliance itself, and/or the spread of fire and products of combustion through the air handling equipment.

2.7.1 Heating, Ventilation & Air-conditioning

General - Heating, ventilation and air conditioning systems shall be operated and maintained so as not to create a hazardous condition. The major components within an HVAC system are heaters, air-conditioners, fans, ducts, heat exchangers, and thermostatic controls. There are several installation, operation, maintenance and testing requirements for HVAC systems contained in the NBC, NFC, and the Canadian Standards Association.

Code Requirements - ***(Reference: NFC, Division B, Part 2.6.1.6 & NBC, Division B, Part 6)*** Heating, ventilation, and air-conditioning appliances and equipment shall be installed in conformance with the NBC. Except for self-contained systems within dwelling units, disconnect switches for mechanical air-conditioning and ventilating systems shall be operated at intervals not greater than 12 months to establish that the system can be shut down in an emergency.

Installed Components - Primary heating and cooling in the NWRI building is provided by means of hot water and steam boilers for heating and 2 chillers for cooling through a distribution system of piping, air handling units, heating/cooling coils, heat exchangers and ductwork.

Primary heating and cooling in the WTC building is provided by steam and chilled water from the NWRI heating/cooling plant through distribution system of piping, air handling units, heating/cooling coils, heat exchangers and ductwork.

Primary heating and cooling in the Annex building is provided through two split type roof top units via a distribution system of duct work.

Code Compliance - The mechanical air ventilation systems in the NWRI building are tied into the fire alarm system with in-line smoke detection and automatic shutdown occurs upon the detection of smoke. It is unknown if the mechanical air handling equipment in the WTC and Annex buildings are tied into the fire alarm system with in-line duct smoke detectors. Where these devices are installed, they shall be tested during the inspection and testing of the fire alarm system on an annual bases.

At the time of site visit, there was no evidence to suggest that an inspection program had been implemented to ensure all the mechanical air-conditioning and ventilating system disconnect switches were being exercised.

2.7.2 Chimneys, Flues and Flue Pipes

General - The inspection of chimneys and flues is important to detect problems with the venting system. Heating appliances and their venting systems can be hazardous when not properly installed, or when damage or deterioration has occurred. Inspections and servicing by a licensed professional are essential for safe, efficient operation of heating equipment and venting systems. During inspection of a chimney connected to an operating appliance, the presence of dense smoke at the outlet will indicate improper operation of the appliance, incorrect sizing of the chimney or that unsuitable fuels are being used.

Code Requirements - ***(Reference: NFC, Division B, Part 2.6.1.4. & NBC, Division B, Part 6.3)*** It is a requirement of the National Fire Code for the owner of a chimney, flue or flue pipe to have it inspected annually, when an appliance is added, or after a chimney fire. Persons responsible for inspections must posses the necessary qualifications to ensure inspections are performed and in accordance with the NFC.

Installed Components - The NWRI building is equipped with several solid fuel burning appliances. Two hot water and 1 steam boiler, in addition to a co-generation plant vent to the exterior by means of factory built breaching and venting through three steel chimneys which exit the southwest wall of the boiler plant and are supported and shrouded by a detailed architectural concrete structure.

Code Compliance - There is no evidence to suggest that an inspection program has been implemented recently. It was reported that the chimneys were last inspected approximately 4 years ago by (McMillan....?). The venting systems, chimneys, breaching, flues and flue pipes must be inspected as soon as possible to ensure their safe operation and compliance with the NFC.

2.7.3 Commercial Cooking Equipment

General - Cooking is another very common cause of fires. Common cooking equipment that can be installed includes ranges, ovens, fryers, warming equipment, and exhaust equipment. While it is primarily an issue at the time of design and construction concerning the layout, the dimensions and effectiveness of these systems, range hoods and cooking equipment must remain in good working order; excess grease and dirt should not be allowed to accumulate on the equipment. In commercial cooking establishments, much of the attention is focused on the hood exhaust and fire protection equipment above the cooking area. These systems shall be designed and installed in conformance with the National Building Code.

Code Requirements - ***(Reference: NFC, Division B, Part 2.6.1.9 & NBC, Division B, Part 6.2.2.6)*** Depending on the extent of equipment usage, the cooking equipment and entire exhaust system should be inspected weekly to determine if more frequent cleaning and/or maintenance is required prior to the six month inspection cycle. The use, inspection and maintenance of commercial cooking equipment exhaust and fire protection systems shall be in conformance with NFPA 96 Ventilation Control and Fire Protection of Commercial Cooking Equipment.

Installed Components - A cafeteria style kitchen is installed on level one of the Administration Laboratory structure. Commercial style griddles, ovens and liquid fat fryer equipment is being used to produce cooked and prepared food for commercial sale.

Code Compliance - At the time of site visit, the exhaust hoods appeared to be reasonably clean and free of combustible oil residues. It was reported by cafeteria staff that they clean the equipment on a daily basis; however, the exhaust range hood is equipped with an automatic water wash function and it is likely the cafeteria staff were referring to this process. Also reported during the site visit, was that Rondar performs inspections and retains a service provider to clean the range hood and exhaust equipment. There were no documents or records available to substantiate this claim

2.7.4 Electrical Equipment Vaults

General - Historically, electricity has always been a common cause of fires. When principles of safety are not followed, electrical energy can produce unwanted and unexpected fires. Most electrical fires are caused by either arcs or overheating. Over 90% of the energy in electricity is converted into heat, and unless the electrical energy is used efficiently, it almost always produces heat as an unwanted by-product.

Code Requirements - ***(Reference: NFC, Division B, Part 2.6.3 & NBC Division B, Part 3.6.2.7)*** In accordance with the NFC reference, electrical equipment vaults shall not be used for storage purposes and shall be kept locked so that unauthorized persons will not have access to them. In accordance with the NBC reference above, if a building is sprinkled throughout, an electrical equipment vault need not be sprinkled, provided the vault contains a smoke detection device which actuates the building fire alarm system in the event of a fire in the vault.

Installed Components - The main electrical transformers are located outside on a concrete pad on the southwest corner of the boiler plant structure in the NWRI building. The primary switch gear and main electrical service is located in a separate room adjacent to the boiler equipment and emergency generator room. All other buildings are fed with underground cables and independent electrical panels from the main building.

Code Compliance - At the time of site visit, the main electrical vault and high voltage switch gear areas were found to have various items stored in this area. The electrical vault/room shall remain clean and clear of combustible materials and debris at all times. It must not be used for storage and must remain locked to unauthorized persons at all times.

2.08 Means of Egress

The "way out" or means of egress is one of the most important factors to be considered in determining whether the design and construction of an occupancy is safe. A means of egress is a continuous unobstructed way of exit travel from any point in a building or structure to the street, alley, or similar parcel of land which is at a safe distance away from the structure.

2.8.1 Corridors, Aisles, Open Floor Areas, and Exits

General - All corridors, aisles and egress routes shall be kept free of obstructions at all times. No furnishings, decorations, or other combustible or flammable objects shall obstruct exits. Corridors and other portions of the means of egress are meant to be a certain width so that the expected numbers of people can exit quickly in a fire situation. Any time there are obstructions, the possibility of people becoming trapped or slowed down in a fire increases greatly. Since the prime function of corridors is to allow people to escape during a fire, we don't want these areas to be the origin of a fire, or a means to allow it to propagate.

Code Requirements - ***(Reference: NFC, Division B, Part 2.7 & NBC Division B, Part 3)***
The design and construction of all means of egress shall be provided in buildings in conformance with the NBC. Means of egress shall be maintained in good repair and free of obstructions at all times.

Installed Components - The NWRI building is provided with a ring corridor around a service core shaft on floors four through seven. The remainder of the building is also provided with corridors surrounding a central core of labs and offices. The R&D Wing is attached to the Administration and Lab tower by an open structure known as the Mall. This area is a large open atrium with a central corridor leading to side corridors on both adjoining structures and a primary exit at the north end. The warehouse/shops wing is provided with large central corridors leading to each workshop and warehouse/stores area of the structure.

The WTC and Annex buildings are also provided with central corridors in the office administration lab areas, with large access corridors in the water treatment laboratory area.

Code Compliance - At the time of evaluation, all primary egress routes appeared to meet the minimum requirements of the National Building Code. The building Health and Safety Committee shall conduct a monthly walk-through to continually assess the conditions of egress routes. The Fire Emergency Organization and/or persons identified as responsible for fire safety shall also conduct a walk-through on a semi-annual basis.

2.8.2 Exit Stairs & Exit Passageways

General - The only permissible openings in an exit are those that allow people to enter the exit from the building and those that empty directly to the exterior. Any openings to the exit must be protected by a self-closing fire door. Exit stairs are a critical component of the means of egress in multi-storeyed buildings. In order to provide a protected path of travel and to qualify as an exit, all interior stairs must be separated from the other parts of the building by proper construction.

Exit passageways are those components of a means of egress to satisfy the requirement that exit stairs discharge directly to the exterior. Exterior passageways serve as an egress path from an exit which leads occupants safely away from the building.

Code Requirements - ***(Reference: NFC, Division B, Part 2.7. & NBC, Division B, Part 3.4)***
An exit shall be designed for no other purpose other than for exiting, except that an exit is permitted also to be designed to serve as an access to a floor area. Every path of egress and exit, including exit stairs, shall lead to and discharge directly to the exterior of the building, with a continuous fire separation that separates an exit from the remainder of the building. Means of egress shall be provided in buildings in conformance with the NBC. Exit facilities shall be provided from every floor area that is intended for occupancy. Means of egress shall be maintained in good repair and free of obstructions.

Installed Components - The NWRI building is divided into five structures, each provided with exit stairways serving as a means of egress. The following is a description of each area:

The Administration Lab tower is provided with 5 exit stairways (NW, NE, CE, SE, and CC) which provides a means of egress from the roof level through to the ground level exiting directly to the exterior through exit lobbies at grade. The R&D structure is provided by two stairways (RC and RN) which provides a means of egress from all three levels, the third floor mechanical penthouse and roof through to the ground level which exits directly to the exterior through exit lobbies at grade. A third stairway is provided at the south end of the R&D structure serving only the first and second levels of the R&D structure and the Hydraulics structure which exits directly to the exterior through exit lobbies at grade.

The area known as the Mall linking the Administration Lab tower to the R&D structure is served by four interior exit stairs, and a fifth stair is located in the main entrance lobby atrium. All of these interior stairs can be used in the event of an emergency but not considered as identified exit stairways.

The warehouse structure is provided with one primary exit stairway (WW) which provides a means of egress from the roof, second and first floors and exits directly to the exterior through exit lobbies at grade. The warehouse structure also shares stairways (RN and NW) which link it to the Administration and R&D structures.

The hydraulics structure is served by two primary stairways which provide a means of egress, only one which serves as an egress from the roof, second and first floors exiting directly to the exterior through exit lobbies at grade.

The boiler plant is a one floor structure with a mezzanine and partial second floor. The second floor and mezzanine levels are served with interior exit stairs leading to the first floor which can exit from several man doors to the exterior of the building.

The WTC building is provided with three primary stairways which provide a means of egress, two of which serve as egress from all levels, the roof, mechanical penthouse, second and first floors. The third serves only the second and first floors, all exiting directly to the exterior.

The Annex building is provided with one interior exit stair serving the second and first floors. An exterior exit stair is provided on the west side of the building providing egress from the second floor only.

Code Compliance - At the time of evaluation, all egress routes, interior stairways, and exterior passageways appeared to meet the minimum requirements of the National Building Code. All doors leading to the stairways were closed and latched accept for those equipped with electromagnetic hold open devices. Several stairways were observed with stored objects, bicycles, cleaners' equipment, clothes racks, and other items which are not permitted to be stored in an exit. Health and Safety Committees shall conduct a monthly walk-through to assess ongoing conditions of their respective egress routes. The Fire Emergency Organization and/or persons identified as responsible for fire safety shall also conduct a walk-through on a semi-annual basis.

3.00 INDOOR & OUTDOOR STORAGE

This part provides information on the level of conformity to the National Fire Code and other Federal legislation as applicable to the storage of combustible products and dangerous goods, both inside and outside of buildings.

3.01 Dangerous Goods

General - A dangerous good is any solid, liquid, or gas that can harm people, other living organisms, property, or the environment. Dangerous goods may be radioactive, flammable, explosive, toxic, corrosive, biohazards, an oxidizer, an asphyxiant, a pathogen, an allergen, or may have other characteristics that render it hazardous in specific circumstances. Mitigating the risks associated with dangerous goods may require the application of safety precautions during their transport, use, storage and disposal.

Code Requirements - ***(Reference: NFC, Division B, Part 3)***
Laws and regulations on the use and handling of hazardous materials may differ depending on the activity and status of the material. For example, one set of requirements may apply to their use in the workplace, while a different set of requirements may apply to spill response, sale for consumer use, or transportation. Cylinders and tanks shall be protected against mechanical damage and shall be firmly secured in a position that will not interfere with the operation of the cylinder.

Installed Components - Compressed gases are located in many of the laboratories throughout the NWRI structures, the WTC and Annex buildings. They are of mixed commodities and stored in pressurised cylinders.

Code Compliance - At the time of site visit, most areas observed as storing gas cylinders appeared to have them stored safely. All were fastened tightly in the upright position, however, cylinders containing Class II type gases cannot be located within 1 metre of any exit. Verification must take place to ensure these gases are not stored too close to the egress path from each of the laboratories.

3.02 Indoor Storage

General- Materials storage in any building or operation presents several potential hazards. Problems such as storing products too close to ceilings or sprinkler equipment, improper storage of flammable liquids and compressed gases, or storage of materials blocking fire protection equipment or egress routes, can be found in many different types of material storage occupancies.

Code Requirements - ***(Reference: NFC, Division B, Parts 3)***
Storage requirements for both indoor storage of combustible products and dangerous goods are outlined in Part 3 of the National Fire Code and specify such requirements as access aisles, clearances, pile size, signage, sprinkler protection, ignition sources, and fencing. The requirements are based on the relative hazard or classification of a commodity.

Installed Components - This facility has three primary areas of concern regarding indoor storage of goods and commodities, the warehouse and stores, workshops and chemicals/ gases used in the various laboratories through the facility. The warehouse is a very large space which accommodates the storage of multiple commodities used in the daily operations of Environment Canada, Coast Guard, and Department of Fisheries and Oceans. Various laboratories throughout the facility were observed with chemicals and gases, and seemed to be limited in quantity. The third area area of concern is the workshops. Various types of flammable combustible products are being used and stored in the various worksshops.

Code Compliance - All areas viewed during the cursory walk-through appeared to meet applicable standards. Most materials were appropriately stacked and/or stored; however, housekeeping is required in many areas to ensure all materials are stored away and not impeding egress. Storage racks in the warehouse seem to be at the appropriate height and not too high to affect the sprinkler coverage. During the site visits, a pallet of chemical bottles and containers labelled “Hazardous Waste” was observed on the floor in a traffic lane close to the sprinkler control valves. These types of products must be stored and handled correctly with caution.

4.00 FLAMMABLE & COMBUSTIBLE LIQUIDS

This part provides information on the level of conformity to the National Fire Code and other Federal legislation as applicable to the storage, handling, and processing of flammable liquids and combustible liquids in buildings, structures and open areas.

4.01 Container Storage and Handling

GENERAL - Flammable materials are substances that can ignite easily and burn rapidly. They can be common materials that are at most work places such as gasoline, solvents, and cleaners, or more volatile and dangerous liquids more commonly found in industrial occupancies such as acetone, toluenes or alcohol. Controlling the potential for fire and explosion with flammable liquids is done through safe storage, transfer, use and disposal.

CODE REQUIREMENTS - ***(Reference: NFC, Division B, Part 4)***
The storage, handling and use of flammable combustible liquids shall be in accordance with Division B, Part 4 of the National Fire Code.

INSTALLED COMPONENTS - During the site visit, several types of flammable or combustible liquids associated with marine equipment maintenance, painting and refinishing operations, wood working, and motorized equipment maintenance were found in each shop area of the warehouse shop's structure. Flammable and combustible liquids were found in various sized containers, and most appeared to be stored in original or approved type containers. Most areas were also equipped with ULC approved Flammable Storage Cabinets for this type of material. Several outer buildings were observed housing/storing portable containers of fuels, both gasoline and diesel for the various types of motorized equipment on the site.

CODE COMPLIANCE - Most areas containing flammable and/or combustible liquids were observed as having appropriately listed and approved metal cabinets to store these types of products, but did not appear to be used properly in some shops. Most shops, labs, and work areas appeared to have small quantities of these materials, whereas larger quantities were stored in a flammable storage area constructed for this purpose. Material Safety Data information must be available for every product contained in each shop, lab and work area.

4.02 Fuel-Dispensing Stations

GENERAL - Dispensing motor fuel raises a number of concerns, including: lack of supervision to prevent unsafe fuelling practices or filling of non-approved containers; lack of protection against interference or tampering with dispensing equipment and facilities; dependence on untrained persons for extinguishing small Class I & Class II combustible liquid fires; and increased reliance by the public on fire departments and other emergency services for response to any type of malfunction or problem at the unattended site.

CODE REQUIREMENTS - ***(Reference: NFC, Division B, Part 4.6.3.1.)***
Fixed dispensers for flammable liquids or combustible liquids shall conform to CAN/CSA B346-M, Power-Operated Dispensing Devices for Flammable Liquids.

INSTALLED COMPONENTS - Although the fuel dispensing devices were not specifically reviewed, it was reported that both a gasoline and diesel fuel power operated dispensing devices are installed on the property. The dispensing device must be protected from unauthorized use and vandalism by means of locked disconnect switches.

CODE COMPLIANCE - The fuel dispensing devices were not observed or evaluated during the site visit; however, the following information is provided as some basic code requirements for fuel dispensing stations. The dispensing devices are required to be provided with protection from collision damage. A remote device to shut off power to the dispensing device and pumps is required in accordance with the NFC and clear signage identifying the location of the emergency shutoff device is also required.

Spill control measures and/or absorbent materials in or around the dispensing device is required in the event of a fuel spill. The NFC references above require the provision of two 40-BC fire extinguishers at every fuel dispensing device. Fuel dispensing devices shall also have operating procedures, and procedures to follow in the event of a spill or emergency.

5.00 HAZARDOUS PROCESSES & OPERATIONS

This part provides information on the level of conformity to the National Fire Code and other Federal legislation as applicable to operations that involve a risk from explosion, high flammability or related conditions that could create a fire hazard to life safety.

5.01 Hot Works

GENERAL - Cutting and thermal welding practices can present significant hazards to the area in which they are being performed. They inherently provide two of the three sides of the fire triangle: an ignition source, and oxygen in the air. All that is needed is a fuel source and you have the potential for a serious fire.

CODE REQUIREMENTS - ***(Reference: NFC, Division B, Part 5.2)***
This section shall apply to hot works involving open flames or producing heat or sparks, including, without being limited to, cutting, welding, soldering, brazing, grinding, adhesive bonding, thermal spraying and thawing pipes. Except as provided in section NFC, Division B, Part 5.2., hot work as described above shall conform to CAN/CSA-W117.2 “Safety in Welding, Cutting and Allied Processes.”

INSTALLED COMPONENTS - During the site visit, it was observed that equipment to perform several of the described hot work processes were present and available for use in the various work shops, machine shops, mechanic shops, and several other shops in the warehouse shops structure.

CODE COMPLIANCE - At the time of site visit, there were no hot work processes being conducted; however, the equipment is readily available to do so. Equipment appeared to be in good condition, with no obvious deficiencies and stored appropriately; however, when these types of operations are being performed, all necessary precautions and safety practices must be observed, and the areas in which this work is conducted must be designed and constructed for this purpose.

5.02 Spray Coating Processes

GENERAL - It is obvious that any operation where flammable liquids or combustible powders are applied in an atomized form, has the potential to easily create severe fire conditions. These finishing operations are commonly found in metal shops, auto-body shops, and manufacturing facilities where metal and wood products are produced.

Code Requirements - ***(Reference: NFC, Division B, Part 5.4.5)***
This section shall apply to spray coating processes involving the use of combustible dry powders, flammable liquids or combustible liquids. The design, operation and maintenance requirements relating to spray coating processes shall conform to NFPA 33, "Spray Applications Using Flammable or Combustible Materials."

Installed Components - During the site visit, it was observed that equipment to apply paint by means of compressed air was installed and available for use in the Marine workshop area.

Code Compliance - At the time of site visit, it was reported by the facility technician that spray operations were being conducted in the marine work shop. These types of operations shall not be performed unless the area where this work is to be conducted is designed and constructed in accordance with the above references for this purpose.

5.03 Dust Producing Processes

General - Woodworking in general, either the production of lumber or making raw lumber into finished products, creates a substantial amount of waste. Most of this waste is in the form of small wood particles and dust. If not controlled properly, this dust can accumulate and ignite given the proper conditions. Although wood dust does not present an explosion hazard in itself, the primary concern with these operations is dust fires. The most common place for fires to occur in woodworking operations is at dust collection systems.

Code Requirements - ***(Reference: NFC, Division B, Part 5.3 & NFPA 664)***
Dust collection systems shall be provided to prevent the accumulation of dust and keep suspended dusts at a safe concentration inside a building. A dust collection system shall be designed in conformance with good engineering practices such as that described in NFPA 664, Prevention of Fires and Explosions in Wood Processing and Woodworking Facilities. Dust collection systems are permitted to be located inside a building if it is provided with explosion venting to the outdoors, and located in a room with a fire separation having not less than a one hour fire resistance rating.

Installed Components - A dust collection system is installed in the carpenter shop and is located outside the building to the exterior of the Carpenters shop. Ducting and collection points are provided for each piece of woodworking equipment, complete with floor level sweep collection entry points.

Code Compliance - The key to preventing fires in woodworking operations is controlling the dust and ignition sources. Housekeeping needs to be frequent to prevent the accumulation of dust. Equipment required to have a dust collection system shall be electrically interlocked to prevent it from starting if the dust collection system is not in operation. No test was performed to ensure this requirement was satisfied. At the time of site visit, the carpenter shop was not in use, and appeared to be in a clean and orderly condition. Electrical installations shall be verified to ensure bonding and grounding requirements have been met to prevent the accumulation of static electricity in the room containing the collection system.

6.00 FIRE PROTECTION EQUIPMENT

This part provides information on the level of conformity to the National Fire Code and other Federal legislation as applicable to the inspection, testing, maintenance, and operation of fire protection equipment and life safety systems.

6.01 Water Based Fire Protection Systems

6.1.1 Water Supplies, Water Main Valves & Back-flow Protection

GENERAL - Water supplies for fire protection shall be readily available and of sufficient volume and pressure to enable emergency response personnel to control fire growth so as to enable the safe evacuation of occupants and the conduct of search and rescue operations, prevent the fire from spreading to adjacent buildings and provide a limited measure of property protection. When water supplies are insufficient or fail, fire departments can utilize pumps on their apparatus to boost the water supply to the sprinkler and/or standpipe systems through a fire fighter connection, also called Siamese connections.

CODE REQUIREMENTS - ***(Reference: NFC, Division B, Part 6.4., NFPA 25, & 2.5.1.4.)***
Water supplies for fire protection shall be maintained so as to be capable of providing the flow and pressure of water for which they were designed. Valves controlling water supplies to fire protection systems shall be inspected at intervals not greater than 7 days to ensure that they are wide open and are locked or sealed in that position. Fire sprinkler and standpipe systems where connected to a potable water system shall be protected against backflow caused by back-siphonage or back pressure.

INSTALLED COMPONENTS - The entire facility is supplied with fire protection water through two 8-inch water mains which loop around the entire property, one from the Lakeshore, Eastport roadway entrance and the other from the southeast corner of Eastport Drive. The supply mains pass around the main structures and join at or near the boiler plant where they enter into the building near the fire pump. The water mains also supply at least 10 - 12 dry barrel fire hydrants distributed around the property. The main control valves are installed with an electronically supervised, anti-tamper device on the main OS&Y valves. The water mains also supply the Annex Building and the WTC Building.

CODE COMPLIANCE - At the time of evaluation, the control valves were in the open position and their access was clear of obstacles and debris. Seven-day inspections are not required because the valves are electronically supervised. As per the National Plumbing Code, the main water supply inlets have been provided with anti-backflow devices to prevent contaminating the domestic potable water supply in the buildings and/or returning back to the municipal supply.

6.1.2 Hydrants

GENERAL - Fire hydrants are devices connected to water mains and are used by fire departments to obtain a continuous water supply for the suppression of fires. Rarely used for this purpose, but when it is required, it must be able to be located quickly with considerable assurance that it will operate as per it's design criteria. Hydrants shall be maintained in good operating condition and shall be kept readily accessible for fire fighters' use and their locations shall be clearly identified. Hydrants are typically adjacent to fire access lanes and risk being buried by snow removal contractors. Landscaping and shrubbery shall be cut back to give clear access in the summer months and snow and ice kept clear in the winter months.

Code Requirements - ***(Reference: NFC, Division B, Part 6.4 & NFPA 25)***
Inspections are required semi-annually for dry barrel hydrants and annually for wet barrel hydrants. All hydrants must be inspected after each operation, with the necessary corrective action taken as applicable. Flow tests need to be conducted on all hydrants annually so they can be checked for ease and proper operation, and to confirm water availability.

Underground and exposed piping shall be flow tested to determine the internal condition of the piping at minimum 5-year intervals. Any flow test results that indicate deterioration of available water flow and pressure shall be investigated to the complete satisfaction of the authority having jurisdiction to ensure that the required flow and pressure are available for fire protection.

Installed Components - At least ten to twelve hydrants were observed on the property and are identified as dry barrel type fire hydrants. All hydrants are fed from the two water mains and appeared to be in fair condition, with no apparent damage or water accumulations. Most hydrants are equipped with marker signs so they can be easily identified, specifically in the winter months during heavy snow all.

Code Compliance - There was no evidence available to substantiate than an inspection program had been implemented. It was reported that inspections had been performed in the past by Canada Hydrant, however, evidence of inspection testing documents was not observed at the time of site visit. Inspection and testing must be performed as soon as possible to ensure these devices operate as intended in compliance with NFPA 25, as referenced by Division B, Section 6.4 of the National Fire Code.

6.1.3 Fire Pumps

General - The main function of a fire pump is to increase the pressure of the water that flows through it. Usually, a fire pump is required to supply a sprinkler system or standpipe system because the available water source, such as elevated storage tanks, ground storage tanks, municipal water supplies do not have adequate pressure to meet the fire suppression demand. The result of pump failure is most often catastrophic. The way to prevent this from happening is to continually make sure that the pump installation is in good operating condition and tested frequently.

Code Requirements - *(Reference: NFC, Division B, Part 6.4 & NFPA 25)*
Fire pumps driven by an electric motor shall be operated at intervals not greater than one week at their rated speeds until the satisfactory performance of the pump, driver and controller is verified in a no-flow condition. Fire pumps shall also be tested at full rated capacities at intervals not greater than 12 months in a flow condition to ensure that they are capable of delivering the rated flow.

Installed Components - Municipal water pressure is not sufficient enough to maintain water pressure in the standpipe systems of the NWRI structures. An electric, base mounted, horizontal shaft, centrifugal fire pump and electronic controller is installed and located in the lower level of the boiler plant. This ULC listed pump is driven by an electric motor and is dedicated to the standpipe system. A jockey pump keeps pressures up to the required pressure, eliminating nuisance start-ups of the pump. Emergency electrical power is supplied to the fire pump by means of the diesel generator through a transfer switch and electric pump controller. The transfer switch and controller is installed in the same room next to the riser.

Code Compliance - At the time of our site visit, there was no evidence to suggest that weekly and annual testing was being performed on the fire pump.

6.1.4 Sprinkler Systems

General - Sprinkler systems provide a means for automatic application of water on fires and are designed to provide a quick and convenient means for applying water streams on a fire on any story of a building. Automatic sprinkler systems consist of water control valves, a system of piping, and a series of nozzle-like devices so arranged that the system will automatically distribute sufficient quantities of water to either extinguish a fire or prevent flashover until fire fighters arrive. Every sprinkler system must have an automatic water supply of adequate volume, pressure and reliability. The water supply must be able to reach the highest sprinkler in the system.

Code Requirements - ***(Reference: NFC, Division B, Part 6.4 & NFPA 25)***
All sprinkler system shall be designed and installed in accordance with the NFC and NFPA 13. Periodic inspections and testing shall be performed in accordance with NFPA 25 as applicable for the installed system type. Where an electrical supervisory signal device is provided for a sprinkler system, initiating and transmitting devices shall be tested at intervals not greater than quarterly to ensure a signal is received at the enunciator.

Installed Components - A full coverage ULC listed automatic wet sprinkler system is installed throughout the entire Warehouse shops structure, including the Ships Wing and Ecotoxicology Labs and supplied by at least six risers, each with a supervised control valve, alarm valve and in-line jockey pump to sustain system pressures. Municipal water pressures (90 psi) are sufficient enough to maintain water pressure in the sprinkler system and therefore, a fire pump is not required. Zone pressures (125 -130 psi) are maintained with the assistance of in-line jockey pumps. A pre-action sprinkler system is also installed in the computer room located in the R&D structure. Each are supplied with independent risers, water control valves, and alarm valves complete with in-line jockey pumps to sustain pressures. Each riser is provided with a spare sprinkler head cabinet and spare sprinkler heads.

Code Compliance - At the time of evaluation, documentation of daily and weekly inspections or testing were not available for review on the systems. Monthly inspections are reported to be performed by Rondar staff and documents were also not available for these inspections/ tests. As per NFPA 25, prescribed by Division B, Section 6.4 of the National Fire Code, water flow tests using the inspector's test connection shall be performed on the system at intervals not greater than 12 months. A main drain test shall also be conducted at intervals not greater than 12 months to ensure that the water supply available to the sprinkler system has not deteriorated. Inspection tags were attached and identified as being performed in 2009, however, no other documents were reviewed at time of site visit to verify a full annual inspection had been performed. It was reported by building technicians that Simplex-Grinnell performs annual inspections and quarterly inspections of supervisory/ flow initiating devices are performed by Rondar.

6.1.5 Standpipe and Hose Systems

General - Standpipe and hose systems provide a means for manual application of water on fires in large, one storey buildings or in multi-storey buildings and are designed to provide a quick and convenient means for operating water streams on all stories of a building and in adjacent buildings. Depending on the type of system installed, the standpipe system may be used by fire fighters, occupants, or both. Standpipe systems are dependent on adequate supplies to be effective and where municipal water pressures are not adequate to meet the demands of the system, a fire pump is required.

Code Requirements - ***(Reference: NFC, Division B, Part 6.4 & NFPA 25)***
All standpipe systems shall be designed and installed in accordance with the NFC and NFPA 14. Periodic inspections and testing shall be performed in accordance with NFPA 25 as applicable for the installed system type. Standpipe systems shall be flow tested at the most remote hose connection of each zone of an automatic standpipe system at intervals not greater than 5 years to ensure that the design flow can be delivered. Hoses shall be hydrostatic tested 5 years after new and at intervals not greater than 3 years thereafter.

Installed Components - A Class III wet standpipe system is installed throughout the five structures of the NWRI facility and can be used by both occupants and fire fighters. A Class I system is installed in the WTC Building and the system can only be used by building occupants. Fire hose cabinets are installed throughout the two facilities and are typically located in major corridors, at stairwell entrances and at main exits. All hose cabinets contain a racked 75 ft. (22 m), 1½" (38 mm) ULC labelled hose, complete with a 2 in. (50 mm) nozzle. A pressure gauge and test connection were installed at the highest or most remote fire hose cabinets in the Administration Lab tower, to monitor system pressures; however, there was no evidence that a pressure gauge was installed on the system in the WTC Building.

Code Compliance - At the time of evaluation, hose cabinets were installed with inspection tags and monthly inspections were being signed off regularly. Hoses were neatly racked and cabinets were well labelled. Fire hose cabinets shall remain accessible and clear of obstacles at all times. Many hoses were observed with various dates of construction and were not affixed with inspection tags to indicate the last annual inspection. Evidence in the form of service provider's labels were attached to many of the hoses indicating the last hydrostatic test and the company which provided the test. The dates on most hoses indicated the test was last performed in 2001-2002. All fire hoses shall be hydrostatically tested as soon as possible to ensure hoses are safe for there intended use.

6.02 Emergency Power Systems, Lighting & Exit Lighting

6.2.1 Emergency Power Supply Equipment

General - The purpose of emergency power supply equipment is to furnish an immediate, automatic source of electric power to a limited number of selected vital circuits in the event the regular power supply fails. It includes one or more solid fuel-driven emergency generators, emergency transfer switches, and a distribution system. The emergency power system, with the use of transfer switches, may also be used for furnishing emergency lighting.

Code Requirements - ***(Reference: NFC, Division B, Part 6.5. & CAN/CSA-C282)***
Emergency power systems shall be inspected, tested and maintained in conformance with the reference above, "Emergency Electrical Power Supply for Buildings". Liquid fuel storage tanks shall be drained and refilled with fresh fuel at intervals not greater than 12 months if through regular testing, the fuel cannot be depleted by more than 50% of it's volume.

Installed Components - This facility is equipped with one emergency diesel generator. The generator equipment is manufactured by Kohler, providing 347 605 kW (756 kVA, 600/347 V) of power and located in the generator room within the southwest boiler room area of the boiler plant structure. The generator set starts automatically when normal power is interrupted through an automatic transfer switch located just outside the generator room in the main boiler plant.

This main transfer switch supplies 600 V emergency power to a distribution switchboard, which in turn provides power to 5 secondary transfer switches. Emergency power is provided for several distribution panels and small panel boards for emergency lighting, building mechanical equipment, fire alarm system, water based fire protection equipment and currently some of the tenants' operational labs, UPS systems and other equipment in the NWRI structures, and the WTC PH electrical room.

A project is currently in place to remove and replace the underground diesel fuel storage tanks. Temporary fuel tanks are in place to ensure a continuos supply of fuel to the generator.

Code Compliance - At the time of evaluation, testing records were not located near the equipment. Written documentation of inspections, and inspection results were not available for review. It was reported that testing is occurring; however, evidence suggests that testing and inspections are not occurring in compliance with the above referenced standards. It is recommended that operational/property management staff acquire a copy of the log book which supplements the CAN/CSA- C282 standard to ensure all required testing inspections are performed.

The following deficiencies and/or conditions were also identified that require correction:

- A manual containing mechanical and electrical drawings and instructions for the operation and maintenance of the emergency generating equipment shall be provided. At least two copies of the manual of instructions shall be provided. One copy shall be kept by the person designated responsible for the overall control of the operation and maintenance program. The other copy shall be used by the operating/maintenance staff and kept in a location convenient for staff to use. There was no evidence available at the time of site visit to suggest that manuals are available for this unit.

- Liquid fuel storage tanks shall be drained and refilled with fresh fuel at intervals not greater than 12 months, which can be achieved by replenishment as a result of the routine testing program. It is unclear how often this equipment is tested to determine the life span of the existing fuel.

- Emergency generator rooms and automatic transfer switch room, where separate, shall be equipped with unit equipment for emergency lighting and shall provide a minimum lighting level of 50 lux for a period of 2 hours. It is doubtful that the existing battery powered unit next to the generator meets this requirement. The information data plate indicates that the unit is a 120 volt unit providing 36 watts of light for a 30 minute duration. The other transfer switches do not have unit battery lighting meeting this requirement.

- Signs shall be installed on the equipment or at the entrance to the enclosure and on the door to the room housing the equipment, stating that the equipment is automatically controlled and may start at any time. There is no signage present on the generator equip- ment or at entrance doorway to the enclosure to alert occupants of this condition.

- A permanent log of the inspection, testing and maintenance of the emergency electrical power supply system shall be maintained in accordance with the manufacturers manual of operating instructions and the requirements of CAN/CSA C282-00-05.

- There is no means to test the settings and proper operation of the louvres in the generator rooms as required by C282-05 Emergency Power Supply for Buildings standard, Table 2 (weekly inspection).

6.2.2 Emergency Lighting and Unit Equipment

General - The purpose for emergency lighting is to provide illumination or lighting when normal power is interrupted. Emergency lighting can be provided through a network of fixtures connected to the emergency electrical power supply from a generator. Where generators are not provided, emergency lighting is provided by means of battery powered unit equipment.

Code Requirements - ***(Reference: NFC, Division B, Part 6.5.1.6.)***
Self-contained emergency lighting units shall be inspected at intervals no greater than one month to ensure that the pilot lights are functioning and not obviously damaged or obstructed. Units shall be tested at intervals not greater than 12 months to ensure that the emergency lights will function upon failure of the primary power supply for a duration equal to the design criteria under simulated power failure conditions. After completion of this test, the charging condition for voltage and current and the recovery period shall be tested to ensure that the charging system is functioning correctly.

Except for unit equipment requirements above, emergency lighting supplied with power from an emergency generator shall be inspected at intervals not greater than 12 months to ensure that they are functional and provide a minimum lighting level of 10 lux in all egress routes.

Installed Components - Emergency lighting is provided from the in-house generator at 347 volts that supplies power to dedicated light fixtures located throughout the building. Emergency lighting is also provided in various locations in this facility by means of battery operated units with two pendant heads and/or single/double remote heads.

Code Compliance - Light units were installed without inspection tags and the performance of monthly inspections were reported as being completed by in-house staff; however, this could not be verified and documentation was not available for review which would substantiate this claim. There were also no records available to substantiate an annual inspection had been performed since installation. There was no evidence to support the performance of the 12-month requirement above to ensure the existing in-house emergency power supplied lighting system provides a minimum of 10 lux at all egress routes

6.2.3 Exit Lighting Equipment

General - The primary purpose of exit signs is to give building occupants the information they would not otherwise have to help them quickly identify the location of the nearest emergency exit and find their way outside safely.

Code Requirements - ***(Reference: NFC, Division B, Part 2.7.3.1.)***
Exit lighting and exit signs shall be provided in buildings in conformance with the NBC. Exit lighting and exit signs shall be illuminated at all times when the building is occupied.

Installed Components - Exit lighting is provided throughout the five structures of the NWRI, WTC Building and the Annex Building by means of internally illuminated exit signs which are equipped with various electrical supplies such as LED, florescent and incandescent lamps.

Code Compliance - There was no evidence to suggest that an inspection program was in place to ensure exit lights remain illuminated and in good working condition. Building technical staff reported that inspections are performed routinely by cleaning staff and Commissioner staff; however, no documentation or records were available to substantiate this claim.

6.03 Fire Alarm & Voice Communication Systems

The purpose of a fire alarm system is to alert building occupants or fire authorities of the detection of such products of combustion or fire and alert or dispatch fire department personnel and/or apparatus to the incident. A fire alarm system is a system of detection devices, wiring, and supervisory equipment used for detecting a fire condition or products of combustion. The type of system installed in any given occupancy depends on the level of the life safety hazard, structural features and/or size of the building.

6.3.1 System Control Unit

General - The system control unit is essentially the brain of the system. This unit is responsible for processing alarm signals from the initiating devices and transmitting them to the local or other signalling systems. The system control panel is often referred to as the fire alarm panel, annunciator panel or combination control annuciator panel. All the controls and testing devices are located in the system control unit.

Code Requirements - ***(Reference: NFC, Division B, Part 6.3)***
All fire alarm systems and components shall be designed and installed in accordance with CAN/ULC-S524-05 “Standard for the Installation of Fire Alarm Systems". The maintenance, testing and inspection of fire alarm systems shall be in conformance with CAN/ULC-536-97 “Standard for the Inspection and Testing of Fire Alarm Systems”, and Treasury Board Secretariat, OSH Directives, Chapter 3-4 “Standards for Fire Alarms”. Records shall be kept

of all maintenance procedures, tests and inspections for a period of two years for examination by the authority having jurisdiction.

Installed Components - An Edwards EST Quick Start, electronic, multi-zone, two stage fire alarm control panel is installed incorporating 6 main control/annuciator panels throughout the facility. A Fireworks fire alarm control computer and software package is located within the maintenance personnel control room at the front entrance of the facility. The system monitors several fire protection systems through a series of supervisory devices. The control unit monitors the sprinkler system, standpipe system, in-line duct smoke detection and shut down relays for the air handling equipment in the main building. The panel also monitors detection devices in the WTC Building, the Annex Building, service tunnel and several other outer buildings. An annuciator panel is installed and located at the main entrance lobby adjacent to the front doors, in the NWRI structure, and five additional panels are located throughout the facility.

Code Compliance - At the time of site visit, evidence in the form of service provider (Simplex-Grinnell) documentation was available to support annual inspection testing of the alarm system and it's components. There is no evidence to suggest that monthly, bimonthly and quarterly testing of the fire alarm system is being performed in accordance with the references above.

6.3.2 Initiating Devices

General - Initiating devices are the manual and automatic devices that are either activated or that sense the presence of fire and then send an appropriate signal to the system control unit. Initiating devices include manual pull stations, heat detectors, smoke detectors, flame detectors, and combination devices.

Code Requirements - See System Control Unit section above

Installed Components - All the structures reviewed in this report are equipped with manually operated pull stations, and heat and/or smoke detection devices. A series of supervisory, anti-tamper, flow, and pressure switches on the sprinkler system are also installed on the sprinkler system in the warehouse/shops structure. The standpipe system is also supervised in the NWRI structure and the WTC Building. It is not known if the air handling equipment is equipped with in-line type duct smoke detection devices in the WTC centre or Annex Building and there is no annunciation label on the fire alarm control panels.

Code Compliance - See System Control Unit section above.

6.3.3 Alarms and Signalling Devices

General - The purpose of a signalling system is to give early warning of a fire. Signalling systems vary from very simple to the complex. A simple system may only sound a local evacuation alarm, whereas a complex system may sound a local alarm, control building services, and notify outside agencies to respond.

Code Requirements - See System Control Unit section above

Installed Components - The control panel is equipped with a remote station type signalling system. The signalling system initiates and sends a signal to alarms, in the main NWRI facility. The main control panels also receive signals from the Annex Building and WTC Building in the event of activation. The alarm system and control panel is monitored by the Commissioner located in the main entrance of the NWRI structure, and a third party monitoring station, Fire Monitoring of Canada (FMC) out of St. Catherines .

Code Compliance - See System Control Unit section above

6.04 Portable Fire Extinguishers

General - The most common fire protection device is the portable fire extinguisher. No portable fire extinguisher is suitable for use on all fires. Portable fire extinguishers are designated with a class or classes of fires they are designed to control. Fire extinguishers shall be selected and installed in conformance with NFPA 10, as prescribed by the references below.

Code Requirements - ***(Reference: NFC, Division B, Part 6.2)***
Fire extinguishers are provided according to the building's anticipated hazards, based on the normal occupancy type and ordinary hazards. Each portable extinguisher shall have a tag securely attached to it showing the maintenance or recharging date, the service agency and the signature of the person who performed the service. All fire extinguishing units shall be affixed with a label indicating the month and year the hydrostatic pressure test was performed and including the test pressure used and the name of the person or agency performing the test.

Installed Components - The three structures evaluated during this study, the NWRI Building, the WTC Building and the Annex Building are provided with various types and sizes of fire extinguishing units. Fire extinguishers are provided in each fire hose cabinet where installed with stand alone multi-purpose, class “C” and/or class “B” type units in various locations such as electrical/mechanical rooms and several units in each shop area.

Code Compliance - At the time of evaluation, monthly sign-off inspection tags were being completed on a regular monthly basis. Annual inspection tags are attached to each unit and indicate inspections were last performed in September, the current month of evaluation. Inspection tags were attached to most units also indicating the last hydrostatic or maintenance procedures. Annual service provider's inspection documents were not reviewed at the time of site visit; however, inspection tags were attached and annual inspections indicated as being performed by Simplex-Grinnell.

6.05 Special Fire Suppression Systems

6.5.1 Carbon Dioxide Extinguishing Systems

General - Carbon dioxide is an effective fire-extinguishing agent that can be used on many types of fires, such as surface fires, flammable liquids, and most solid combustible materials. For fire suppression, the discharge is designed to raise the carbon dioxide concentration in the hazard. This displaces the air containing oxygen, which supports combustion and results in fire extinguishment. The containers are connected to a piping distribution system and discharge nozzles in the area of protection. The components include actuation devices, agent storage containers, piping, and nozzles.

Code Requirements - ***(Reference: NFC, Division B, Part 2.1.3.5, 6.6 & NFPA 12)***
Local application systems shall be designed, installed, tested, and maintained in accordance with the references above. Only properly trained and qualified persons should perform servicing, testing and inspection of these systems.

Installed Components - A carbon dioxide suppression system was observed as being installed in a chemical storage area on the seventh floor of the Administration Lab tower structure. The agent containers were located in the upper mechanical room above the seventh floor. The system included five compressed cylinders of carbon dioxide agent, a distribution system of piping down to the storage room on the seventh floor, and a control panel in the area of protection.

Code Compliance - At the time of site visit, there was no evidence available to suggest inspection and testing in accordance with the references above was occurring. An old inspection certificate was posted on the wall next to the cylinders dated February 1991. This equipment shall be inspected as soon as possible to ensure that it meets current National Fire Code installation requirements and is inspected and tested at the prescribed frequencies in the above references.

6.5.2 Wet Chemical Extinguishing Systems

General - A wet chemical system is best suited for applications in commercial cooking range hoods, plenum, ducts and associated cooking appliances. It is an excellent extinguishing agent for fire involving a flammable liquid, gas, or ordinary combustibles such as paper and wood; however, it is most effective on fires caused by cooking hazards.

Code Requirements - ***(NFC, Division B, Part 2.1.3.5, 6.6 & NFPA 17A)***
Local application systems shall be designed, installed, tested, and maintained in accordance with the references above. Only properly trained and qualified persons should perform servicing, testing and inspection of these systems.

Installed Components - A wet chemical fire suppression system was installed in the cafeteria kitchen range hood with discharge nozzles over most of the cooking appliances.

Code Compliance - At the time of site visit, the system appeared to be installed in accordance with the references above and was affixed with inspection tags indicating that inspections were being performed by Simplex-Grinnell. The stem appears to have been inspected in August 2009, shortly before our site visit.

6.5.3 Clean Agent Extinguishing Systems

General - Clean agent systems work on class A, B, and C fires and react quickly to extinguish a fire at its earliest stages. Using early detection and rapid extinguishment, clean agent systems eliminate the fire, reduce the damage to equipment, and increase the safety of people in the fire area. Clean agents extinguish fires as a gas, which gives them the ability to permeate into cabinets and obstructed areas. It also makes them uniquely suited to protect the electronics hidden inside a piece of equipment, a likely place for a fire to start. By thoroughly flooding the area with a gaseous fire fighting agent, even obscured or hard to reach fires are quickly extinguished, usually long before they can be seen.

Code Requirements - ***(NFC, Division B, Part 2.1.3.5, 6.6 & NFPA 2001)***
Local application systems shall be designed, installed, tested, and maintained in accordance with the references above. Only properly trained and qualified persons should perform servicing, testing and inspection of these systems.

Installed Components - At the time of site visit**,** two separate FM-200 clean agent systems were installed in the NWRI structure. They were located in the main LAN computer room on the first floor adjacent to the Mall corridor, and the second was installed in the main communications (Bell Telephone) room on the second floor at the north end of the Mall corridor. The system consists of an alarm control panel, a manual override switch, a system of piping and discharge nozzles and containers containing clean agent (FM-200).

Code Compliance - At the time of site visit, both systems were found to have inspection tags affixed and had been tested and inspected on a regular basis by Simplex-Grinnell. Certificates and service provider's inspection records were available for review

7.00 FIRE EMERGENCY SYSTEMS IN HIGH BUILDINGS

This part provides information on the level of conformity to the National Fire Code and other Federal legislation as applicable to the inspection, testing and maintenance of the fire emergency systems installed in high buildings as described by the National Building Code.

7.01 Vertical Transportation Devices

General - Elevators safely serve the purpose for which they were designed under normal conditions. There are concerns, however, about the use of elevators by building occupants during fire-emergency conditions. Persons using an elevator can be exposed to excessive heat, smoke and toxic gases if an elevator cab stops at a floor on which fire is present. Also, elevator shafts tend to act as chimneys through which smoke, heat and toxic gases can rise. It is due to these conditions that most elevating devices are programed or designed to become inoperable or return to the main floor and park allowing passengers to exit, and then the doors will close, preventing re-entry. Elevators installed in high-rise facilities are designed with additional emergency service features to minimize or mitigate these risks. Although these feature are primarily designed for high-rise elevators, they are not restricted for this use and may be observed in low-rise or two-stop elevators.

Code Requirements - ***(Reference: NFC, Division B, Part 7.2.2., COSHR Part IV & CSA B44)*** In addition to the legislated annual inspection described below, where emergency service features for elevators are present, they shall be tested to ensure that they operate in conformance with appropriate provincial, territorial or municipal requirements or, in the absence of such requirements, in conformance with CAN/CSA B44 “Safety Code for Elevators”. Every elevating device and every safety device attached thereto shall be inspected and tested by a qualified person once every 12 months in accordance with Canadian Occupational Safety and Health Regulations, Part IV.

INSTALLED COMPONENTS - The NWRI facility is equipped with four elevating devices and the WCT Building is equipped with one elevating device.

CODE COMPLIANCE - This building is not designated as a high-rise, and emergency service features are not installed; therefore, the only requirement under this section is assurance the performance of routine maintenance, testing and inspections in accordance with CAN/CSA-B44 are performed. For further details, see Vertical Transportation section. Annual safety inspections are performed in accordance with Canadian Occupational Safety and Health Regulations, Part IV, and were inspected by the Technical Standards and Safety Authority as a qualified third party service provider. Operating licence is current and posted.

8.00 OTHER LEGISLATIVE INSPECTION REQUIREMENTS & SAFETY DEVICES

This part provides information on the level of conformity to the National Fire Code and other Federal legislation pertaining to occupational health and safety requirements in regards to the safe occupancy of a building, and inspection, testing and maintenance of other safety equipment.

8.01 Fixed Plumbed Emergency Showers/Eyewash Stations

GENERAL - Emergency showers and eyewash stations provide on-the-spot decontamination.

They allow workers to flush away hazardous substances that can cause injury. The first 10 to 15 seconds after exposure to a hazardous substance, especially a corrosive substance, are critical. Delaying treatment, even for a few seconds, may cause serious injury. Accidental chemical exposures can still occur even with good engineering controls and safety precautions. As a result, it is essential to look beyond the use of goggles, face shields, and procedures for using personal protective equipment. Emergency showers and eyewash stations are a necessary backup to minimize the effects of accidental exposure to chemicals.

CODE REQUIREMENTS - ***([ANSI] Standard Z358.1-1998)***
Currently, there is no Canadian standard for the design or placement of eyewash stations or emergency showers. As a result, the American National Standards Institute (ANSI) Standard Z358.1-1998 "Emergency Eyewash and Shower Equipment" is generally used as a guide.

INSTALLED COMPONENTS - Manually operated emergency eyewash stations are provided in various areas, primarily in the laboratory areas. Plumbed emergency showers are installed in corridors outside most of the lab facilities adjacent to the entry doors.

CODE COMPLIANCE - Most emergency eyewash units were affixed with inspection tags which were not completed, and there were no other records available to substantiate an implemented inspection program.

8.02 Roof Anchor Systems & Fall Restraint System

GENERAL - Anchors or fall restraint systems are a minimum requirement on all roofs not equipped with a 42" high parapet or guard-rail to protect workers performing maintenance at roof level. In addition, all buildings three storeys and higher where work is performed over the roof edge using suspended bosun's chair or platforms, require at least safety anchors for workers' fall protection and tieback anchors for securing primary equipment.

CODE REQUIREMENTS - ***(Ontario Regulation 859/1990 Window Cleaning Operations)***
Anchor systems must be inspected on an annual basis and have an engineering study performed every 5 years.

INSTALLED COMPONENTS - This facility is equipped with a roof anchor system on the upper roof of the Administration Lab tower structure for the purpose of anchoring window cleaner's scaffolds and swing staging. Drawings or schematics are available for the systems and approved for use, and are posted at or near some of the exit doors leading to the roof area.

CODE COMPLIANCE - At the time of evaluation, copies of the installation and certification drawings were posted; however, there were no reports available to suggest that a five year load test inspection had occurred. A five year engineering or load test is required on the system to ensure compliance with Ontario Regulation 859/1990 Window Cleaning Operations. This equipment should not be used, and window cleaning service providers must be advised that the equipment does not have a valid 5 year inspection report and/or load test.

Environment Canada
Canada Centre for Inland Waters
Burlington, ON

SUMMARY OF RECOMMENDED EXPENDITURES
NWRI - Main Building
ARCHITECTURAL SYSTEMS

Report Section No.	Systems Description	Description of Work	Priority of Work	Project Priority System	Type of Expendi-tures	Short Term Expenditures Year 1	2	3	4	5	Long Term Expenditures Years 6 - 10	11 - 15	16 - 20	21- 25
1.1.3	Other Structures	Replace tunnel waterproofing	Opt.	D1	R								$175,000	
1.2.2	Exterior Walls	Repairs to metal panel walls	Opt.	C2	R	$5,000								
1.2.2	Exterior Walls	Cleaning/painting of louvres	Cyl.	C3/D2	R	$3,500								
1.2.2	Exterior Walls	Restoration of concrete wall panels (incl. sealants)	Cyl./Opt.	C3/D2	R		$300,000							
1.2.2	Exterior Walls	Cleaning/painting of metal panel walls	Opt.	C3/D2	R						$165,000			
1.2.2	Exterior Walls	Replace sealants at concrete sandwich panel walls	Cyl.	C2	R							$340,000		
1.2.3	Roofing	Roofing Study	Opt.	X2	R	$22,000								
1.2.3	Roofing	Replace EPDM membrane roofings	Cyl.	B2	R		$360,000							
1.2.3	Roofing	Replace SBS membrane roofings	Cyl.	C2	R						$2,375,000			
1.2.4	Exterior Doors	Refurbish overhead doors	Cyl.	C3	R							$52,500		
1.2.5	Windows, Sloped Glazing & Skylights	Replace window sealants	Cyl.	C2	R						$178,500			
1.3.1	Flooring	Replacement of resilient floorings (vinyl tiles and vinyl sheet) (partial)	Cyl.	C2/D2	R	$7,500	$147,500	$147,500	$147,500	$147,500	$737,500	$442,500		
1.3.1	Flooring	Replacement of carpet flooring (partial)	Cyl.	C2/D2	R						$165,000	$165,000	$165,000	
1.3.2	Interior Partitions	Repaint/replace wall coverings (partial - in conjunction with flooring w	Cyl.	D2	R		$32,500	$32,500	$32,500	$32,500	$162,500	$97,500		
1.3.3	Ceilings	Replacement of coffered ceilings (partial - in conjunction with flooring	Opt.	D1	C		$3,835		$3,835		$21,470	$47,500		
1.3.4	Interior Doors	Refurbish overhead doors	Cyl.	C3	R							$17,500		
1.3.6	Fitments (Fixed Furnishings)	Refurbishment of fitments (partial - in conjunction with flooring work)	Opt.	C2/D2	R	$17,500	$290,000	$290,000	$290,000	$290,000	$145,000	$870,000		
1.4	Heritage	Arrange for FHBRO review	Man.	A	-	no cost - housekeeping								
1.7	Code Compliance	Fire Separation Study	Man.	A	-	$22,000								
5.2.1	Pavements	General repairs	Opt.	C1/D1	R	$22,000								
5.2.1	Pavements	Replace asphalt pavements	Cyl.	C1/D1	R		$540,000		$540,000		$1,620,000			
					Period Totals	$94,500	$1,673,835	$470,000	$1,013,835	$470,000	$5,569,970	$2,032,500	$165,000	$0
									Total Short Term Expenditures	$3,722,170			**Total Long Term Expenditures**	$7,767,470

All estimated costs are in year 2009 dollars.
PWGSC - RPB - PTP - Maintenance Management Service

Environment Canada
Canada Centre for Inland Waters
Burlington, ON

SUMMARY OF RECOMMENDED EXPENDITURES
NWRI - Main Building
MECHANICAL SYSTEMS

Report Section No.	Systems Description	Description of Work	Priority of Work	Project Priority System	Type of Expendi-tures	Short Term Expenditures Year 1	2	3	4	5	Long Term Expenditures Years 6 - 10	11 - 15	16 - 20	21- 25
3.0	Mechanical	Energy/Environmental study in ref. to major retrofits	Opt.	C2	R		$200,000							
3.1.1	Heating System	Alfa Laval heat exchangers reclaiming heat - 3 units - assessment of conditior	Opt.	C2	R				$5,000					
3.1.1	Heating System	Condensate tanks - replacement	Cyl.	C2	C	$80,000	$80,000	$80,000	$80,000	$80,000				
3.1.1	Heating System	Existing steam humidification system - design replacement	Man.	B1	C	$100,000								
3.1.1	Heating System	Study/assessment change old shell/tube heat exch.steam/glycol or hot water	Opt.	C2	R		$30,000							
3.1.2	Cooling System	Chiller system replacement study	Opt.	C2	R	$60,000								
3.1.2	Cooling System	Chiller system replacement	Cyl.	C2	C		$2,250,000							
3.2.1	Hydronic Heating System	Wall induction, radiation wall fin, fan coil units, unit heaters - assessment	Opt.	C3	R	$50,000								
3.2.1	Hydronic Heating System	Wall induction, radiation wall fin, fan coil units, unit heaters - design replaceme	Opt.	C2	R		$100,000							
3.2.3	Primary Air Supply	Study/design to replace exhaust fan system A&L and R&D	Opt.	C2	R		$200,000							
3.2.3	Primary Air Supply	Assessment on condition of Ecotox fume hoods/fans	Opt.	C2	R	$8,000								
3.2.3	Primary Air Supply	Assessment on condition of Workshop/Wharehouse exhaust fans	Opt.	C2	R	$8,000								
3.2.3	Primary Air Supply	Air handling units - study replacement	Opt.	C2	R		$200,000							
3.2.4	Supplemental Air Conditioning	Engineering study/design - Server room	Opt.	C2	R	$10,000								
3.4	Storm Sewer System	Storm sewer system - catch basins assessment/investigation	Opt.	C2	R		$10,000							
3.6	Domestic Hot Water system	Domestic Hot Water System - Assessment	Opt.	C2	R						$5,000			
3.7	Plumbing System	Plumbing System - Evaluatiuon/Assessment	Opt.	C3	R			$60,000						
3.8.2	Sprinkler System	Assessemnt - 7th floor fire suppression	Man.	B1	C	$10,000								
3.8.2	Sprinkler System	Assessment Ecotox fire suppression/sprinkler system	Man.	B1	C	$10,000								
					Period Totals	$336,000	$3,070,000	$140,000	$85,000	$80,000	$5,000	$0	$0	$0
									Total Short Term Expenditures	$3,711,000			**Total Long Term Expenditures**	$5,000

All estimated costs are in year 2009 dollars.
PWGSC - RPB - PTP - Maintenance Management Service

SUMMARY OF RECOMMENDED EXPENDITURES
NWRI - Main Building and Executive Summary Electrical
ELECTRICAL SYSTEMS

Report Section No.	Systems Description	Description of Work	Priority of Work	Project Priority System	Type of Expendi-tures	Short Term Expenditures					Long Term Expenditures			
						Year					Years			
						1	2	3	4	5	6 - 10	11 - 15	16 - 20	21- 25
	Executive Summary Electrical													
A	Main Electrical Distribution	Update and post Single Line Diagram for the entire property.	Man.	C1	C	$25,000								
B	Electrical panel & Electrical service area	Removal of stored materials, provison of signs & guards.	Man.	B1	C	$10,000								
C	Exit Lighting System	Survey for additional exit sign requirements,	Opt.	C2	R	$7,000								
C	Exit Lighting System	Replace existing exit signs throughout three facilities and add new re	Opt.	C1	C		$165,000							
D	Emergency lighting	Survey existing emergency lighting levels to ensure compliance.	Opt.	C1	R	$5,000								
	Main Building													
4.1	Electrical Power	Replace low voltage equipment at the end of effective service life.	Man.	C3	C						$1,500,000			
4.1	Electrical Power	Replace lighting and receptacle panels at the end of effective service	Man.	C3	C	$35,000	$35,000	$35,000	$35,000	$35,000	$175,000			
4.1	Electrical Power	Replace MCC's at the end of at the end of effective service life.	Man.	C3	C			$200,000	$200,000	$200,000	$400,000			
4.2	Emergency Power	Provide new emergency lighting in the generator and transfer swich a	Man.	B1	C	$4,000								
4.2	Emergency Power	Provide proper warning signs on generator room doors.	Man.	B1	C	$500								
4.2	Emergency Power	Purchase CAN/CSA 282-05 Logbook for generator maintenance.	Opt.	C1	C	$100								
4.2	Emergency Power	Replace Current transfer switches as per report.	Man.	B1	C							$175,000		
4.2	Emergency Power	Replace current generator and end of effective service life.	Man.	B1	C							$600,000		
4.2	Co Generator	Replace existing co-generation unit and associated equipment.	Man.	B1	C							$800,000		
4.3	Exterior Lighting	Exterior lighting level survey.	Opt.	C1	R		$4,500							
4.4	Interior Lighting	Relamp / repair elevator lobby lighting as per report.	Man.	C1	R	$500								
4.4	Interior Lighting	Relamp / repair mall area lighting as per report.	Man.	C1	R		$25,000							
4.4	Interior Lighting	Lighting study to improve lighting in warehouse and shop areas.	Opt.	C1	R		$6,000							
4.5	Emergency Lighting	See executive summary section D above.	Opt.	C1	R									
4.5	Emergency Lighting	Create drawings for emergency and exit lighting locations (all 3 buildi	Opt.	D1	C		$20,000							
4.6	Exit Lighting	See executive summary section C above.	Opt.	C1	R									
4.7	Fire Alarm System	Replace main fire alrm system components at the end of effective ser	Man.	C1	C							$400,000		
4.7	Fire Alarm System	Install additional signal devices at roof exits as per report.	Man.	C1	C	$25,000								
4.8	Security System	Install new fully integrated security system for entire property.	Opt.	D1	C					$800,000		$75,000		
4.8	Security System	Install new CCTV camaeras and associated equipment.	Opt.	D1	C		$45,000							
4.9	Telephone & Communications System	Install all bond to ground conductors as per report.	Man.	C1	C	$15,000								
					Period Totals	$127,100	$300,500	$235,000	$235,000	$1,035,000	$2,075,000	$2,050,000	$0	$0
									Total Short Term Expenditures	$1,932,600		**Total Long Term Expenditures**		$4,125,000

All estimated costs are in year 2009 dollars.

Environment Canada

Canada Centre for Inland Waters (CCIW)

WTC BUILDING

CONDITION REPORT

September 2009

WTC BUILDING - Contents

Refer to 'NWRI Building' report.

Refer to 'NWRI Building' report.

BUILDING DESCRIPTION

The 'Wastewater Treatment Centre (WTC) Building' is a two-storey heated structure, with a partial basement and a mechanical penthouse, originally constructed in 1971, with an addition (east-side) in 1995, and is currently serving as a laboratory. The 'building area' of this structure is approximately 2210 m^2.

Owing to the complexity of uses throughout the facility, the *major occupancy* type, as defined in the National Building Code of Canada 2005 (NBC), Part 3, is difficult to determine. While the laboratory, workshops and storage functions clearly define the facility as a “Group F - Industrial” major occupancy, the specific level (either Division 1 - High Hazard, Division 2 - Medium Hazard, or Division 3 - Low Hazard) of each area varies depending on specific usage and materials (e.g. Chemicals) and equipment involved.

The facility also contains a *minor occupancy* - “Group D - Business and Personal Services (offices, open office areas).

Determination of the occupancy types in each area is at the sole discretion of HRSDC Labour Programme, Fire Protection Engineering *(formerly the Fire Commissioner of Canada),* being the ‘authority having jurisdiction’ in Federal facilities. Knowing the occupancy types is key in order to ensure proper assessment of required fire separations and exit/egress requirements (see recommendations under ‘1.7 Code Compliance’ below).

The total estimated Short Term Expenditure (1 to 5 years) cost for this facility is **$408,000**, as outlined below:

Architectural/Structural	$203,000
Mechanical	$200,000
Electrical	$5,000
Short Term Total	$408,000

The total estimated Long Term Expenditure (6 to 25 years) cost for this facility is **$1,316,000**, as outlined below:

Architectural/Structural	$646,000
Mechanical	$60,000
Electrical	$610,000
Long Term Total	$1,316,000

PART 1 - ARCHITECTURAL/STRUCTURAL

1.1 Structure

1.1.1 Substructure

The substructure consists of pilings and pile caps, supporting reinforced cast-in-place concrete grade beams and walls. No information with respect to the presence of any dampproofing/waterproofing was available/visible - no reports of dampness/leakage were identified by on-site personnel.

Concrete slab-on-grade floors are provided throughout the ground floor level.

1. Condition

The substructure is considered to be in good overall condition, with no visual signs of settlement or failure; however, some minor issues were identified, as follows:

- Cracks and settlement of the concrete slab-on-grade floors - localized areas throughout.
- Exposed/displaced insulation - southeast corner of east-side addition.

2. Recent Repairs/Modifications

To our knowledge, no recent repairs/modifications have been carried out on the substructure.

3. Design Problems/Deficiencies

To our knowledge, no design problems/deficiencies exist with the substructure.

4. Effective Remaining Life

The substructure dates from original construction of the facility in the early 1970's and construction of the east-side addition in 1995. Given its current condition, the substructure can likely be expected to perform indefinitely.

5. Major Repairs/Recommendations

Other than normal maintenance (i.e. regular monitoring and minor repairs), no repair/replacement is anticipated for the substructure.

NOTE: It is presumed that identified minor deficiencies/deterioration (see above) will be investigated/corrected as part of existing O&M operations in order to prevent the spread of existing deterioration and maintain the integrity of the substructure and adjacent components.

1.1.2 Superstructure

The superstructure for this facility is a mixture of concrete and steel, as follows:

- Framing - except for the perimeter stairwells (see note below) <u>steel</u> is used throughout the structure.
- Suspended floors - except for the perimeter stairwells (see note below) <u>concrete filled metal decking</u> is used throughout the structure.
- Roof - except for the perimeter stairwells (see note below) <u>metal decking</u> is used throughout the structure.

NOTE: Although integral with the superstructure, exposed concrete walls of the stairwells at the building perimeter form an integral part of building envelope and are covered in more detail under '1.2.2 Exterior Walls'.

1. Condition

The superstructure is considered to be in good overall condition, with no visual signs of settlement or failure.

2. Recent Repairs/Modifications

To our knowledge, no recent repairs/modifications have been carried out on the superstructure.

3. Design Problems/Deficiencies

To our knowledge, no design problems/deficiencies exist with the superstructure.

4. Effective Remaining Life

The superstructure dates from the original construction of the facility in the early 1970's and construction of the east-side addition in 1995. Given its current condition, the superstructure can likely be expected to perform indefinitely.

5. Major Repairs/Recommendations

Other than normal maintenance (i.e. regular monitoring and minor repairs), no repair/replacement is anticipated for the superstructure.

1.1.3 'Other' Structures

The only 'other' structures at this facility are the canopies above each of the exterior overhead doors (4) - steel frame structures (supported from the superstructure) with metal soffits and cladding and modified bitumen roofing.

1. Condition

The 'other' structures are considered to be in fair overall condition, except as follows:

- Metal siding/soffits at the canopies are in poor condition (see '1.2.2 Exterior Walls' below).
- Roofing at the canopies are in poor condition (see '1.2.3 Roofing' below).

2. Recent Repairs/Modifications

To our knowledge, no recent repairs/modifications have been carried out on the 'other' structures.

3. Design Problems/Deficiencies

To our knowledge, no design problems/deficiencies exist with the 'other' structures.

4. Effective Remaining Life

Three of the canopies date from the original construction of the facility in the early 1970's, while the remaining canopy dates from construction of the east-side addition in 1995. Given their current condition, they can likely be expected to perform indefinitely.

5. Major Repairs/Recommendations

Cleaning and repainting of metal soffits and siding at the canopies is included with recommendations for '1.2.2 Exterior Walls'.

Replacement of roofing at the canopies is included with recommendations for '1.2.3 Roofing'.

Other than normal maintenance (i.e. regular monitoring and minor repairs), no repair/ replacement is anticipated for the 'other' structures.

1.2 Building Envelope

1.2.1 Soffits

The soffits present on this building are <u>stucco</u> - consisting of 19 mm thick stucco, galvanized metal latch and furring, air space, and rigid insulation at the underside of the structure - metal louvres are provided at the soffit face to provide ventilation of the air space (note that some drawing details show 140 mm batt insulation atop the gypsum board).

NOTE: Soffits forming part of the precast concrete wall panels and the overhead door canopies are included with '1.2.2 Exterior Walls' below.

1. Condition

The soffits are considered to be in fair overall condition, with no signs of damage or deterioration.

2. Recent Repairs/Modifications

To our knowledge, no recent repairs/modifications have been carried out on the soffits.

3. Design Problems/Deficiencies

To our knowledge, no design problems/deficiencies exist with the soffits.

4. Effective Remaining Life

The soffits date from original construction of the facility in the early 1970's. Given their current condition, the soffits can likely be expected to perform indefinitely.

5. Major Repairs/Recommendations

Other than normal maintenance (i.e. regular monitoring and minor repairs), no repair/ replacement is anticipated for the soffits.

1.2.2 Exterior Walls

Owing to the complexity of this facility, there are many detail variations of the exterior walls. The following outlines the main exterior wall types in general terms:

- Concrete (cast-in-place) - located at the perimeter stairwells; reinforced concrete (rough board finished); interior surfaces are exposed concrete (also rough board finish); un-insulation.
- Concrete Panels (precast) - consisting of concrete, vented air space, 38 mm rigid insulation, and concrete structure/concrete block located at the south elevation.
- Concrete Sandwich Panels - consisting of 75 mm concrete, 50 mm insulation, and 75 mm concrete located on the west, north and east elevations, and the lower part of the original building south elevation.
- Metal Panels - consisting of prefinished metal cladding, insulation, and galvanized metal liner located at the mechanical penthouse and above the overhead doors.

Siding/soffits on the overhead door canopies (see '1.1.3 Other Structures' above) are the same prefinished metal cladding as the metal panels.

NOTE: Solar siding, located at the south elevation of the east-side addition was installed to provide outside air preheating for the mechanical system - it is not a component of the exterior wall - see 'Part 3 Mechanical''.

1. Condition

The exterior walls are considered to be in fair overall condition; however, the following deficiencies were identified:

Concrete Sandwich Panels -

- Joint sealants are in poor condition (cracked, debonding, missing).
- Many locations appear to have new sealant applied over top of old sealants.
- Surfaces are stained below a louvre - lack of drip sill.
- Random surface stains were noted at upper levels - cause unknown.
- Some areas of localized surface deterioration (spalled concrete) were noted.
- Unsealed openings.
- Unsealed penetration.
- Moisture is penetrating the wall (moving from interior to exterior) at the panel bottom edge - single location on north elevation, source unknown).

Concrete Panels -

- Surfaces are dirty/stained to various degrees throughout - normal accumulation - aesthetic issue only.
- One of the 1st floor level panels of the east-end addition has uniform cracking throughout - presumed to be a manufacturing defect.
- Joint sealants are in poor condition (cracked, debonding, missing).

<u>Metal Panels</u> -

- Deteriorated paint finish and rusting surfaces at all panel bent edges (typical of older prefinished metal) and many field areas (likely a manufacturing defect) - aesthetic at present, however, continued deterioration will eventually result in failure of the components.

2. Recent Repairs/Modifications

To our knowledge, no recent repairs/modifications have been carried out on the exterior walls.

3. Design Problems/Deficiencies

Concrete walls at the perimeter stairwells are without insulation/vapour barrier. Otherwise, to our knowledge, no design problems/deficiencies exist with the remaining exterior wall types.

4. Effective Remaining Life

The exterior walls date from the original construction of the facility in the early 1970's and construction of the east-side addition in 1995. Given their current condition, and with corrective actions, the exterior walls can likely be expected to perform indefinitely; however, sealants will continue to require periodic replacement.

5. Major Repairs/Recommendations

It is recommended that an allowance be made for restoration of the concrete panel walls and the concrete sandwich panel walls (including replacement of sealants, area repairs, and cleaning of stained surfaces) in order to reinstate the integrity of the building envelope, extend their effective service life by correcting deteriorating conditions, as well as facilitating monitoring and restoring some of the facility's aesthetic value. This work is projected for the 2nd year, at an estimated cost of $175,000.

It is recommended that an allowance be made for cleaning/painting (electrostatic) of the metal panel walls (including the overhead door canopy sides/soffits) in order to extend their effective service life by correcting deteriorating conditions, as well as to facilitating monitoring and restoring some of the facility's aesthetic value. This work is projected for the 6th year, at an estimated cost of $27,500.

1.2.3 Roofing

A variety of roof coverings are employed throughout the multiple roof levels/areas at this facility, as follows:

- <u>Styrene Butadiene Styrene (SBS) a.k.a. Modified Bitumen</u> - located on all roof areas of the original building (including the main roof, penthouse roof, and stairwell roofs); a conventional assembly consisting of a fully adhered SBS membrane and flashings over insulation (specific assembly details - i.e. insulation type and thickness, vapour barrier, etc. - unknown); counter/cap flashings are prefinished metal.

- Built-Up Roofing (BUR) - located at the east end addition; a conventional built-up assembly consisting of a stone surfaced bituminous membrane and flashings over insulation (specific assembly details - i.e. number of plies, insulation type and thickness, vapour barrier, etc. - unknown); counter/cap flashings are prefinished metal.

Drainage for small areas is provided by scupper drains with external copper downspouts discharging at lower roof levels, while large areas rely on area drains connected to the storm water system with internal piping.
Roof access to main roof areas is via doors leading directly from adjacent stairwells and service spaces, while access to smaller roof areas (stairwell roofs) requires the use of portable ladders.

1. Condition

The roofing is considered to be in fair overall condition; however, several deficiencies were noted, as follows:

- Accumulation of debris.
- Vegetation growth.
- Rusting metal components (ladders, equipment supports).
- Blocked drains.
- Missing/damaged strainers at drains.
- Deteriorated filler at pitch pockets.
- Deteriorated sealants - cracking, debonding, new applied over old.
- SBS Roofing - blisters, cracking, wrinkles, loss of granular, membrane shrinkage.
- BUR - asphalt bleed-through.

2. Recent Repairs/Modifications

To our knowledge, no recent repairs/modifications have been carried out on the roofing.

3. Design Problems/Deficiencies

All roof areas have inadequate slope to accommodate good drainage, resulting in standing water throughout, and leading to decreased service life of the roofing and creation of mosquito breeding conditions (West Nile virus).

4. Effective Remaining Life

The age of the SBS (modified bitumen) roofing is unknown, but is presumed to range from 10 - 15 years old. The built-up roofing (BUR) is presumed to date from construction of the east-end addition in 1995. Given their current condition, the SBS membrane roofings and the BUR are considered to be approaching the end of their effective service lives, with replacement likely required in the 6th year.

5. Major Repairs/Recommendations

As the roofings represent a significant cyclical investment, there is potential for significant cost saving in the maximization of their service lives by avoiding premature replacement. However, as an integral part of the building envelope, and arguably the most vulnerable, deferring replacement too long increases the risk of damage, inconvenience and incurred costs due to increasing localized failures. Therefore, it is recommended that prior to replacement of the roofings, that a detailed roofing study (including visual assessment, test cuts, moisture checks, and infrared scanning) be completed to fully assess the various roofing assemblies and the condition of their components. This information will be invaluable in determining both the timing and the scope of work required for upcoming replacements. This work is recommended for the 1st year, at an estimated cost of $4,500.

NOTE: In accordance with good roof maintenance practices, repairs to the roofing, including repair of blisters, replacement of missing/damaged components, re-securing of loose components, cleaning/repainting of metal components, and removal of accumulated debris/sediment and vegetation, should be corrected as part of existing O&M operations in order to ensure that the roofing maximizes its effective service life (by preventing the spread of existing deterioration) and maintain the integrity of the system components.

Pending assessment and verification, the SBS membrane roofings (include roofing for the overhead door canopies) and the BUR will likely require replacement at the end of their effective service lives in order to maintain the integrity of the building envelope and prevent damage/deterioration and/or known health issues associated with leakage. Also, correction of identified deficiencies with respect to slope/drainage should be incorporated at this time. This work is projected for the 6th year, at an estimated cost of $331,500.

1.2.4 Exterior Doors

A variety of door types are employed throughout this facility, as follows:

- Aluminum - aluminum (dark bronze anodized), fixed type, with insulating glass units - located at the main entrance and exit stair/vestibule doors.
- Hollow metal - paint finished - located at secondary entrance/exit locations.
- Overhead, Vertical Lift - paint finished, power operated - located at original building, door R (west elevation), and doors S and T (north elevation).
- Overhead, Sectional - prefinished, insulated, manual operation - located at the east-side addition (east elevation), no name/designation.

NOTE: Former exterior door 'U' now an interior door since construction of the east-side addition (see '1.3.4 Interior Doors' below).

1. Condition

The exterior doors are considered to be in fair overall condition, however some deficiencies were noted, as follows:

- Overhead door panels and frames have deteriorated paint finishes and rusting metal surfaces.
- New door is not identified within the original number/letter designations systems (as per original doors).

2. Recent Repairs/Modifications

To our knowledge, no recent repairs/modifications have been carried out on the exterior doors.

3. Design Problems/Deficiencies

To our knowledge, no design problems/deficiencies exist with the exterior doors.

4. Effective Remaining Life

The exterior doors date from the original construction of the facility in the early 1970's, and from construction of the east-side addition in 1995. Given their current condition, and with corrective actions (including cleaning/painting of metal surfaces), the exterior doors can likely be expected to perform indefinitely.

5. Major Repairs/Recommendations

Other than normal maintenance (i.e. regular monitoring and minor repairs), no repair/replacement is anticipated for the exterior doors over the short-term.

NOTE: It is presumed that 'minor repairs' included under normal O&M operations include annual spot cleaning/painting of metal surfaces to prevent deterioration and maintain the integrity of the components throughout their service life.

Pending future assessment and verification, it is recommended that an allowance be made for refurbishment of the older overhead doors in order to extend their effective service life. This work is projected for the 11th year, at an estimated cost of $15,500.

1.2.5 Windows

The windows throughout are aluminum (dark bronze anodized finish), fixed type, with insulating glass units.

1. Condition

The windows are considered to be in good overall condition, with no signs of damage or deterioration; however, some deficiencies were noted, as follows:

- Deteriorated sealants - cracking, debonding, extruding under pressure.
- Failed seals at insulating glass units - noted throughout.

2. Recent Repairs/Modifications

To our knowledge, no recent repairs/modifications have been carried out on the windows.

3. Design Problems/Deficiencies

To our knowledge, no design problems/deficiencies exist with the windows.

4. Effective Remaining Life

The windows date from original construction of the facility in the early 1970's and from construction of the east-side addition in 1995. Given their current condition, the windows can likely be expected to perform indefinitely, excepting the insulating glass units and the sealants which will continue to require cyclical replacement. The insulating glass units will fail randomly without warning and can be replaced on an 'as required' basis. The sealants are considered to be at the end of their effective service life and should be considered for replacement in the 2nd year.

5. Major Repairs/Recommendations

Window frame sealants (frame to wall) require replacement (cut out old and replace with new) at the end of their effective service life. This work is projected for the 2nd year, at an estimated cost of $18,000.

Although glazing sealants (frame to glazing) are also in fair to poor condition, it is recommended that these be replaced in conjunction with the ongoing insulating glass units replacements as a part of normal O&M operations.

1.3 Interior Construction

1.3.1 Flooring

A variety of flooring types are employed throughout this facility, as follows:
- <u>Quarry Tile</u> - located in the 3 original exit stairwells.
- <u>Ceramic Tile</u> - located in the 1st floor corridor and labs, the 2nd floor labs & kitchenette, and washrooms and shower/change rooms throughout.
- <u>Vinyl Sheet</u> - located in the 1st floor offices (original building), and the 2nd floor corridor
- <u>Vinyl Tile</u> - located in the stair of the east-side addition, and the 2nd floor janitor room.
- <u>Carpet</u> - located in offices & office areas: at the 1st floor (east-side addition), and 2nd floor (all).

Concrete floor is in service areas and the 'high-bay' are a mixture of sealed and unfinished.

1. Condition

The floorings throughout are considered to be in fair overall condition, except as follows:
- Carpet in individual offices throughout the east-side addition is wrinkled - presumed to be either 'loose-laid' or inadequately adhered - resulting in wrinkles (increased wear, trip hazard).
- Use of broadloom carpet in lieu of carpet tile in offices and open office areas restricts ongoing maintenance - requiring patches or full replacement.

2. Recent Repairs/Modifications

Most flooring throughout the laboratory/office portion of the original building original portion was replaced as part of the renovation project in 2001 - exit stairwells excepted.

3. Design Problems/Deficiencies

To our knowledge, no design problems/deficiencies exist with the flooring.

4. Effective Remaining Life

The floor finishes date from various times over the life of the facility, and will require cyclical partial replacements based on in-service times and usage:

- Hard surface floorings in the stairs, washrooms and shower/change rooms (ceramic tile and quarry tile) are presumed to date from the original construction of the facility in the early 1970’s and construction of the east-side addition in 1995. Hard surface floorings in the corridor and laboratories (ceramic tile) date from the renovation project in 2001. Given their current condition, the hard surface floorings will likely continue to perform indefinitely.
- Resilient flooring (vinyl tile and sheet vinyl) dates from various times over the life of the facility (janitor room vinyl tile c.1970; east-side stair vinyl tile c.1995; and all vinyl sheet flooring c.2001). Given their current condition, they will likely require replacement at the end of their effective service lives in the 16th year.
- The carpet floorings are presumed to date from construction of the east-side addition in 1995, and will continue to require cyclical replacement on an ongoing basis - wrinkled carpet area can be expected to require premature replacement.
- The painted and sealed concrete floors will continue to require cyclical replacement on an ongoing basis.

5. Major Repairs/Recommendations

Other than normal maintenance (i.e. regular monitoring and minor repairs), no repair/replacement is anticipated for the hard surface floorings (ceramic tile and quarry tile).

It is recommended that an allowance be made for the replacement of approximately 1/2 of the carpet flooring in the older and high-traffic areas. This work is projected to cost an estimated $42,250 in each of the 6th and 9th years, and again in the 21st and 25th years.

It is recommended that an allowance be made for the phased replacement of the resilient flooring (vinyl tile and sheet vinyl) beginning with older and high traffic areas. This work is projected to cost an estimated $32,500 in each of the 11th and 16th years.

1.3.2 Interior Partitions

The interior partitions employed throughout this facility include a variety of types, as follows:

- Frame (fixed) - a mixture of wood and/or metal stud framing finished with plaster and/or gypsum board.
- Frame (demountable) - metal stud framing finished with gypsum board panels with batten covered seams.
- Concrete Block - standard block - various locations throughout the facility.
- Concrete (structural) - rough board finish in the original stairwells (including the vestibule/lobbies and main entrance.

A variety of finishes are employed throughout this facility, as follows:

- Paint - used for gypsum board on fixed frame partitions, and on concrete block partitions - also over original vinyl wall covering in 2nd floor corridor.
- Vinyl Wall Covering - used for gypsum board on demountable partitions.
- Ceramic Tile - used in original washrooms and shower/change rooms.

1. Condition

The interior partitions and their finishes are considered to be in fair overall condition, free of damage and with no visible outside of normal wear patters, except in some high-traffic locations where localized damage has occurred.

2. Recent Repairs/Modifications

Most of the laboratory/office portion of the original building original portion was repainted as part of the renovation project in 2001.

3. Design Problems/Deficiencies

The partitions/finishes in some locations are not holding-up against the high traffic and heavy usage they're subjected to - 1st and 2nd floor corridors where recycle bins are stored.

4. Effective Remaining Life

Most of the partitions date from the original construction of the facility in the early 1970's and construction of the east-side addition in 1995. Given their current condition, the partitions can likely be expected to perform indefinitely.

The 'soft' finishes (paint & vinyl wall covering) date from various times over the life of the facility, and will continue to require cyclical replacement.

The 'hard' finishes (ceramic tile) date from original construction of the facility in the early 1970's, and given their current condition can likely be expected to perform indefinitely.

5. Major Repairs/Recommendations

It is recommended that an allowance be made for phased repainting and replacement of vinyl wall coverings in conjunction with flooring replacement works (to minimize tenant disruption). This work is projected to cost an estimated $10,250 in each of the in each of the 11th and 16th years.

1.3.3 Ceilings

The ceilings throughout are a mixture of:

- Suspended metal T-bar with lay-in acoustic tiles in the east high-bay, main entrance, corridors, offices and open office areas, 2nd floor labs, 2nd floor janitor closet, kitchenettes, addition area washrooms, and the addition area stair.

- Suspended plaster in the original washrooms, and the 1st floor janitor closet, gas storage and UPS/pump rooms.
- Wood (on gypsum board) - 19 mm cedar slats (stain finish) on 16 mm gypsum board on suspended galvanized furring, located in the stairwell lobbies/vestibules.

In the remaining areas (west high-bay, centre high-bay, east high-bay lab, 1st floor labs, and the mechanical penthouse) where there are no ceilings, the exposed structural components are paint finished.

1. Condition

The ceilings are considered to be in good overall condition, except as follows:

- A water stained/damaged acoustic tile was observed in the east addition (2nd floor storage/server room - suspected equipment leak).

2. Recent Repairs/Modifications

To our knowledge, no recent repairs/modification has been carried out on the ceilings.

3. Design Problems/Deficiencies

To our knowledge, no design problems exist with the ceilings.

4. Effective Remaining Life

The ceilings date from date from the original construction of the facility in the early 1970's, and from construction of the east-side addition in 1995. Given their current condition, they can be expected to perform indefinitely.

5. Major Repairs/Recommendations

It is recommended that water stained/damaged acoustic units be replaced ASAP on an ongoing basis as part of existing O&M procedures, to assist in both monitoring of leaks (continuous and ongoing), and to reduce risk of possible health issues associated with moisture leakage.

NOTE: Monitoring of leaks is expected to increase in priority over the short-term as the roofing reaches the end of its effective service life.

1.3.4 Interior Doors

A variety of standard door types are employed throughout the interior of this facility, as follows:

- Hollow Metal - pressed metal doors and frames (paint finished) - various locations throughout the facility.
- Wood - solid core, plastic laminate finish; hollow metal and aluminum frames (for fixed and demountable partitions, respectively) - various locations throughout the facility.

Glazing in doors, sidelights and transoms are a mixture of clear and wired glass.
Door hardware throughout is a mixture of exit devices, push/pull hardware, and both lever and knob type latchsets/locksets, with a variety of functions, trims and accessories.

Overhead, Vertical Lift - paint finished, power operated
Overhead, Rolling - paint finished, manual operation

1. Condition

The interior doors are considered to be in fair overall condition, with no obvious signs of damage or deterioration outside of normal wear.

2. Recent Repairs/Modifications

To our knowledge, no recent repairs/modifications have been carried out on the interior doors.

3. Design Problems/Deficiencies

Various issues with respect to accessibility and general design have been identified (see '1.5 Accessibility' and '1.7 Code Compliance' below).

NOTE: Most interior doors throughout the east-side addition are labelled (i.e. fire rated) - reason unknown as partitions are clearly not fire separations.

4. Effective Remaining Life

The interior doors date from the original construction of the facility in the early 1970's. Given their current condition, and with normal maintenance:

- the standard doors can be expected to perform indefinitely, with partial repairs/replacements carried out on an 'as required' basis.
- overhead doors will likely require refurbishment in order to extend their effective service life.

5. Major Repairs/Recommendations

Other than normal maintenance (i.e. regular monitoring and minor repairs), no repair/replacement is anticipated for the interior doors over the short-term.

Pending future assessment and verification, it is recommended that an allowance be made for refurbishment of the older overhead doors in order to extend their effective service life. This work is projected for the 11th year, at an estimated cost of $7,500.

1.3.5 Window Coverings

The window coverings throughout are a mixture of <u>PVC horizontal louvre blinds</u> and <u>vinyl fabric roller shades</u>.

1. Condition

The window coverings are considered to be in fair overall condition, with no obvious signs of damage or deterioration.

2. Recent Repairs/Modifications

To our knowledge, no recent repairs/modifications have been carried out on the window coverings.

3. Design Problems/Deficiencies

To our knowledge, no design problems/deficiencies exist with the window coverings.

4. Effective Remaining Life

The window coverings date from date from the original construction of the facility in the early 1970's, and from construction of the east-side addition in 1995. Given their current condition, they can likely be expected to perform over the next 10 years.

5. Major Repairs/Recommendations

Pending assessment and verification, window coverings will likely require replacement at the end of their effective service life. This work is projected for the 11th year, at an estimated cost of $9,500.

1.3.6 Fitments (Fixed Furnishings, Millwork and Manufactured Specialties)

The fitments present throughout include:

- Reception counter - gypsum board, plastic laminate - in the main entrance lobby.
- Toilet partitions - painted metal - in the multi-person washrooms.
- Lab cabinets - painted metal, solid surface tops - in the laboratories.
- Kitchen cabinets - plastic laminate - in the kitchenettes.

1. Condition

The fitments are considered to be in fair overall condition, with no obvious signs of damage or deterioration.

2. Recent Repairs/Modifications

To our knowledge, no recent repairs/modifications have been carried out on the fitments.

3. Design Problems/Deficiencies

To our knowledge, no design problems/deficiencies exist with the fitments.

4. Effective Remaining Life

The fitments date from various times over the life of the facility. Given their current condition, with normal maintenance can be expected to perform over the next 25 years.

5. Major Repairs/Recommendations

Other than normal maintenance, no repairs/replacements are anticipated for the fitments over the next 25 years.

1.3.7 Interior Stairs

There are numerous interior stairs employed throughout this facility which provide access and/or egress, as follows:

- Southwest Stair: concrete, painted metal guards/handrails, ground floor (level 1) to 2nd floor (level 2), exits to exterior at grade through entrance vestibule.
- South Centre Stair: concrete, integrally cast concrete guards with painted steel handrails, basement (level 0) to main roof/PH (level 3), exits to exterior at grade through main entrance lobby.
- Southeast Stair: concrete, painted metal guards/handrails, ground floor (level 1) to 2nd floor (level 2), fixed metal ladder to main roof (level 3), exits to exterior at grade through entrance vestibule.
- East Centre Stair: metal with concrete filled treads and landings, painted metal guards/ handrails with vinyl cap, ground floor (level 1) to 2nd floor (level 2), exits directly to exterior at grade.

In addition to the above, there are open circulation metal stairs and metal ladders located throughout the ‘high-bay’ areas which provide access between levels and to equipment.

1. Condition

The interior stairs are considered to be in good overall condition, with no obvious signs of damage or deterioration.

2. Recent Repairs/Modifications

To our knowledge, no recent repairs/modifications have been carried out on the interior stairs.

3. Design Problems/Deficiencies

Various issues with respect to accessibility and general design of the stairs/stairwells have been identified (see ‘1.5 Accessibility’ and ‘1.7 Code Compliance’ below.

4. Effective Remaining Life

The interior stairs date from the original construction of the facility in the early 1970’s and construction of the east-side addition in 1995. Given their current condition, they can likely be expected to perform indefinitely.

5. Major Repairs/Recommendations

Other than normal maintenance (i.e. regular monitoring and minor repairs), no repair/replacement are anticipated for the interior stairs.

1.4 Heritage

As the “Custodial Department” for this facility, EC is responsible for arranging a review and preparation of a “Heritage Character Statement” by the Federal Heritage Building Review Office (FHBRO) through Canadian Heritage, to identify any elements which may have heritage value, and thereafter be responsible for submitting concept proposals and detailed design proposals for and interventions (defined as alteration, demolition or disposal) to FHBRO for review and comment.

- This facility has not yet been reviewed by the Federal Heritage Building Review Board (FHBRO) through Canadian Heritage.
- Given the age of the building (40 years), and as the maximum age for review is 40 years, a request for review should be put through as soon as possible, with no interventions carried out until a review has been completed.

1.5 Accessibility

While various projects have been carried out to address barrier-free design throughout this facility, it is not fully compliant with current accessibility standards. As a Crown facility, accessibility requirements are dictated by the Treasury Boards ‘Accessibility Standard for Real Property’ (effective Nov. 01, 2006) and its designated technical standard (CAN/CSA-B651 Accessible Design For The Built Environment).

- A recently completed Accessibility Audit (see ‘Appendix E - Accessibility Audit’) outlines details, including identified deficiencies with entrances, elevators, washrooms, tactile signage and ‘public’ areas when assessed against both the 1995 and 2004 editions of CAN/CSA-B651.

NOTE: A draft version of the next edition, currently in the review stage, is expected to be issued in 2011.

1.6 Environmental

Given the age of the building (40 years), it is likely that building materials containing hazardous substances (e.g. lead, asbestos, etc.) are present. Suspect materials observed on-site include plaster, gypsum board (and joint filler), paint, and acoustic tiles. No information regarding previous surveys/testing for hazardous materials was reviewed.

- All existing environmental information be collected and reviewed to determine what actions, if any, are required.
- It should be ensured that all on-site personnel as well as all independent contractors are aware of any possible exposure to hazardous substances.

It is recommended that an allowance be made for the commission of a Designated Substances Survey (DSS) to identify any hazardous substances present on-site, including their locations and concentrations (mandatory under Ontario regulations). The scope of this survey should include: site inspection to establish likely presence of designated substances; collection of representative samples and laboratory analysis; estimation of quantities of substances present; and recommendations to address the presence of the designated substances, including remediation and/or managing/monitoring. This information allows persons working on site (e.g. construction demolition/renovation, maintenance activities, repairs, etc.) to take appropriate actions in controlling exposure to themselves and others.

Designated substances include: acrylonitrile, arsenic, asbestos, benzene, coke oven emissions, ethylene oxide, isocyanates, lead, mercury, silica (free crystalline silica), and vinyl chloride monomer (not PVC). This study should be completed in the 1st year, at an estimated cost of $35,000.

1.7 Code Compliance

Compliance issues identified throughout the facility are described within the report under their applicable components.

- It is recommended that these items be addressed on an urgent basis.
- Due to the extensive nature of correcting some of the identified items, it is further recommended that the 'Authority Having Jurisdiction' (being HRSDC Labour Programme, Fire Protection Engineering), be consulted to determine what interim measures, if any, can be employed to ensure that occupant health and safety is not compromised.

In addition, several compliance issues with respect to the 'general design' of the facility have been identified, as follows:

- NBC 3.1.8.4., 3.1.8.11., 3.1.8.12, and 3.1.8.13. - Issues with doors in fire separations throughout - some not rated, some not closing/latching unassisted, some propped/ wedged open, some binding in open position, some exit devices dogged open, some hold-open hardware, some with push/pull hardware, some with electric strikes with unconfirmed operation (fail-safe or fail-secure).
- NBC 3.4.4.4.(7) - Exit stairs opening directly into service rooms (basement tunnel and mechanical penthouse).
- NBC 3.4.4.2. - Exit stairs lead through entrance vestibules, essentially making them 'exit lobbies' - only a single 'exit lobby' is permitted (in this facility it's the South Centre Stair at the main entrance).
- NBC 3.1.8.14. - Area of wired glass in doors/sidelights at exit stairs (including vestibules at 1st floor exit lobbies) may exceed allowable limits.
- NBC 3.1.13.2 - Combustible material in the exit stairwell lobbies/vestibules - wood ceilings.
- NBC 3.4.6.4.(7) and 3.4.6.5.(5) - Stair handrails do not have adequate extensions and returns, while guards have unprotected openings.

Some of these identified issues may be a result of continual changes in applicable code requirements over time, and therefore may not apply retroactively. It may be enough to be aware of these conditions and risk manage them (implement corrective actions as/when practicable) as opposed to taking immediate corrective actions, however this determination is solely at the discretion of the 'authority having jurisdiction'. Also, without first confirming the particulars of the facility with respect to classification and occupancy, it would be impractical to make any recommendations without proper assessment of required fire separations and exit/egress requirements.

It is recommended that an allowance be made for the commission of a fire protection study that will define the major occupancy and classification of the facility, identify individual occupancy types at locations throughout, and identify the locations and ratings of required fire separations. In addition, this study should evaluate existing fire separations, egress conditions, and fire protection systems against those required (gap analysis), and provide recommendations for corrective actions (including associated costs and priorities). This study should be completed in the 1st year, at an estimated cost of $13,500.

PART 2 - VERTICAL TRANSPORTATION

2.1 Elevating Devices

2.1.1 Elevators, Passenger

Their is one (1) passenger elevator:
Elevator 1 - Installation No. 10900

- Type: Geared machine 2 speed AC
- Controller: Armour Relay
- Capacity: 905 kg (2,000 lbs.), 11 persons
- Rated Speed: 0.5 m/sec. (100 ft./min.)
- Stops/Openings: 3/3; Basement, 1 & 2
- Cab Dimensions: 2000 x 1220 mm (depth x width)
- Cab Interior: pressed steel patterned walls with stainless steel hand rails and lower bump rail; flooring is vinyl tile; lighting is by two incandescent light fixtures.
- Doors: Type - 2 speed; Width - 910 mm; Protection - mechanical

1. Condition

The elevator is considered to be in fair overall condition, being well maintained and operating well. The elevator maintenance is under contract with Thyssen Krupp Elevator (specific contract details and expiry date unknown).

2. Recent Repairs/Modifications

To our knowledge, no recent repairs/modifications have been carried out on the elevator.

3. Design Problems/Deficiencies

This elevator does not meet barrier-free requirements, and it cannot be made to comply as the cab is too narrow.

4. Effective Remaining Life

The elevator dates from the original construction of the facility in the early 1970’s - manufactured and installed by Armour Elevator (acquired by Schindler), and is considered to be nearing the end of its effective service life.

5. Major Repairs/Recommendations

It may be possible to install a custom elevator cab that, if not able to comply, can be made to come very close to current requirements. Therefore, it is recommended that prior to modernization of the elevator, a detailed study be completed to determine if a large enough cab can be made to fit the existing hoistway. This work is recommended for the 1st year, at an estimated cost of $4,500.

It is recommended that allowance be made for a complete modernization of the elevator. This work is projected for the 6th year, at an estimated cost of $140,000.

NOTE: If the preceding study determines that a new custom elevator cab cannot be accommodated in the existing hoistway, the modernization work utilizing the existing cab is estimated at $85,000.

2.1.2 Elevators, Freight

There are no freight elevators in this building.

2.1.3 Escalators

There are no escalators in this building.

2.1.4 Dumbwaiters

There are no dumbwaiters in this building.

2.2.5 Platform Lifts

There are no platform lifts in this building.

2.2 Dock Hoists

2.2.1 Scissor Lifts

There are no scissor lifts in this building.

2.2.2 Dock Levellers

There are no dock levellers in this building.

PART 3 - MECHANICAL

3.1 Primary Services

3.1.1 Heating

The main steam supply is from CCIW through the underground tunnel.

A steam to glycol heat exchanger is located in the mechanical penthouse. Two base mounted pumps are installed to provide the force circulation of the glycol throughout the preheat coils in the air handling units.

A steam-to-hot water heat exchanger is located in the mechanical penthouse. Three in-line centrifugal water pumps are installed for the required force circulation of the heated water throughout the heating coils in the air handling units.

An expansion tank is dedicated to the glycol system. The existing unit is floor mounted.

An expansion tank is dedicated to the chilled water system. The existing unit is ceiling mounted.

A condensate receiver tank complete with two transferring pumps is located in the basement.

1. Condition

The existing equipment and associated components from the original construction (1970) are considered to be in fair condition, based on their age and operating environment.

The existing equipment and associated components installed after 1998 are considered to be fair to good condition, based on their age and operating environment.

The existing steam direct spray humidification system is not in operation. It has been decommissioned for quite some time.

Unless otherwise noted, the existing heating equipment and associated components are considered to be adequate for the facility, based on the existing occupancy.

2. Recent Repairs/Modifications

No other additions after the 1998 extension were identified.

3. Design Problems/Deficiencies

To our knowledge, no design problems/deficiencies exist with the current steam distribution systems, glycol or hot water heat exchangers, based on the original design intent.

The need for a humidification system serving the office space, not related to direct steam injection, should be investigated.

4. Effective Remaining Life

Based on present day industry standards, the existing steam boilers installed in 2006 - 2007, located in the boiler room in the main building have a useful economic life of 25 - 30 years, based on ASHRAE guidelines, if proper maintenance practices and repairs are conducted.

Based on the duty cycle, operational environment and maintenance practices and procedures applied, it is anticipated that the existing units will be operational for the following 14 - 15 year time period, with limited risk of catastrophic failure. It is recommended that a complete detailed evaluation of the existing equipment be conducted within the 14 years, and consideration for their replacement be given within the 15 years. This value added engineering will prove effective in the selection of new system capacities, compatibility, operational life cycle cost analysis and provide design working drawings/specification. Our estimated cost for the engineering evaluation is $25,000. Due consideration for asbestos abatement must be given when undertaking any construction project in the facility.

5. Major Repairs/Recommendations

Other than normal maintenance practices applied to the system, the primary heating system should perform over the remaining life.

3.1.2 Cooling

A chilled water line is connected via tunnel and serves the cooling coils installed in the air handling units located in the Wastewater Technology Centre (WTC) mechanical penthouse.

1. Condition

The existing cooling system and related components is considered to be in fair to good condition.

2. Recent Repairs/Modifications

No other additions after the 1998 extension were identified.

3. Design Problems/Deficiencies

To our knowledge, no design problems/deficiencies exist with the cooling systems.

4. Effective Remaining Life

The normal anticipated life expectancy for the existing system is in the 30 - 35 year range, based on ASHRAE guidelines.

5. Major Repairs/Recommendations

Based on the duty cycle, operational environment and maintenance practices and procedures applied, it is anticipated that the existing units will be operational for the following 14 - 15 year time period, with limited risk of catastrophic failure. It is recommended that a complete detailed evaluation of the existing equipment be conducted within the 14 year period, and consideration for their replacement be given within the 15 year period. This value added engineering will prove effective in the selection of new system capacities, compatibility, operational life cycle cost analysis and provide design working drawings/specification. Our estimated cost for the engineering evaluation and design/specification is $25,000.

Other than normal maintenance practices, no major repairs are anticipated over the life of the remaining units.

3.2 Secondary Services - Heating/Cooling

3.2.1 Hydronic Heating System

Heating is by perimeter wall induction units, radiation wall fin units, vestibule fan coil units, steam and hot water unit heaters, total of 19 according to the last inventory. All the heating units in the facility are directly reliant upon the existing boilers, piping and circulating pumps in order to operate as intended.

Secondary heating units such as passive solar heating panels are installed in the WTC building. The heat reclaiming coil is interconnected with air handling unit number 53 in the WTC building. The existing panels are installed on the southwest walls.

The existing components of the hydronics heating system are a combination of new and original components. Unless otherwise noted, all the system pipes, valves and heating equipment are from the original construction built in 1970, and the addition built in 1998.

For further information regarding the hydronic heating systems, see section 3.1.1.

1. Condition

In most cases, the existing units are suspected to be from the original construction of the facility and are considered to be in fair to good condition.

2. Recent Repairs/Modifications

No recent major repairs or modifications were noted or reported on the systems.

3. Design Problems/Deficiencies

To our knowledge, no design problems/deficiencies exist with the hydronic heating system.

4. Effective Remaining Life

It is anticipated that the existing perimeter wall induction units, radiation wall fin units, vestibule fan coil units, steam and hot water unit heaters should be in operation for the next 15 - 20 years, with limited risk of failure.

5. Major Repairs/Recommendations

Other than normal maintenance, no major repairs are anticipated for the remaining life of the units. An assessment to replace the perimeter radiators may be considered in first year period, at an estimated cost of $25,000. The design is estimated to be completed in year 2, at an estimated cost of $50,000.

3.2.2 Supplemental Heating Units

No supplemental heating units are installed in this facility.

3.2.3 Primary Air Supply

The existing components of the air supply system are a combination of new and original components. Unless otherwise noted, all the equipment, system ducts, dampers, and diffusers are from the original construction built in 1970.

Equipment installed in Wastewater Technology Centre (WTC) penthouse, mezzanine, and roof are as follows:

- Air handling unit number 51, 2nd floor offices and labs, capacity not available. The unit is ducted overhead supplying the air distribution system in the laboratories and offices on the second floor and estimated to be in poor condition.
- Air handling unit number 52, 1st floor offices and labs, capacity not available. The unit is ducted overhead supplying the air distribution system in the laboratories and offices on the first floor. The unit was manufactured by Haakon Industry.
- Air handling unit number 53, east addition side (in conjunction with solar wall) capacity not available. The unit is ducted overhead supplying the air distribution system to the VAV system in the east wing offices. The unit was manufactured by Trane.
- Air handling unit number 54, west side 1st floor - Eng Air Rooftop Unit (Heating - natural gas and Cooling), capacity not available. The unit is ducted overhead supplying the air distribution system in the west high bay (Zenon plant).
- Air handling unit number 55, East Side - map room, capacity not available. The unit is ducted overhead supplying the air distribution system in the map room east plant. Heating on glycol loop and cooling on chilled water loop. The unit was manufactured by Trane.
- Air handling unit number 56, capacity not available. The unit is ducted overhead supplying the air distribution system in the green lab east plant. The unit was manufactured by Engineer Air.
- Air handling unit number 57, Center High Bay capacity not available. Heating on glycol loop and cooling on chilled water loop

The laboratory fume hoods and some equipment cabinets in the Wastewater Technology Centre are ducted and connected to two strobic fans. The strobic fans are located on the roof of the mechanical penthouse and in process to be replaced in March 2010.
The other fans are located on the building roof, it appears that they were installed in 2004.

Exhaust fans for the addition are located in the mezzanine area. The existing units were refurbished in 2001.

Exhaust fans for the washrooms and general area are installed in the mechanical penthouse on the roof of the mechanical penthouse, and on the building roof. It appears that the existing units were installed in the mid-1970's.

The air and temperature supplied at the floor level in the west high bay area was identified as " not comfortable or sufficient". Since the supply and return air grilles are only installed up high in the ceiling spaces, the air distribution is unevenly supplied to the lower floor areas. To provide the proper comfort air and temperature supply to the floor level, we recommend that ceiling stratification fans be installed, at an estimated cost is $10,000.

1. Condition

The existing primary and secondary air units are from the original construction of the facility and are considered to be in fair to good condition;

2. Recent Repairs/Modifications

Other than normal maintenance, to our knowledge, no other recent repair/ modification works have been conducted on main air handling units.

3. Design Problems/Deficiencies

To our knowledge, no design problems/deficiencies exist.

4. Effective Remaining Life

The life expectancy of the primary/secondary air handling units and exhaust units is in the 30 - 35 year range. It is anticipated that the existing units will be in operation for the following 5 - 10 years, if proper maintenance practices and procedures are applied. It is recommended that a complete detailed engineering evaluation/report of the air handling units and exhaust units be conducted in the second year (2011). This value added engineering will prove effective in the selection of a new system, ensure system capacities, compatibility, life expectancy, operational life cycle cost analysis, and take environmental and indoor air quality considerations into account, and provide working drawings and specification. Our estimated cost for the engineering evaluation is $50,000. The replacement construction cost will be determined and provided by the consultant engineer.

5. Major Repairs/Recommendations

A complete IAQ is recommended for the office/lab spaces during the winter time and correlated with the study to convert/replace the existing humidification system for specific air handling units serving the office space. The value of this study is estimated at $15,000 in year one. Action to be correlated with similar conditions for CCIW (NWRI) building where consideration for the size of R.O system was identified.

3.2.4 Supplemental Air Conditioning

One air cooling split systems is installed in the room S227. Condenser is located on the roof. The condensers are installed on the roof. It appears that they have been recently installed. It is anticipated that the remaining life of the unit is in the 6 - 10 year range if proper maintenance practices and procedures are applied.

1. Condition

The unit is estimated in good condition

2. Recent Repairs/Modifications

No major repairs or operational design deficiencies were reported or noted on the systems.

3. Design Problems/Deficiencies

To our knowledge, no design problems/deficiencies exist with the supplemental cooling system.

4. Effective Remaining Life

The units are expected to perform for the next 6-10 years.

5. Major Repairs/Recommendations

Normal maintenance is anticipated over the effective remaining life of the system.

3.3 Control System

A variety of controls are used and integrated in the main building HVAC systems controls for operating the mechanical units. The existing is a combination of electric, pneumatic controllers for the sensing and modulation of various flow control devices, as well as the start/stop operation. The HVAC systems and associated components are controlled by the Delta Direct Digital (DDC) system. The master control PC's are located in the building operators offices, and mechanical room. A control panel is located in the penthouse mechanical room.

1. Condition

The existing system is considered to be in good condition and suitable for the application, and capable of future expansion.

2. Recent Repairs/Modifications

Other than the present upgrading and normal maintenance, to our knowledge, no recent repairs have been conducted on the existing control system.

3. Design Problems/Deficiencies

Based on the original intent and design criteria, no deficiencies were noted or reported.

4. Effective Remaining Life

The effective remaining life of the existing DDC system is anticipated to be in the 16 - 20 year range if proper maintenance practices and procedures are applied. Future upgrades will be correlated with the central command in main CCIW building.

3.4 Storm Sewer System

The building and grounds storm sewer system are from the original construction of the building and are discharged into the Hamilton Harbour.

Roof drains for the building, including penthouse mechanical room roofs, are connected to the main building storm sewage system. This piping system is anticipated to be from the original construction of the building.

Visual inspection of the system was limited to that in exposed areas in and around the building. It is assumed that limited PVC piping was used in the construction of the storm drainage system during renovations and client fit-up.

1. Condition

The piping appears to be in good condition, with no indication of leaks or deterioration. It is anticipated that the existing will be in operation for the following 20 years, with no unexpected failures, if proper maintenance practices and procedures are followed.

Catch basins on the grounds and in the parking area appear to be operating as intended, with no reported problems. It is anticipated that these units will be in operation for the following 25 years with no unexpected failures if proper maintenance practices and procedures are followed.

2. Recent Repairs/Modifications

Some minor repairs to the building storm drains have been conducted in conjunction with roof repairs.

3. Design Problems/Deficiencies

To our knowledge, no design problems/deficiencies exist with the system.

4. Effective Remaining Life

It is anticipated that the storm sewer system will remain in operation for the following 20 years, based on the normal anticipated effective life of approximately 50 years.

3.5 Sanitary Sewer System

The drainage from all the washrooms, lunchrooms, mechanical rooms, janitor's closets, and emergency showers is connected to the main building sanitary sewage piping system. All piping available for inspection were noted as being metallic.

The main WTC building sanitary sewage mains are connected to one sewage lift pumping station. The pumping station is complete with two above-ground pumps. The pump outlets are connected to the CCIW main sewage pumping station.

Visual inspection of the system was limited to that in exposed areas in and around the building. It is assumed that limited PVC piping was used in the construction of the system during renovations and client fit-up.

The drains from the weeping tiles and the elevator pits are pumped by submersible pumps into the building sanitary system. The pumps have been replaced over the life of the facility.

1. Condition

All piping available for visual inspection was noted as being metallic. It is assumed that no PVC piping was used in the construction of the sanitary drainage system.

The piping appears to be in good condition, with no indication of leaks or deterioration.

2. Recent Repairs/Modifications

To our knowledge, no modifications have been conducted on the sanitary drainage system.

3. Design Problems/Deficiencies

To our knowledge, no design problems/deficiencies exist with the system.

4. Effective Remaining Life

It is anticipated that the existing will be in operation to serve it's intended purpose for the following 10-15 years, if proper maintenance practices and procedures are applied. Sewage distribution project upgrade is scheduled in summer 2010.

5. Major Repairs/Recommendations

Other than normal maintenance, no other major repairs are anticipated over the remaining life of the system.

3.6 Domestic Hot Water System

Domestic hot water is generated through one low pressure, steam-to-hot water converter located in the mechanical penthouse. Domestic hot water is force circulated throughout the facility by an in-line circulation pump. The hot water in the building is provided in washrooms, laboratories, and janitor's closets. The existing unit was installed in 1969-1970. Based on ASHRAE guidelines, the existing unit has exceeded the life expectancy. The unit is considered to be in poor condition, based on the age.

1. Condition

The hot water piping is considered to be in fair condition, with no problems reported.

2. Recent Repairs/Modifications

Some minor repairs to the domestic hot water system have been conducted in conjunction with tenant upgrade.

3. Design Problems/Deficiencies

To our knowledge, no design problems/deficiencies are associated with the domestic hot water system.

4. Effective Remaining Life

It is anticipated that the existing units will serve for the next 5 years if proper maintenance and repairs are conducted.

5. Major Repairs/Recommendations

Other than normal maintenance, no major repairs are anticipated over the remaining life of the system. It is suggested that consideration for replacement of the existing unit/or installation of a new system shall be given within the second year (2011) in order to restore the required comfort level and avoid failure of the system. A new system consisting of a gas fired, high efficiency heater will be considered to be installed. Our estimated cost is $50,000.

3.7 Plumbing System

The plumbing system in this facility provides potable water and drainage to the laboratories, washrooms, janitors closets, and mechanical rooms in the facility. The typical washroom and janitor's closet fixtures are from the original construction, with some minor exceptions, and considered to be in fair condition.

1. Condition

The building plumbing system is considered to be in good to fair condition. The existing fixtures are from the original construction, with minor exceptions, and operating as intended. Water for the facility is purchased from the local municipality..

2. Recent Repairs/Modifications

To our knowledge, no recent repairs or modifications have been conducted on the building plumbing system.

3. Design Problems/Deficiencies

To our knowledge, there are no design problems/deficiencies associated with the plumbing system.

4. Effective Remaining Life

Based on present day industry standards, the existing plumbing fixtures have a useful economic life of 25 - 30 years, based on AHRAE guidelines.

It is recommended that a complete detailed engineering evaluation of the existing plumbing fixtures and associated components be conducted prior to replacement. This value added engineering will prove effective in the selection of a new system/fixtures and will ensure system capacities, compatibility, life expectancy, and operational life cycle cost analysis. Our estimated cost for the engineering evaluation is $10,000. This work should be completed in the sixth year.

3.8 Fire Protection/Life Safety Systems

3.8.1 Water Supply, Standpipes, Fire Hoses

Fire hoses in cabinets are installed throughout the facility. Portable extinguishers were installed in each cabinet. Monthly inspection tags were provided and inspections of the units were dated and signed as required.

As per the National Fire Code of Canada, the building is fitted with standpipes and fire hoses installed in recessed wall mounted cabinets. The condition of the system is considered to be good.

3.8.2 Sprinkler System

No sprinkler system was identified in this building

3.8.3 Portable Fire Extinguishers

The building has portable fire extinguishers installed, either stand alone or inside fire hose cabinets. The existing portable fire extinguishers are provided according to anticipated hazards based on the normal occupancy type.

Monthly inspections are to be conducted on the portable fire extinguishers as required by the applicable Codes. Existing fire extinguishers are to be replaced on “as and when needed” basis, based on the monthly inspection reports. Replacement of these units is considered to be a maintenance item and not a capital expenditure. The testing, recharging and replacement of the extinguishers is included in other annual maintenance and service contracts issued by this department for fire protection systems.

No Code violations were noted regarding the installation of the fire fighting system in this facility.

3.9 Ozone Depleting Substances Management (ODS)

For refrigerant inventory, see Appendix “C”.

PART 4 - ELECTRICAL

4.1 Electrical Power

The main power to this building is supplied from the 5 kV distribution switchboard (located in the Main Building) via a 4160 volt, high voltage TECK cable installed through the crawl space to the tunnel and up the main pipe chase to the rooftop level of the WTC. From the penthouse electrical room, the high voltage cable enters a cable tray installed across the roof, down the west façade of the facility to the main 600 kVA, 4160 V to 600 V pad mount transformer. Secondary feeders from the transformer supply back to the rooftop electrical room and also split to feed a main bus duct that runs the length of the WTC high bay area. An 800 A main distribution board in the penthouse area supplies 600 volt power to mechanical equipment and also feeds a main 120/208 volt distribution board via a 150 kVA air cooled transformer. Lighting and receptacle panels throughout office/labs and high bay area are fed from the main 120/208 volt distribution panel. The main 600 volt distribution bus duct in the high bay area provides power mainly for testing and laboratory equipment located within this area. This equipment includes all types of pumps and water treatment machines. Most of the branch circuits are installed in exposed EMT conduits, TECK and cabtire type cables used for portable equipment.

1. Condition

The existing distribution equipment was found to be in fair working condition. Based on a cursory inspection of the electrical equipment, no major deficiencies were found, the system does not reveal any violations of the present requirements of the electrical safety code.

2. Recent Repairs/Modifications

The main outside transformer and secondary distribution in the penthouse area has been replaced within the last 5 years to suit current configuration.

3. Design Problems/Deficiencies

At the time of site visit, there appeared to be no major problems or deficiencies with the main high and low voltage distribution equipment. A preventative maintenance program is in place and is currently contracted to RONDAR Inc. Maintenance specifications were also noted to be in place; however, updating is required prior to the next contract award to keep current with the latest maintenance principles, codes, acts and regulations. It is recommended that the latest revision of the International Electrical Testing Association (NETA) Maintenance Specifications be utilized for this purpose.

Refer also to the NWRI Building, Electrical Preamble - Sections A & B for more details which apply to this building.

4. Effective Remaining Life

Most of the building distribution equipment is of the original construction and is in good condition.

With regular maintenance and minor repairs, the low voltage equipment should operate as intended for the remaining life expectancy of 20 years. The estimated cost for replacement at the end of its useful life is $600,000.

5. Major Repairs/Recommendations

At the time of site visit, there appeared to be no major repairs required with the main electrical equipment, other than the replacement at the end of its useful life. It is recommended that all corrections listed in the Executive Summary - Sections A & B be completed.

It was noted that all distribution panels and lighting/receptacle panelboards located in common areas have been left unlocked. This allows for unauthorized personnel to have access to breakers, which poses a safety concern for both the non-qualified individual and/or equipment being fed from the devices contained within. It is recommended that all appropriate keys be obtained and locks be maintained on these units at all times.

General cleaning of all interior, exterior and ventilation surfaces for all panels, transformers, MCC's and distribution equipment was severely lacking and should be made one of the top priorities for the next maintenance shutdown. Exterior surface cleaning can be completed throughout the year and should be considered as debris and dust is one of the major contributing factors to premature equipment failure. Cleaning of electrical equipment should only be completed by qualified electrical personnel.

4.2 Emergency Power

Emergency power is supplied to this facility from the main building emergency generator via a 600 volt, 200 A breaker in the main emergency power distribution board via a TECK type cable installed through the tunnel area and up the main riser to the penthouse electrical room. This cable terminates into a 200 A transfer switch which feeds a 600V emergency power splitter. From this splitter, 600 V power is supplied to necessary mechanical equipment to a small 30 kVA, 600-120/208 V transformer to feed panelboards for emergency lighting and fire alarm loads. A second 30 kVA, 600-120/208 V transformer was also noted to feed a UPS located on the first floor for laboratory equipment.

1. Condition

The existing emergency power distribution equipment is in good condition.

2. Recent Repairs/Modifications

At the time of site visit, it appeared that there have been no major repairs or modifications to the emergency power distribution equipment in the last two years. A project is currently underway to remove client UPS systems and other connected equipment from the emergency generator and place it on the co-generation unit.

3. Design Problems/Deficiencies

There were no design problems or deficiencies with the emergency power distribution equipment noted.

4. Effective Remaining Life

With regular maintenance and minor repairs, the emergency power distribution equipment should operate as intended for the remaining life expectancy of 20 years. The replacement cost at the end of its useful life was included in the above estimate for the main electrical power.

5. Major Repairs/Recommendations

There are no major repairs required with the emergency power distribution equipment other than the replacement at the end of its useful life.

4.3 Exterior Lighting

Exterior lighting is provided from wall mounted, high pressure sodium type fixtures rated at 150 to 200 watts depending on location, and pole mounted high pressure sodium roadway lights rated at 200 watts. The wall units are operating at 347 volts and the pole lights are operating at 220 volts. All exterior lights are controlled by local photocells and contactors.

1. Condition

All of the exterior lighting appeared to be in fair working condition. As this was a daytime inspection, no measurement was taken as to the amount of light the current setup will provide. It was noted that several of the lenses were quite dirty and require cleaning, as this will greatly diminish the lighting output of the current fixtures.

2. Recent Repairs/Modifications

At the time of site visit, there appeared to have been no recent major repairs or modifications to the exterior lighting system within the last two years.

3. Design Problems/Deficiencies

At the time of site visit, there appears to be no deficiencies or design problems with the exterior lighting system. A lighting survey and measurement project is required to determine actual lighting levels.

4. Effective Remaining Life

The exterior lighting system should continue to perform satisfactorily, with minor repairs for another 6 - 10 years.

5. Major Repairs/Recommendations

General exterior lamp and ballast replacement is required and periodic lens cleaning on a cyclical basis is required to ensure maximum light output. In the next 6 - 10 years, it is recommended that a project to replace the current units with new LED technology be investigated. These new units will be virtually maintenance free for several years beyond regular lamp and ballast replacements and will provide the utmost in energy efficiency. It is recommended that an exterior lighting survey be completed to ensure that a minimum of 10 lux average lighting level is present around the facility walkways, entrances and parking areas as stipulated by the Canada Labour Code - Schedule II & III requirements. Caution should be exercised to ensure proper lighting and positioning be applied in areas where security cameras are operating. Additional fixtures and costing would be pending survey results. The estimated cost for the survey would be approximately $1,500.

4.4 Interior Lighting

Interior lighting in the WTC Building is provided from fixtures of varying types, as follows:

High Bay areas - Industrial high bay fixtures equipped with 1000 watt multi-vapour lamps operating at 347 volts and controlled by building automation.

Office Areas (includes hallways and washrooms) - Varying types of fluorescent fixtures, both recessed and surface mounted, containing T8 lamps and electronic ballasts.

Lab Areas - Fluorescent fixtures recessed mounted, containing T8 lamps and electronic ballasts. Operating at 120 volts and controlled by local wall switches and building automation.

Stairwells, machine, boiler rooms - Varying types of fluorescent fixtures, suspended and surface mounted, containing T8 lamps and electronic ballasts.

Average levels of illumination were taken in several areas and results are as follows:

Location	*Actual*	*Required*
General office	300 to 500 lux	500 lux
Laboratories	400 to 600 lux	500 lux
Stairwells	80 to 130 lux	100 lux
High Bay Area	450 lux	300 lux

Mechanical room	130 lux	100 lux
Corridors	80 to 150 lux	100 lux
Washrooms	150 to 200 lux	200 lux
Elevator Lobbies	200 lux	100 lux

1. Condition

The general condition of the interior lighting can be considered to be good.

2. Recent Repairs/Modifications

At the time of site visit, there have been no recent repairs or modifications to the interior lighting system in the WTC Building within the last two years. The majority of fluorescent fixtures have been retrofitted to T8 lamps and electronic ballasts in the mid-1990's.

3. Design Problems/Deficiencies

At the time of site visit, no major design problems or deficiencies were noted with the interior lighting within the WTC building.

4. Effective Remaining Life

The interior lighting system should continue to perform satisfactorily, with general ballast and lamp replacement, over the next 25 years.

5. Major Repairs/Recommendations

The current interior lighting appears to meet the current needs of the facility. It is recommended to further conserve energy by exploring new lighting technologies as they arise (e.g. - LED type).

4.5 Emergency Lighting

Emergency lighting is provided by dedicated base building fixtures connected to the emergency power system within the facility. Emergency lighting battery pack, two-lamp units and remote heads were also noted in some mechanical, electrical and stairwell areas.

No test of the emergency lighting system was performed as to the amount of light they provide.

1. Condition

The emergency lighting system was found to be in fair working condition.

2. Recent Repairs/Modifications

At the time of site visit, it appeared that there have been no recent repairs or modifications to the emergency lighting system within the last two years.

3. Design Problems/Deficiencies

As per CAN/CSA 282-05, an emergency battery lamp unit capable of supplying 50 lux for 2 hours is to be installed within the transfer switch area to illuminate the controls in case of generator failure. Estimated cost for this would be $500.

4. Effective Remaining Life

The dedicated fluorescent lighting fixtures for the emergency lighting should continue to perform satisfactorily over the next 25 years. Battery operated emergency lighting units have a limited life span of 5 to 10 years.

5. Major Repairs/Recommendations

Refer also to the NWRI Building, Electrical Preamble - Section D for details.

It is recommended that all emergency lighting fixtures receive a marking to clearly indicate which fixtures are fed from emergency power, as these units were not easily identified during the recent site visit walk-through. It is also recommended that a detailed set of floor plans be developed and/or updated to clearly indicate emergency lighting configuration. These drawings should be filed with similar life safety systems drawings.

4.6 Exit Lighting

Exit lighting throughout the WTC building was noted to be a large mix of many types and styles of fixtures. Several units noted were either not functioning, were English only, or did not meet letter sizing requirements of 144 mm high x 19 mm strokes as stipulated by the National Building Code 2005. It was also noted that several inefficient compact fluorescent and incandescent lamp type fixtures were utilized in older areas of the facilities and mechanical areas.

1. Condition

The existing lights comply with the current building code, NBC/OBC 2005 as to their size. Varying ages of the units were noted, from the original construction of the facility to current day type units installed as part of office and/or lab area refits.

2. Recent Repairs/Modifications

There have been no major recent repairs or modifications to the exit light system within the last two years. Exit lighting is repaired as required.

3. Design Problems/Deficiencies

Exit lighting appeared to be lacking throughout several areas of the whole facility. This was especially noted within the high bay area. Exit lighting is to be installed to clearly define intended emergency exit routes. It is recommended that at least one exterior exit light device be installed at each exit stairway that accesses the roof areas to ensure service personnel working in these areas will be able to clearly define exit routes from the rooftop.

4. Effective Remaining Life

The current exit light system should continue to perform, with minor repairs over the next 5 to 10 years. Replacement as per recommendations in the executive summary should be considered at this time.

5. Major Repairs/Recommendations

Refer also to the NWRI Building, Electrical Preamble - Section C for details.

4.7 Fire Alarm System

The building is equipped with an Edwards EST, two stage, multi-zone fire alarm main panel which monitors heat and smoke detectors, manual pull stations, sprinkler flow, anti-tamper devices on control valves. The main system in this building also sends a remote trouble signal to the main facility upon activation.

The main fire alarm system also incorporates a voice communication system that consists of speakers installed throughout floor spaces and emergency telephones located at each stairwell area.

Main control (bypass, reset, etc.) is provided by a Fireworks fire alarm control computer and software package rack mounted in a separate cabinet located within the maintenance personnel control room at the front entrance of the facility.

1. Condition

Based on a cursory inspection, the system appears to meet with the NBC, Part 2. The fire alarm system was in good condition at the time of site visit.

2. Recent Repairs/Modifications

The main fire panels have been replaced within the last 5 - 10 years and a small annunciator has been installed for monitoring purposes, at the front security desk.

3. Design Problems/Deficiencies

It was noted that minimal signal devices were located at the rooftop areas of this facility. Service personnel working on rooftops may not hear alarm conditions, therefore, it is recommended that at least one exterior signal device be installed at each exit stairway that accesses the roof areas.

4. Effective Remaining Life

The theoretical anticipated life expectancy for fire alarm systems is typically 17 - 20 years, based on technology changes and condition of installed equipment. It appears that the current main panels for this fire alarm system were replaced in the last 10 years and are in good condition. It is anticipated that the fire alarm system installed at this facility will not require major replacement for at least another 15 years. Estimated cost to replace this panel would be approximately $10,000.

5. Major Repairs/Recommendations

It is recommended that at least one exterior signal device be installed at each exit stairway that accesses the roof areas to ensure service personnel working in these areas will be able to hear fire alarm signals. Estimated cost for this would be approximately $3,000.

Refer to Life Safety Portion of this report for required testing and maintenance requirements of this system.

4.8 Security System

The security system for the WTC is made up of door contacts, card access control and CCTV cameras connected to the Main Building. The security system is integral to the security systems installed throughtout the entire property. For details, see the report for the Main Building.

4.9 Telephone & Communications System

The main telephone and communications lines enter the building from the service tunnel via fibre optic and standard cabling installed on pipe rack systems. Termination of these cables is located in a storage closet in the first floor old facilities office, where a multi-line bix board unit is installed. Communications cables are installed to end user locations via plenum rated free air conductors and zone conduits.

1. Condition

The telephone & communications system was found to be in good working condition and appeared to satisfy the needs of current technologies utilized.

2. Recent Repairs/Modifications

At the time of site visit, it appeared that no major recent repairs or modifications have been made to the telephone/communications systems other than normal operational repairs and/or relocations to suit fitups.

3. Design Problems/Deficiencies

No major design problems or deficiencies were noted at the time of site visit.

4. Effective Remaining Life

Telephone and communications equipment is constantly upgraded, repaired and replaced as needed to suit current technology needs. Typical systems of this type would be expected to last 25 years. It appears that the current systems are of new technology.

5. Major Repairs/Recommendations

As the majority of telephone/communications systems are tenant owned, the upgrade, replacement and repair will be the responsibility of the tenants and typically are not funded as a base building system.

PART 5 - PROPERTY/SITE

For a detailed assessment of site elements, refer to separate report prepared for the 'NWRI Building'.

PART 6 - BUILDING AND OCCUPANT FIRE SAFETY

For a detailed assessment of legislated inspection and testing, refer to separate report prepared for the 'NWRI Building'.

SUMMARY OF RECOMMENDED EXPENDITURES
WTC Building
ARCHITECTURAL SYSTEMS

Report Section No.	Systems Description	Description of Work	Priority of Work	Project Priority System	Type of Expendi-tures	Short Term Expenditures					Long Term Expenditures			
						Year					Years			
						1	2	3	4	5	6 - 10	11 - 15	16 - 20	21- 25
1.2.2	Exterior Walls	Restoration of concrete wall panels (incl. sealants)	Cyl./Opt.	C3/D2	R		$175,000							
1.2.2	Exterior Walls	Cleaning/painting of metal panel walls	Opt.	C3/D2	R						$27,500			
1.2.3	Roofing	Roofing Study	Opt.	X2	R	$4,500								
1.2.3	Roofing	Replace roofings	Cyl.	B2	R						$331,500			
1.2.4	Exterior Doors	Refurbish overhead doors	Cyl.	C3	R							$15,500		
1.2.5	Windows, Sloped Glazing & Skylights	Replace window sealants	Cyl.	C2	R		$18,000							
1.3.1	Flooring	Replacement of resilient floorings (vinyl tiles and vinyl sheet) (partial)	Cyl.	C2/D2	R						$84,500			$84,500
1.3.1	Flooring	Replacement of carpet flooring (partial)	Cyl.	C2/D2	R							$32,500	$32,500	
1.3.2	Interior Partitions	Repaint/replace wall coverings (partial - in conjunction with flooring w	Cyl.	D2	R							$10,250	$10,250	
1.3.4	Interior Doors	Refurbish overhead doors	Cyl.	C3	R							$7,500		
1.3.5	Window Coverings	Replace window coverings	Cyl.	C2/D2	R							$9,500		
1.4	Heritage	Arrange for FHBRO review	Man.	A	-	no cost - housekeeping								
1.7	Code Compliance	Fire Separation Study	Man.	A	-	$5,500								
					Period Totals	$10,000	$193,000	$0	$0	$0	$443,500	$75,250	$42,750	$84,500
									Total Short Term Expenditures	$203,000			**Total Long Term Expenditures**	$646,000

All estimated costs are in year 2009 dollars.

SUMMARY OF RECOMMENDED EXPENDITURES
WTC Building
MECHANICAL SYSTEMS

Report Section No.	Systems Description	Description of Work	Priority of Work	Project Priority System	Type of Expenditures	Short Term Expenditures Year 1	2	3	4	5	Long Term Expenditures Years 6 - 10	11 - 15	16 - 20	21- 25
3.1.1	Heating System	Heating System - enginering evaluation for replacement	Opt.	C2	R							$25,000		
3.1.2	Cooling System	Cooling System - enginering evaluation for replacement	Opt.	C2	R							$25,000		
3.2.1	Hydronic heating system	Assessment to replace the perimeter radiators	Opt.	C3	R	$25,000								
3.2.1	Hydronic heating system	Design to replace the perimeter radiators	Opt.	C3	R		$50,000							
3.2.3	Primary Air Supply	West High Bay Area - stratification ceiling fans	Opt.	C3	R	$10,000								
3.2.3	Primary Air Supply	Air handling units and the exhaust units - enginering evaluation for replacement	Opt.	C3	R		$50,000							
3.2.3	Primary Air Supply	IAQ - office spaces and humidification solutions	Opt.	C1	R	$15,000								
3.6	Domestic Hot Water System	Gas fired high efficiency heater	Opt.	C2	C		$50,000							
3.7	Plumbing System	Engineering evaluation replacement/upgrades	Opt.	C2	R						$10,000			
					Period Totals	$50,000	$150,000	$0	$0	$0	$10,000	$50,000	$0	$0
									Total Short Term Expenditures	$200,000			**Total Long Term Expenditures**	$60,000

SUMMARY OF RECOMMENDED EXPENDITURES
WTC Building
ELECTRICAL SYSTEMS

Report Section No.	Systems Description	Description of Work	Priority of Work	Project Priority System	Type of Expendi-tures	Short Term Expenditures Year 1	2	3	4	5	Long Term Expenditures Years 6 - 10	11 - 15	16 - 20	21- 25
4.1	Electrical Power	Replace distribution equipment at the end of effective service life.	Man.	C3	C								$600,000	
4.2	Emergency Power	Costs included in em.power of main facility.												
4.3	Exterior Lighting	Exterior lighting survey as per report recommendations.	Opt.	C1	R		$1,500							
4.4	Interior Lighting	No recommended expenditures at this time.												
4.5	Emergency Lighting	New 2 hr emergency battery pack required by transfer switch as per r	Man.	C1	C	$500								
4.5	Emergency Lighting	See executive summary section D costing.												
4.6	Exit Lighting	See executive summary section C costing.												
4.7	Fire Alarm System	Replace main fire panel in this facility.	Man.	C1	C							$10,000		
4.7	Fire Alarm System	Install additional signal devices at roof exits as per report.	Man.	C1	C	$3,000								
4.8	Security System	Refer to recommendations and costing in main building report.												
4.9	Telephone & Communications System	No recommended expenditures at this time.												
					Period Totals	$3,500	$1,500	$0	$0	$0	$0	$10,000	$600,000	$0
									Total Short Term Expenditures	$5,000			**Total Long Term Expenditures**	$610,000

All estimated costs are in year 2009 dollars.

Environment Canada

Canada Centre for Inland Waters (CCIW)

ANNEX BUILDING

CONDITION REPORT

September 2009

ANNEX BUILDING - Contents

BUILDING DESCRIPTION

The 'Annex Building' is a two-storey, partially heated structure, originally constructed in 1988 with a partial 1st storey/full 2nd storey addition in 1991, and currently serves as both office space and a storage garage. With an approximate 'building area' of 570 m^2, it is classified under the National Building Code of Canada 2005 (NBC), Part 9, as a "Group F, Division 3 - Low Hazard Industrial" major occupancy (storage garage), with a "Group C - Business and Personal Services" minor occupancy (offices) (NBC Table 9.10.2.1).

The total estimated Short Term Expenditure (1 to 5 years) cost for this facility is **$101,500**, as outlined below:

Architectural/Structural	$11,500
Mechanical	$89,000
Electrical	$1,000
Short Term Total	$101,500

The total estimated Long Term Expenditure (6 to 25 years) cost for this facility is **$220,000**, as outlined below:

Architectural/Structural	$220,000
Mechanical	$0
Electrical	$0
Long Term Total	$220,000

PART 1 - ARCHITECTURAL/STRUCTURAL

1.1 Structure

1.1.1 Substructure

Visible portions of the substructure identify a mixture of types for this facility, as follows:

- poured concrete perimeter foundation walls at the storage garage portion of the building - the ground floor is predominantly asphalt throughout, with a poured concrete portion at the enclosed storage room.
- concrete block perimeter foundations walls at the office portion of the building - the ground floor is poured concrete slab-on-grade.

No detailed system information with respect to footing types (strip footings or pilings), damp-proofing, insulation, etc. is available.

1. Condition

The substructure is considered to be in fair overall condition, with no obvious signs of damage, deterioration or settlement.

2. Recent Repairs/Modifications

To our knowledge, no recent repairs/modifications have been carried out on the substructure.

3. Design Problems/Deficiencies

To our knowledge, no design problems/deficiencies exist with the substructure.

4. Effective Remaining Life

The substructure dates from the original construction of the facility in 1988 and construction of the addition in 1991. Given its current condition, the substructure can be expected to perform indefinitely.

5. Major Repairs/Recommendations

Other than normal maintenance (i.e. regular monitoring and minor repairs), no major repair/replacement is anticipated for the substructure.

1.1.2 Superstructure

The superstructure for this facility is a mixture of concrete and steel, as follows:

- Framing - a <u>pre-engineered steel/truss frame system</u> is used in the storage garage portion; while <u>conventional steel framing</u> (columns and beams) is used for the office portion.
- Suspended floors - <u>reinforced cast-in-place concrete</u> is used in the storage garage portion (for the mezzanine above the office), while <u>concrete filled metal decking</u> is used throughout the office portion.
- Roof - a <u>pre-engineered steel/truss frame system</u> is used in the storage garage portion, while <u>metal decking</u> is used for the office portion.

1. Condition

The superstructure is considered to be in good overall condition, with no visual signs of settlement or failure.

2. Recent Repairs/Modifications

To our knowledge, no recent repairs/modifications have been carried out on the superstructure.

3. Design Problems/Deficiencies

To our knowledge, no design problems/deficiencies exist with the superstructure.

4. Effective Remaining Life

The superstructure dates from original construction of the facility in 1988 and construction of the addition in 1991. Given its current condition, the superstructure can likely be expected to perform indefinitely.

5. Major Repairs/Recommendations

Other than normal maintenance (i.e. regular monitoring and minor repairs), no repair/replacement is anticipated for the superstructure.

1.1.3 'Other' Structures

The only ‘other’ structure present at this facility is the exterior stair (metal, paint finished, wall mounted) located on the west elevation - providing the required second exit from the 2nd floor.

1. Condition

The exterior stair is considered to be in fair overall condition, with no obvious signs of damage, deterioration or settlement.

2. Recent Repairs/Modifications

To our knowledge, no recent repairs/modifications have been carried out on the exterior stair.

3. Design Problems/Deficiencies

To our knowledge, no design problems/deficiencies exist with the exterior stair.

4. Effective Remaining Life

The exterior stair dates from construction of the addition in 1991, and given its current condition can be expected to perform indefinitely.

5. Major Repairs/Recommendations

Other than normal maintenance (i.e. regular monitoring and minor repairs), no repair/replacement is anticipated for the exterior stair.

1.2 Building Envelope

1.2.1 Suspended Floors/Soffits

There are no suspended floors/soffits associated with this building.

1.2.2 Exterior Walls

A variety of wall types are employed throughout the facility, as follows:

- <u>Concrete Block</u> - located at the office portion, consisting of exterior concrete block (both ribbed and smooth faced), with an interior gypsum board finish (specific assembly details

- i.e. insulation type and thickness, vapour barrier, etc. - unknown); a cementitious coating has been added to the exterior surface (west elevation) for unknown reasons.

- Metal Siding - located at the storage garage portion; consisting of prefinished metal cladding, insulation and a flexible poly liner.

1. Condition

The exterior walls are considered to be in fair overall condition; however, the following deficiencies were identified:

Metal Siding) -

- Physical damage to the metal siding was observed along the entire south elevation.

General -

- The unsealed opening between the office and garage storage portions of the building is filled with debris - susceptible to damage/deterioration.

2. Recent Repairs/Modifications

Addition of the cementitious coatings to the block walls (west elevation) - specific date unknown.

3. Design Problems/Deficiencies

To our knowledge, no design problems/deficiencies exist with the exterior walls.

4. Effective Remaining Life

The exterior walls date from the original construction of the facility in 1988 and construction of the addition in 1991. Given their current condition, and with corrective actions, the exterior walls can likely be expected to perform indefinitely.

5. Major Repairs/Recommendations

It is recommended that preventative actions be taken to preserve the condition of the exterior walls and to extend their service life. This work should include providing barriers (e.g. curbs, bollards, guards) along the south elevation to prevent future physical damage to the metal siding, and also to clear the space between the office and storage garage portions of debris and install closure panels (vented - to permit air flow, yet restrict debris and pests). This work is projected for the 2nd year, at an estimated cost of $7,500.

Otherwise, other than normal maintenance (i.e. regular monitoring and minor repairs), no repair/replacement is anticipated for the exterior walls.

1.2.3 Roofing

A variety of roof coverings are employed throughout the multiple roof levels/areas at this facility, as follows:

- Styrene Butadiene Styrene (SBS) a.k.a. Modified Bitumen - located on the low roof (storage garage portion); a fully adhered SBS membrane and flashings (specific assembly details - i.e. insulation type and thickness, vapour barrier, etc. - unknown); counter/cap flashings are prefinished metal.

- Built-Up Roofing (BUR) - located at the upper roof (office portion), a conventional built-up assembly consisting of a stone surfaced bituminous membrane and flashings over insulation (specific assembly details - i.e. number of plies, insulation type and thickness, vapour barrier, etc. - unknown); counter/cap flashings are prefinished metal.

Drainage for the lower roof is provided by perimeter metal eavestroughs and downspouts discharging at grade, while the upper roof relies on perimeter scupper drains connected to exterior metal downspouts discharging at grade.
Roof access from grade to the lower roof, and from the lower roof to the upper roof, is via fixed metal ladders.

NOTE: The SBS membrane roof system at the low roof has been installed over the structure's original metal roofing system (part of/integral with the pre-engineered structure).

1. Condition

The roofing is considered to be in fair overall condition; however, several deficiencies were noted, as follows:

- Accumulation of debris.
- Rusting metal components (ladders).
- Deteriorated sealants - cracking, debonding.
- SBS Roofing - ridging, loss of granular, minor membrane damage.
- BUR - asphalt bleed-through, and areas of bare/exposed membrane.

2. Recent Repairs/Modifications

To our knowledge, no recent repairs/modifications have been carried out on the roofing.

3. Design Problems/Deficiencies

All roof areas have inadequate slope to accommodate good drainage, resulting in standing water throughout, and leading to decreased service life of the roofing and creation of mosquito breeding conditions (West Nile virus).

4. Effective Remaining Life

The built-up roofing (BUR) is presumed to date from construction of the addition in 1991 (20 years old). The age of the SBS (modified bitumen) roofing is unknown, but is presumed to range from 10 - 15 years old. Given their current condition, the SBS membrane roofings and the BUR can likely be expected to require replacement at the end of their effective service lives in the 6th and 11th years, respectively.

5. Major Repairs/Recommendations

As the roofings represent a significant cyclical investment, there is potential for significant cost savings in the maximization of their service lives by avoiding premature replacement. However, as an integral part of the building envelope, and arguably the most vulnerable, deferring replacement too long increases the risk of damage, inconvenience and incurred costs due to increasing localized failures.

Therefore, it is recommended that prior to replacement of the roofings, that a detailed roofing study (including visual assessment, test cuts, moisture checks, and infrared scanning) be completed to fully assess the various roofing assemblies and the condition of their components. This information will be invaluable in determining both the timing and the scope of work required for upcoming replacements. This work is recommended for the 1st year, at an estimated cost of $2,500.

NOTE: In accordance with good roof maintenance practices, minor repairs to the roofing, including restoration of the gravel surfacing, removal of accumulated debris/sediment, and cleaning/repainting of metal components, should be corrected as part of existing O&M operations in order to ensure that the roofing maximizes its effective service life (by preventing the spread of existing deterioration) and maintain the integrity of the system components.

Pending assessment and verification, the BUR will likely require replacement at the end of its effective service life in order to maintain the integrity of the building envelope and prevent damage/deterioration and/or known health issues associated with leakage. Also, correction of identified deficiencies with respect to slope/drainage should be incorporated at this time. This work is projected for the 6th year, at an estimated cost of $32,500.

Pending assessment and verification, the SBS membrane roofing will likely require replacement at the end of its effective service life in order to maintain the integrity of the building envelope and prevent damage/deterioration and/or known health issues associated with leakage. Also, correction of identified deficiencies with respect to slope/drainage should be incorporated at this time. This work is projected for the 11th year, at an estimated cost of $67,000.

1.2.4 Exterior Doors

A variety of door types are employed throughout this facility, as follows:

- Aluminum - aluminum (dark bronze anodized), fixed type, with insulating glass units - located at the entrance lobby.
- Hollow metal - paint finished - located at secondary entrance/exit locations.
- Overhead, Sectional - prefinished, manual operation; located at the storage garage portion of the building (south elevation); door ‘V’.

1. Condition

The exterior doors are considered to be in fair overall condition, operating as intended and with no damage or visible deterioration.

2. Recent Repairs/Modifications

To our knowledge, no recent repairs/modifications have been carried out on the exterior doors.

3. Design Problems/Deficiencies

Issues with respect to general design have been identified (see ‘1.7 Code Compliance’ below).

4. Effective Remaining Life

The exterior doors date from the original construction of the facility in 1988, and from construction of the addition in 1991. Given their current condition, the exterior doors can likely be expected to perform indefinitely.

5. Major Repairs/Recommendations

Other than normal maintenance (i.e. regular monitoring and minor repairs), no repair/replacement is anticipated for the exterior doors over the short-term.

NOTE: It is presumed that 'minor repairs' included under normal O&M operations include annual spot cleaning/painting of metal surfaces to prevent deterioration and maintain the integrity of the components throughout their service life.

1.2.5 Windows

The windows throughout are aluminum (anodized finish), fixed type, with insulating glass units.

1. Condition

The windows are considered to be in good overall condition, with no signs of damage or deterioration; however, some deficiencies were noted, as follows:

- Deteriorating sealants storage garage window - cracking, debonding.
- Deteriorated paint finish and rusting metal surfaces at lintels.

2. Recent Repairs/Modifications

To our knowledge, no recent repairs/modifications have been carried out on the windows.

3. Design Problems/Deficiencies

To our knowledge, no design problems/deficiencies exist with the windows.

4. Effective Remaining Life

The windows date from the original construction of the facility in 1988 and from construction of the addition in 1991. Given their current condition, the windows can likely be expected to perform indefinitely, excepting the insulating glass units and the sealants which will continue to require cyclical replacement. The insulating glass units will fail randomly without warning and can be replaced on an 'as required' basis. The sealants are considered to be in fair condition, with replacement at the end of their effective service life likely in the 6th year.

5. Major Repairs/Recommendations

Window frame sealants (frame to wall) require replacement (cut out old and replace with new) at the end of their effective service life. This work is projected for the 6th year, at an estimated cost of $6,000.

Although glazing sealants (frame to glazing) are also in fair to poor condition, it is recommended that these be replaced in conjunction with the ongoing insulating glass units' replacements as a part of normal O&M operations.

1.3 Interior Construction

1.3.1 Flooring

A variety of flooring types are employed throughout this facility, as follows:

- Vinyl Tile - located in the exit stair, entrance lobby, and washrooms.
- Carpet - located throughout, except as otherwise indicated.

There is no finished flooring in the storage garage portion of the building (unfinished concrete in the office, and asphalt in the remaining areas).

1. Condition

The floorings throughout are considered to be in fair overall condition, except as follows:

- Carpet throughout the 1st floor corridor is wrinkled and very dirty/stained.
- Use of broadloom carpet in lieu of carpet tile in offices and open office areas restricts ongoing maintenance - requiring patches or full replacement.

2. Recent Repairs/Modifications

To our knowledge, no recent repairs/modifications have been carried out on the floorings.

3. Design Problems/Deficiencies

To our knowledge, no design problems/deficiencies exist with the flooring.

4. Effective Remaining Life

The floor finishes throughout are presumed to date from the construction of the addition in 1991, and will require cyclical partial replacements based on in-service times and usage:

- Resilient flooring (vinyl tile) will likely require replacement at the end of its effective service life in the 11th year.
- The carpet floorings will continue to require cyclical replacement on an ongoing basis - wrinkled carpet area can be expected to require premature replacement.

5. Major Repairs/Recommendations

It is recommended that an allowance be made for the replacement of approximately 1/2 of the carpet flooring in the older and high-traffic areas. This work is projected to cost an estimated $22,250 in each of the 6th and 9th years, and again in the 21st and 25th years.

It is recommended that allowance be made for the replacement of the resilient flooring (vinyl tile) at the end of its effective service life. This work is projected for the 11th year, at an estimated cost of $5,500.

1.3.2 Interior Partitions

The interior partitions employed throughout this facility include a variety of types, as follows:
- Frame (fixed) - metal stud framing finished with gypsum board - exit stair, entrance lobby and washrooms.
- Frame (demountable) - metal stud framing finished with vinyl-faced gypsum board panels with batten covered seams - throughout, except as otherwise indicated.
- Concrete Block - standard block - office in the storage garage portion of the building.

A variety of finishes are employed throughout this facility, as follows:
- Paint - used for gypsum board on fixed frame partitions.
- Vinyl Wall Covering - used for gypsum board on demountable partitions.

1. Condition

The interior partitions and their finishes are considered to be in fair overall condition, free of damage and with no visible damage outside of normal wear patterns, except in some high-traffic location wear localized damage has occurred.

2. Recent Repairs/Modifications

To our knowledge, no recent repairs/modifications have been carried out on the interior partitions.

3. Design Problems/Deficiencies

The partitions/finishes in some locations are not holding up against the high traffic and heavy usage they're subjected to - 1st and 2nd floor corridors where recycle bins are stored.

4. Effective Remaining Life

Most of the partitions date from the original construction of the facility in the early 1970's and construction of the east-side addition in 1995. Given their current condition, the partitions can likely be expected to perform indefinitely.

The 'soft' finishes (paint & vinyl wall covering) date from various times over the life of the facility, and will continue to require cyclical replacement.

5. Major Repairs/Recommendations

It is recommended that an allowance be made for phased repainting and replacement of vinyl wall coverings in conjunction with flooring replacement works (to minimize tenant disruption). This work is projected to cost an estimated $3,500 in each of the 6th, 9th, 11th, 21st and 25th years.

1.3.3 Ceilings

The ceilings throughout are a mixture of:

- Suspended gypsum board, texture finished - in the entrance corridor and stair;
- Suspended gypsum wallboard, paint finished - in the washrooms, and
- Suspended metal T-bar with lay-in acoustic tile - throughout the remaining areas.

There is no finished ceiling in the storage garage portion of the building (unfinished structure - see '1.1.2 Superstructure', above).

1. Condition

The ceilings are considered to be in fair overall condition, with no obvious damage or deterioration.

2. Recent Repairs/Modifications

To our knowledge, no recent repairs/modifications have been carried out on the ceilings.

3. Design Problems/Deficiencies

To our knowledge, no design problems/deficiencies exist with the ceilings.

4. Effective Remaining Life

The ceilings date from the original construction of the facility in 1988 and construction of the addition in 1991. Given their current condition, and with normal maintenance, they can likely be expected indefinitely.

5. Major Repairs/Recommendations

Other than normal maintenance (i.e. regular monitoring and minor repairs), no repair/replacement is anticipated for the ceilings.

NOTE: Monitoring of leaks is expected to increase in priority over the short-term as the roofing reaches the end of its effective service life.

1.3.4 Interior Doors

A variety of standard door types are employed throughout the interior of this facility, as follows:

- Hollow Metal - pressed metal doors and frames (paint finished) - located at the exit stair, entrance lobby and washrooms.
- Wood - solid core (paint finished), hollow metal frames (paint finished) - throughout, except as otherwise indicated.

Glazing in doors, sidelights and transoms are a mixture of clear and wired glass. Door hardware throughout is a mixture of both lever and knob type latchsets/locksets, with a variety of functions, trims and accessories.

1. Condition

The interior doors are considered to be in fair overall condition, with no obvious signs of damage or deterioration outside of normal wear.

2. Recent Repairs/Modifications

To our knowledge, no recent repairs/modifications have been carried out on the interior doors.

3. Design Problems/Deficiencies

To our knowledge, no design problems/deficiencies exist with the interior doors

4. Effective Remaining Life

The interior doors date from the original construction of the facility in 1988, and construction of the addition in 2001. Given their current condition, and with normal maintenance, the interior doors can be expected to perform indefinitely, with partial repairs/replacements carried out on an 'as required' basis.

5. Major Repairs/Recommendations

Other than normal maintenance (i.e. regular monitoring and minor repairs), no repair/replacement is anticipated for the interior doors.

1.3.5 Window Coverings

Window coverings throughout are <u>PVC vertical louvre blinds</u>.

1. Condition

The window coverings are in fair overall condition, with no damage or deterioration.

2. Recent Repairs/Modifications

To our knowledge, no recent repairs/modifications have been carried out on the window coverings.

3. Design Problems/Deficiencies

To our knowledge, no design problems/deficiencies exist with the window coverings.

4. Effective Remaining Life

The window coverings date from construction of the addition in 2001, and given their current condition, can likely be expected to perform over the next 15 years.

5. Major Repairs/Recommendations

Pending assessment and verification, window coverings will likely require replacement at the end of their effective service life. This work is projected for the 16th year, at an estimated cost of $2,500.

1.3.6 Fitments (Fixed Furnishings, Millwork and Manufactured Specialties)

The fitments present throughout include:

- Vanities - plastic laminate, located in the 1st floor washrooms.
- Kitchen cabinets - plastic laminate, located in the 2nd floor kitchenettes (cabinets and top).

1. Condition

The fitments are considered to be in fair overall condition, with no obvious signs of damage or deterioration.

2. Recent Repairs/Modifications

To our knowledge, no recent repairs/modifications have been carried out on the fitments.

3. Design Problems/Deficiencies

To our knowledge, no design problems/deficiencies exist with the fitments.

4. Effective Remaining Life

The fitments date from construction of the addition in 2001, and given their current condition, can likely be expected to perform indefinitely.

5. Major Repairs/Recommendations

Other than normal maintenance (i.e. regular monitoring and minor repairs), no repair/replacement are anticipated for the fitments.

1.3.7 Interior Stairs

There is a single interior stairs employed in the office portion of this facility which provides access/egress: metal with concrete filled treads and landings, metal handrail with vinyl cap, ground floor (level 1) to 2nd floor (level 2), exits to exterior at grade through the main entrance lobby.

In addition to the above, there is a metal stairs located in the storage garage portion of the building, providing access to a mezzanine area.

1. Condition

The interior stairs are considered to be in good overall condition, with no obvious signs of damage or deterioration.

2. Recent Repairs/Modifications

To our knowledge, no recent repairs/modifications have been carried out on the interior stairs.

3. Design Problems/Deficiencies

Various issues with respect to accessibility and general design of the stair/stairwell have been identified (see ‘1.5 Accessibility’ and ‘1.7 Code Compliance’ below).

4. Effective Remaining Life

The interior stairs date from construction of the addition in 2001, and given their current condition, can likely be expected to perform indefinitely.

5. Major Repairs/Recommendations

Other than normal maintenance (i.e. regular monitoring and minor repairs), no repairs/replacements are anticipated for the interior stairs.

1.4 Heritage

As the “Custodial Department” for this facility, EC is responsible for arranging a review and preparation of a “Heritage Character Statement” by the Federal Heritage Building Review Office (FHBRO) through Canadian Heritage, to identify any elements which may have heritage value, and thereafter be responsible for submitting concept proposals and detailed design proposals for and interventions (defined as alteration, demolition or disposal) to FHBRO for review and comment.

- This facility has not yet been reviewed by the Federal Heritage Building Review Board (FHBRO) through Canadian Heritage.
- Given the age of the original portion of the building (21 years), and as the maximum age for review is 40 years, a request for review should be put through no later than 2028.

1.5 Accessibility

While various projects have been carried out to address barrier-free design throughout this facility, it is not fully compliant with current accessibility standards. As a Crown facility, accessibility requirements are dictated by the Treasury Boards ‘Accessibility Standard for Real Property’ (effective Nov. 01, 2006) and its designated technical standard (CAN/CSA-B651 Accessible Design For The Built Environment).

- A recently completed Accessibility Audit (see 'Appendix E - Accessibility Audit') outlines details, including identified deficiencies with entrances, stairs, washrooms, tactile signage and 'public' areas when assessed against both the 1995 and 2004 editions of CAN/CSA-B651.

1.6 Environmental

Given its age, it is considered unlikely that any of the equipment and/or building materials used would contain any hazardous substances (e.g. lead, asbestos, etc.).

1.7 Code Compliance

Compliance issues identified throughout the facility are described within the report under their applicable components.
- It is recommended that these items be addressed on an urgent basis.
- Due to the extensive nature of correcting some of the identified items, is further recommended that HRSDC Labour Programme, Fire Protection Engineering, be consulted to determine what interim measures, if any, can be employed to ensure that occupant health and safety is not compromised.

In addition, several compliance issues with respect to the 'general design' of the facility have been identified, as follows:
- NBC 3.4.4.2.(2)(f) and 3.4.6.12. - Exit lobby doors and stair door wedged open
- NBC 3.4.6.15 - Hardware on the 1st floor north exterior door (required 2nd exit) cannot be opened with a single releasing operation - lockset and auxiliary deadbolt.

It is recommended that an allowance be made for the commission of a fire protection study that will define the major occupancy and classification of the facility, identify individual occupancy types at locations throughout, and identify the locations and ratings of required fire separations. In addition, this study should evaluate existing fire separations, egress conditions, and fire protection systems against those required (gap analysis), and provide recommendations for corrective actions (including associated costs and priorities). This study should be completed in the 1st year, at an estimated cost of $6,500.

PART 2 - VERTICAL TRANSPORTATION

Not applicable to this facility.

PART 3 - MECHANICAL

3.1 Primary Services

3.1.1 Heating

There are two rooftop units (heat pumps) serving this building. The units are dual mode heating and cooling. The heating section is electrical. There is one dedicated unit per floor.

1. Condition

The existing equipment and associated components from the original construction are considered to be in poor to fair condition, based on their age and operating environment.

Unless otherwise noted, the existing heating equipment and associated components are considered to be adequate for the facility, based on the existing occupancy.

2. Recent Repairs/Modifications

Not applicable.

3. Design Problems/Deficiencies

To our knowledge, no design problems/deficiencies exist with the current heating system. However, the building has no perimeter radiation, and portable electric heaters were observed in some office areas.

4. Effective Remaining Life

The present units are considered close to the end of their useful life.

5. Major Repairs/Recommendations

See section 3.2.3.

3.1.2 Cooling

The cooling sections of the rooftop units are providing the necessary cooling for this space. The systems are using HCFC-22 (R-22) refrigerant and are considered to be under 5.4 tons cooling capacity each. There is one dedicated unit per floor.

1. Condition

See heating section

2. Recent Repairs/Modifications

Not applicable.

3. Design Problems/Deficiencies

To our knowledge, no design problems/deficiencies exist with the cooling systems.

4. Effective Remaining Life

See heating section.

5. Major Repairs/Recommendations

See heating section

3.2 Secondary Services - Heating/Cooling

3.2.1 Hydronic Heating System

No hydronic heating systems are installed in this facility.

3.2.2 Supplemental Heating Units

No supplemental heating units are installed in this facility. When reconsidering the full occupancy of the building, the necessity of installation of perimeter heating and design should be assessed. Heating may be hydronic or electric. This is assessment is recommended to be taken in second year, at an estimated cost of $20,000.

3.2.3 Primary Air Supply

The two rooftop units are ducted overhead supplying the air distribution to the offices on the interior core. Exhaust fans are connected to the washrooms.

No humidification system was identified in this space.

1. Condition

The existing units are from the original construction of the facility and are considered to be replaced in the near future.

2. Recent Repairs/Modifications

Other than normal maintenance, to our knowledge, no other repair/modification works have been conducted on main ventilation system

3. Design Problems/Deficiencies

There is no control over the inside humidity levels.
The system should be reconsidered for balancing when rooftop units will be changed

4. Effective Remaining Life

The system should be reconsidered for balancing when rooftop units will be changed

5. Major Repairs/Recommendations

Installation of two wall-mounted humidifiers (one per floor) is recommended when the building is being considered for full occupancy.

This work will be executed at the moment of major retrofit and coordinated with the replacement of rooftop units. It estimated to be executed in year 2, at an estimated cost of $15,000.

3.2.4 Supplemental Air Conditioning

No supplemental A/C units are installed in the this facility. The future rooftop units should provide enough cooling for the office space.

3.3 Control System

Local thermostats are providing control of heating and cooling levels in this space.

1. Condition

The existing thermostats are wall mounted with mercury contacts.

2. Recent Repairs/Modifications

To our knowledge, no recent repairs have been conducted on the existing control system.

3. Design Problems/Deficiencies

Based on the original intent and design criteria, no deficiencies were noted or reported.

4. Effective Remaining Life

The existing thermostats may perform for the next 10 years. However, an upgrade to digital thermostats is recommended and applicable when rooftops are replaced.

5. Major Repairs/Recommendations

Other than normal maintenance, no major repairs/replacements are anticipated for the control system.

3.4 Storm Sewer System

The building and grounds storm sewer system are from the original construction of the building and are discharged into the Hamilton Harbour.

Roof drains for the building are connected to the building storm sewage system. This piping system is anticipated to be from the original construction of the building.

Visual inspection of the system was limited to that in exposed areas in and around the building. It is assumed that limited PVC piping was used in the construction of the storm drainage system during renovations and client fit-up.

1. Condition

The piping appears to be in good condition, with no indication of leaks or deterioration. It is anticipated that the existing will be in operation for the following 20 years, with no unexpected failures, if proper maintenance practices and procedures are followed.

2. Recent Repairs/Modifications

None noted.

3. Design Problems/Deficiencies

To our knowledge, no design problems/deficiencies exist with the system.

4. Effective Remaining Life

It is anticipated that the storm sewer system will remain in operation for the following 20 years, based on the normal anticipated effective life of approximately 50 years.

5. Major Repairs/Recommendations

Other than normal maintenance, no major repairs/replacements are anticipated for the storm sewer system.

3.5 Sanitary Sewer System

The drainage from all the washrooms, lunchrooms, mechanical rooms, janitor's closets, and emergency showers is connected to the WTC building sanitary sewage piping system. All piping available for inspection were noted as being metallic.

Visual inspection of the system was limited to that in exposed areas in and around the building. It is assumed that limited PVC piping was used in the construction of the storm drainage system during renovations and client fit-up.

1. Condition

All piping available for visual inspection was noted as being metallic. It is assumed that no PVC piping was used in the construction of the sanitary drainage system.

The piping appears to be in good condition, with no indication of leaks or deterioration.

2. Recent Repairs/Modifications

To our knowledge, no recent repairs/modifications have been conducted on the sanitary drainage system.

3. Design Problems/Deficiencies

To our knowledge, no design problems/deficiencies exist with the system.

4. Effective Remaining Life

It is anticipated that the existing will be in operation to serve it's intended purpose for the following 20 years, if proper maintenance practices and procedures are applied.

5. Major Repairs/Recommendations

Other than normal maintenance, no major repairs are anticipated over the remaining life of the system.

3.6 Domestic Hot Water System

There is a small capacity electric hot water heater located at the floor level in the exterior electrical room.

1. Condition

The hot water piping is considered to be in good to fair condition, with no problems reported.

2. Recent Repairs/Modifications

None identified.

3. Design Problems/Deficiencies

To our knowledge, no design problems/deficiencies associate with the capacity of domestic hot water system. However, the installation of individual small electric hot water heaters, one per floor is recommended. The actual location of the hot water tank near an electric transformer is questionable.

4. Effective Remaining Life

Based on present day industry standards, the existing hot water tank has a useful economic life of maximum of 20 years. It is anticipated that the existing unit will serve for the next 5 years.

5. Major Repairs/Recommendations

The installation of two individual small electric hot water heaters, one per floor is recommended to serve the washrooms and lunch areas. This work is recommended to be executed in the first year, at an estimated cost of $7,000.

3.7 Plumbing System

City water is provided to Annex building from WTC building.

1. Condition

The building plumbing system is considered to be in fair to good condition. The existing fixtures are from the original construction, with minor exceptions, and operating as intended. Water for the facility is purchased from the municipality. it is assumed that the supply quality meets the applicable guidelines.

2. Recent Repairs/Modifications

To our knowledge, no recent repairs or modifications have been conducted on the building plumbing system.

3. Design Problems/Deficiencies

To our knowledge, there are no design problems/deficiencies associated with the plumbing system.

4. Effective Remaining Life

Based on present day industry standards, the existing plumbing fixtures have a useful economic life of 25 - 30 years, based on AHRAE guidelines. It is recommended that consideration for replacement of the units be given with the next major renovation of the building in the next 5 years.

5. Major Repairs/Recommendations

Washroom upgrades will have to be considered when deciding to increase the occupancy for this Annex. The upgrade of the washrooms should be evaluated (designed) in the first year, at an estimated amount of $7,000.

3.8 Fire Protection System/Life Safety Systems

3.8.1 Water Supply, Standpipes, Fire Hoses

No supplemental stand pipes or fire hoses are installed in the this facility.

3.8.2 Sprinkler System

No sprinkler system is installed in this facility.

3.8.3 Portable Fire Extinguishers

The building has portable stand alone fire extinguishers installed. The existing portable fire extinguishers are provided according to anticipated hazards, based on the normal occupancy type. No Code violations were noted regarding the installation of the fire fighting system in this facility.

3.9 Ozone Depleting Substances Management (ODS)

The halocarbon inventory see Appendix “C”.

PART 4 - ELECTRICAL

4.1 Electrical Power

The main electrical power for this facility is fed underground from the WTC Building and provided by four 120/208 volt panelboards, 2 located in the first floor office main corridor, 1 in the second floor office main corridor, and 1 located in the shop area by the garage door.

General lighting, office and equipment loads are fed via these panels. A 600 volt splitter is also present which feeds some mechanical and equipment load.

1. Condition

Based on a cursory inspection of the electrical equipment, no major deficiencies were found; the system does not reveal any violation of the present requirements of the electrical safety code.

2. Recent Repairs/Modifications

At the time of site visit, it appeared that there were no recent repairs or modifications to the main distribution equipment for this building.

3. Design Problems/Deficiencies

There were no design problems or deficiencies with the electrical installation within this building.

4. Effective Remaining Life

The building distribution equipment is of the original construction and is in fair condition, therefore, with regular maintenance and minor repairs, the existing equipment should operate as intended for the next 15 - 20 years. Evaluation for replacement should be considered at that time.

5. Major Repairs/Recommendations

“Fed from” information on labels and single line diagrams was not available in the facility; it is recommended that a copy of the proposed new single lines be posted by the garage door area electrical service when completed. It is also recommended that the current electrical equipment receive labels which clearly dictate “fed from” info. Estimated cost for this would be approximately $500.

It was noted that all distribution panels and lighting/receptacle panelboards located in common areas have been left unlocked. This allows for unauthorized personnel to have access to breakers, which poses a safety concern for both the non-qualified individual and/or equipment being fed from the devices contained within. It is recommended that all appropriate keys be obtained and locks be maintained on these units at all times.

General cleaning of all interior, exterior and ventilation surfaces for all panels, transformers and distribution equipment was severely lacking and should be made one of the top priorities for the next maintenance shutdown. Exterior surface cleaning can be completed throughout the year and should be considered, as debris and dust is one of the major contributing factors to premature equipment failure. Cleaning of electrical equipment should only be completed by qualified electrical personnel.

4.2 Emergency Power

This facility does not have a source of emergency power.

4.3 Exterior Lighting

Exterior lighting is provided from wall mounted high intensity discharge fixtures operating at 120 volts and they are controlled by local photocells.

1. Condition

All of the exterior lighting would appear to be in fair working condition. It was noted that the lenses were quite dirty and require cleaning, as this will greatly diminish the lighting output of the current fixtures.

2. Recent Repairs/Modifications

At the time of site visit, there appeared to have been no recent major repairs or modifications to the exterior lighting system within the last two years.

3. *Design Problems/Deficiencies*

At the time of site visit, there appeared to be no deficiencies or design problems with the exterior lighting system. A lighting survey and measurement project is required to determine actual lighting levels.

4. Effective Remaining Life

The exterior lighting system should continue to perform satisfactorily, with minor repairs, for another 6 - 10 years.

5. Major Repairs/Recommendations

General exterior lamp and ballast replacement is required and periodic lens cleaning on a cyclical basis is required to ensure maximum light output. In the next 6 - 10 years, it is recommended that a project to replace the current units with new LED technology be investigated. These new units will be virtually maintenance free for several years beyond regular lamp and ballast replacements and will provide the utmost in energy efficiency. It is recommended that an exterior lighting survey be completed to ensure that a minimum of 10 lux average lighting level is present around the facility walkways, entrances and parking areas, as stipulated by the Canada Labour Code - Schedule II & III requirements. Caution should be exercised to ensure proper lighting and positioning be applied in areas where security cameras are operating. Additional fixtures and costing would be pending survey results. The estimated cost for the survey would be approximately $500.

4.4 Interior Lighting

Interior lighting is provided by varying types of fluorescent fixtures containing T8 lamps and electronic ballasts. Office and corridor areas are generally 1’ x 4’, recessed 2-lamp fixtures and/or 2’ x 4’, recessed 2-lamp fixtures. The garage area fixtures are 2-lamp, 8’ fixtures containing high output T12 lamps and ballasts.

Average levels of illumination were taken in several areas and results are as follows:

Location	*Actual*	*Required*
General office	300 to 500 lux	500 lux
Stairwells	110 lux	100 lux
Garage Area	250 to 300 lux	300 lux
Corridors	80 to 150 lux	100 lux
Washrooms	150 to 200 lux	200 lux

1. Condition

The general condition of the interior lighting can be considered to be fair.

2. Recent Repairs/Modifications

At the time of site visit, it appeared that there were no recent repairs or modifications to the interior lighting within the last two years.

3. Design Problems/Deficiencies

There are no deficiencies or design problems with the interior lighting system at this time.

4. Effective Remaining Life

The interior lighting system should continue to perform satisfactorily, with minor repairs, over the next 25 years.

5. Major Repairs/Recommendations

There are no major repairs anticipated to the interior lighting system, other than the replacement of lamps and ballasts as they burn out. The current interior lighting appears to meet the current needs of the facility. It is recommended to further conserve energy by exploring new lighting technologies as they arise (e.g. - LED type).

4.5 Emergency Lighting

Emergency lighting is provided by basic battery pack, 2-lamp units and remote heads. One unit was noted in the garage mezzanine staircase area and one unit with two remote head was noted in the general office and stairwell area.

1. Condition

The general condition of the emergency lighting can be considered to be good. Emergency lighting is not required by the NBC 2005 for a facility of this type.

2. Recent Repairs/Modifications

At the time of site visit, it appeared that there were no recent repairs or modifications to the emergency lighting within the last two years.

3. Design Problems/Deficiencies

There are no deficiencies or design problems with the emergency lighting system at this time.

4. Effective Remaining Life

Battery operated emergency lighting units have a limited life span of 5 to 10 years. It is not known when the current units were installed; however, minimal lamp and battery replacement and testing of these units is required as per the life safety portion of this report.

5. Major Repairs/Recommendations

There are no major repairs anticipated to the emergency lighting system, other than the replacement of lamps and batteries as they burn out.

4.6 Exit Lighting

Exit lighting is minimal in the ANNEX building. Signs were located at garage man door area, corridors and stairwell areas within the office and appeared to clearly indicate emergency exit routes. Exit lighting is not required in a facility of this type; however, where a voluntary installation exists, it must conform to all applicable codes, acts and regulations.

1. Condition

The existing lights comply with the current building code, NBC/OBC 2005 as to their size and locations within the Annex Building.

2. Recent Repairs/Modifications

There have been no major recent repairs or modifications to the exit light system within the last two years. Exit lighting is repaired as required.

3. Design Problems/Deficiencies

No design problems or deficiencies were noted with the exit signs at this time.

4. Effective Remaining Life

The current exit light system should continue to perform, with minor repairs, over the next 5 to 10 years. Replacement as per recommendations in the executive summary should be considered.

5. Major Repairs/Recommendations

Refer also to NWRI Building, Electrical Preamble - Section C for details and costing.

4.7 Fire Alarm System

This facility does not contain a main fire alarm system panel; however, smoke detectors, pull stations and voice communication devices were noted installed throughout the premises. It is assumed that these devices are a zone from the fire alarm system located within the WTC building system.

1. Condition

Based on a cursory inspection, the system appears to meet with the NBC, Part 2. The fire alarm system was in good condition at the time of site visit.

2. Recent Repairs/Modifications

It appears that no recent repairs or modifications have taken place with the fire alarm devices within the last 2 years.

3. Design Problems/Deficiencies

No design problems nor deficiencies were noted at this time.

4. Effective Remaining Life

The theoretical anticipated life expectancy for fire alarm systems are typically 17 - 20 years. Replacement of the devices in this building would be required when replacements and upgrades are completed within the WTC building. It is anticipated that the fire alarm devices installed at this facility will not require major replacement for at least another 15 years.

5. Major Repairs/Recommendations

No recommendations at this time. Refer to the Life Safety portion of this report for required testing and maintenance requirements of this system.

4.8 Security System

The security system for the Annex Building is made up of door contacts, card access control and CCTV cameras connected to the Main Building. The security system is integral to the security systems installed throughout the entire property. For details, see the report for the Main Building.

4.9 Telephone & Communications System

Telephone and communications services enter the facility undergound at the garage door electrical service area and terminate into a multi-line BIX board type configuration. Cables are installed free air from this location to a small LAN cabinet located in an office on the second floor. Cables are also run free air through plenum areas from the BIX board and LAN closet area to end user locations.

1. Condition

The telephone & communications system was found to be in good working condition and appeared to satisfy the needs of current technologies utilized.

2. Recent Repairs/Modifications

At the time of site visit, it appeared that no major recent repairs or modifications have been made to the telephone/communications systems other than normal operational repairs and/or relocations to suit fitups.

3. Design Problems/Deficiencies

No major design problems or deficiencies were noted at the time of site visit.

4. Effective Remaining Life

Telephone and communications equipment is constantly upgraded, repaired and replaced as needed to suit current technology needs. Typical systems of this type would be expected to last 25 years. It appears that the current systems are of newer technology.

5. Major Repairs/Recommendations

As the majority of telephone/communications systems are tenant owned, the upgrade, replacement and repair will be the responsibility of the tenants and typically are not funded as a base building system.

PART 5 - PROPERTY/SITE

For a detailed assessment of site elements, refer to separate report prepared for the 'NWRI Building'.

PART 6 - BUILDING AND OCCUPANT FIRE SAFETY

For a detailed assessment of legislated inspection and testing, refer to separate report prepared for the 'NWRI Building'.

SUMMARY OF RECOMMENDED EXPENDITURES
Annex Building
ARCHITECTURAL SYSTEMS

Report Section No.	Systems Description	Description of Work	Priority of Work	Project Priority System	Type of Expendi-tures	Short Term Expenditures Year 1	2	3	4	5	Long Term Expenditures Years 6 - 10	11 - 15	16 - 20	21- 25
1.2.2	Exterior Walls	Preventative actions	Opt.	C3	R		$7,500							
1.2.3	Roofing	Roofing Study	Opt.	X2	R	$2,500								
1.2.3	Roofing	Replace roofings	Cyl.	B2	R						$32,500	$67,000		
1.2.5	Windows, Sloped Glazing & Skylights	Replace window sealants	Cyl.	C2	R						$6,000			
1.3.1	Flooring	Replacement of resilient flooring (partial)	Cyl.	C2/D2	R							$5,500		
1.3.1	Flooring	Replacement of carpet flooring (partial)	Cyl.	C2/D2	R						$44,500			$44,500
1.3.2	Interior Partitions	Repaint/replace wall coverings (partial- in conjunction with flooring wo	Cyl.	D2	R						$7,000	$3,500		$7,000
1.3.5	Window Coverings	Replace window coverings	Cyl.	C2/D2	R								$2,500	
1.4	Heritage	Arrange for FHBRO review	Man.	A	-							no cost - housekeeping		
1.7	Code Compliance	Fire Separation Study	Man.	A	-	$1,500								
					Period Totals	$4,000	$7,500	$0	$0	$0	$90,000	$76,000	$2,500	$51,500
									Total Short Term Expenditures	$11,500			**Total Long Term Expenditures**	$220,000

SUMMARY OF RECOMMENDED EXPENDITURES
Annex Building
MECHANICAL SYSTEMS

Report Section No.	Systems Description	Description of Work	Priority of Work	Project Priority System	Type of Expendi-tures	Short Term Expenditures					Long Term Expenditures			
						Year					Years			
						1	2	3	4	5	6 - 10	11 - 15	16 - 20	21- 25
3.1.1	Heating System	Rooftop units replacement	Opt.	C3	R		$40,000							
3.2.2	Suplemental Heating Units	Assessment/design for perimeter heating	Opt.	C3	R		$20,000							
3.2.3	Primary Air Supply	Installation of humidifiers	Man.	B3	R		$15,000							
3.6	Domestic Hot Water System	Installation of domestic hot water heaters	Opt.	C2	C	$7,000								
3.7	Plumbing System	Washroom upgrade evaluation/design	Opt.	C3	R	$7,000								
					Period Totals	$14,000	$75,000	$0	$0	$0	$0	$0	$0	$0
								Total Short Term Expenditures		$89,000	**Total Long Term Expenditures**			$0

All estimated costs are in year 2009 dollars.

Environment Canada
Canada Centre for Inland Waters
Burlington, ON

SUMMARY OF RECOMMENDED EXPENDITURES
Annex Building
ELECTRICAL SYSTEMS

Report Section No.	Systems Description	Description of Work	Priority of Work	Project Priority System	Type of Expendi- tures	Short Term Expenditures					Long Term Expenditures			
						Year					Years			
						1	2	3	4	5	6 - 10	11 - 15	16 - 20	21- 25
4.1	Electrical Power	Single Line diagram and labels recommended as per report.	Man.	C1	C	$500								
4.2	Emergency Power	Not applicable.												
4.3	Exterior Lighting	Exterior lighting survey as per report recommendations.	Opt.	C1	R		$500							
4.4	Interior Lighting	No recommended expenditures at this time.												
4.5	Emergency Lighting	See executive summary section D costing.												
4.6	Exit Lighting	See executive summary section C costing.												
4.7	Fire Alarm System	No recommended expenditures at this time.												
4.8	Security System	Costing included in main building report.												
4.9	Telephone & Communications System	Costing included in main building report.												
					Period Totals	$500	$500	$0	$0	$0	$0	$0	$0	$0
									Total Short Term Expenditures	$1,000			**Total Long Term Expenditures**	$0

All estimated costs are in year 2009 dollars.
PWGSC - RPB - PTP - Maintenance Management Service

APPENDIX A1

PHOTOGRAPHS - NWRI BUILDING

AR-001 – Administration & Laboratory (A&L) structure north and east elevations.

AR-002 – Warehouse structure north and east elevations.

AR-003 – Warehouse and Administration & Laboratory (A&L) structures west and north elevations.

AR-004 – Administration & Laboratory (A&L) structure upper south and west elevations.

AR-005 – Boiler Plant west and north elevations.

AR-006 – Boiler Plant south and west elevations.

AR-007 – Hydraulics Lab part south elevation (west end).

AR-008 – Hydraulics Lab offices south and west elevations.

AR-009 – Overview of facility east/south elevations – view looking north from Hamilton side of canal.

AR-010 – Hydraulics Lab east and part south elevation (east end).

AR-011 – Hydraulics Lab north and east elevations.

AR-012 – Exposed rebar/deteriorating concrete at foundation, and undersized sealant backer rods falling out from behind wall panel.

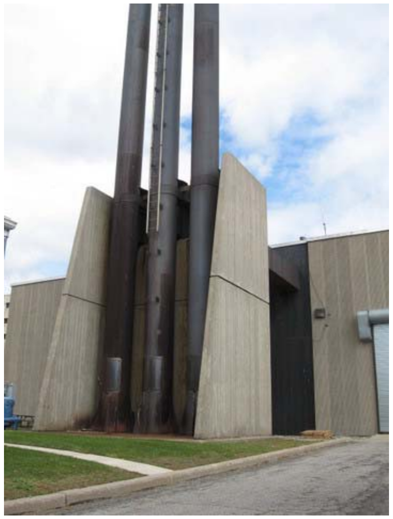
AR-013 – Exposed rebar with deteriorated concrete at foundation.

AR-014 – Exposed and deteriorating foundation insulation at Warehouse north elevation.

AR-015 – Exposed foundation insulation at A&L stairwell foundation.

AR-016 – Unexplained void in foundation at Hydraulics lab north elevation.


AR-017 – Cracks in concrete floor slab.


AR-018 – Concrete chimney support structure and rusting metal chimneys/breechings at Boiler Plant west elevation.


AR-019 – Underside of rusting metal breechings at Boiler Plant.


AR-020 – Old Guardhouse north and east elevations.


AR-021 – Tunnel access hatch cover with deteriorating paint finish.

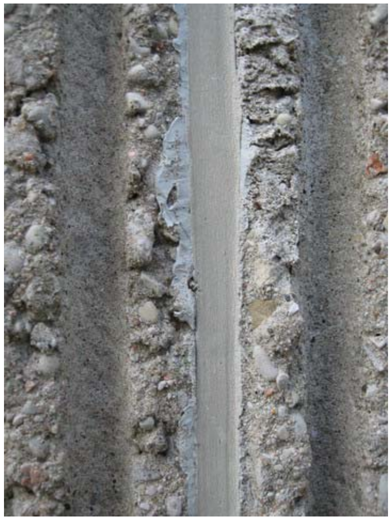

AR-022 – Water staining and efflorescence along ceiling crack in tunnel.


AR-023 – Previous crack repair (poorly executed) in tunnel wall.


AR-024 – Water staining from ongoing seepage at tunnel wall/floor.

AR-025 – Cement plaster soffit with localized crack.

AR-026 – Concrete exterior wall with cementitious coating at A&L exit stairwell (SE).



AR-027 – Sealants at concrete sandwich panel joints – old sealant visible.

AR-028 – Unsealed opening through concrete sandwich panel.

AR-029 – Undersized sealant backer rods falling out of concrete sandwich panel joints.

AR-030 – Stained/discoloured surfaces of concrete panels at Hydraulics lab offices.

AR-031 – Deteriorated paint finish and rusting metal surfaces at louvre.

AR-032 – Deteriorated paint finish and rusting metal surfaces at Boiler Plant wall metal panel.


AR-033 – Rusting at exposed rebar and general surface staining/ Discolouring of concrete panels at Hydraulics Lab offices.

AR-034 – Cracks in cementitious coating on exposed column at A&L east elevation.


AR-035 – Cracks in cementitious coating on exposed column at R&D west elevation.


AR-036 – Debonding sealant at concrete panel.

AR-037 – Deteriorated paint finish and rusting metal surfaces at Overhead door canopy siding/soffit.

AR-038 – Deteriorated paint finish and damaged components at overhead door canopy siding/soffit.

AR-039 – Water and rusting metal structure from active leak in Boiler Plant north wall (upper level).

AR-040 – Deteriorated paint finish and rusting metal surfaces at A&L Mechanical penthouse west elevation metal panel wall.

AR-041 – Deteriorated paint finish and rusting metal surfaces at A&L mechanical penthouse east elevation metal panel wall.


AR-042 – Unsealed openings in R&D mechanical penthouse metal panel wall.


AR-043 – Unsealed penetration in R&D mechanical penthouse metal panel wall.


AR-044 – Moisture damaged interior finish at A&L 3rd floor east wall.

AR-045 – Open joints at window glazing/framing at Hydraulics Lab office.

AR-046 – Deteriorated window sealants, both at frame and glazing.

AR-047 – Open joints, deteriorated sealants and deteriorated paint finish at window framing.

AR-048 – Open joints and deteriorated sealants at window framing.

AR-049 – Part of windows interior glazing gasket fallen from place.

AR-050 – Deteriorated paint finish and rusting metal surfaces at door/overhead door framing.

AR-051 – Deteriorated paint finish and rusting metal surfaces at overhead door panels.

AR-052 – Deteriorating concrete door sill at Boiler Plant (Door 15).

AR-053 – Deteriorating concrete door sill at Boiler Plant (Door 17).

AR-054 – Deteriorating concrete door sill at Warehouse (Door 30).

AR-055 – Deteriorated paint finish and rusting metal surfaces at door lintel.

AR-056 – Deteriorated sealant, deteriorated paint finish and rusting metal surfaces at door frame.


AR-057 – Deteriorated SBS roofing membrane at old guardhouse roof.


AR-058 – Standing water throughout old guardhouse roof.


AR-059 – Tenting membrane and displaced ballast at EPDM membrane roofing.


AR-060 – Debris accumulation at EPDM membrane roofing.

AR-061 – Loose/displaced metal flashing at SBS membrane roofing.

AR-062 – Debris and sediment from standing water accumulation at SBS membrane roofing.


AR-063 – Darker stained locations indicate locations of standing water throughout roof areas.

AR-064 – Cracking of membrane and loss of granular material at SBS membrane roof flashing.

AR-065 – Recently repaired/patched area at SBS membrane roofing.

AR-066 – Severe loss of granular material at SBS membrane roofing at roof access point.

AR-067 – Blister in SBS membrane roofing.

AR-068 – Deteriorated paint finish and rusting metal surfaces at rooftop guard.

AR-069 – Debris accumulation at SBS membrane roofing.

AR-070 – SBS membrane roofing pulled out from behind termination bar at penthouse flashing.

AR-071 – Deteriorated paint finish, rusting metal surfaces and deteriorating wood at rooftop guards and walkway.

AR-072 – Proximity of vegetation to building face inhibits access for inspection and maintenance.

AR-073 – Proximity of vegetation to building face restricts air flow and holds moisture in building envelope.

AR-074 – Proximity of vegetation to building face invites foundation damage from roots.

AR-075 – Rusting metal components and stained surfaces at exterior bench.

AR-076 – Deteriorating wood components at exterior bench.

AR-077 – Settled/sunken unit pavers at Mall north entrance creating tripping hazard.

AR-078 – Key building access point at Mall north entrance restricted by bicycle storage.

AR-079 – Deteriorated paint finish, rusting metal and stained surfaces from Guards and exposed rebar at R&D west-centre entrance stair.

AR-080 – Overview of R&D west-centre entrance stair.

AR-081 – Deteriorated paint finish and rusting metal surfaces at wharfside guards.

AR-082 – Cracking/alligatoring of asphalt pavement at driveway.

AR-083 – Cracking/alligatoring of asphalt pavement at driveway and throughout parking area.

AR-084 – Cracking/alligatoring of 'residential grade' asphalt pavement throughout driveway.

AR-085 – Deteriorated asphalt paving at wharfside outdoor storage/work area.

AR-086 – Cracked/broken concrete at walkway through parking area.

AR-087 – Cracked/broken concrete at walkway curb ramp.

AR-088 – Exit stair (WS) exterior door (Door 44) leading on to uneven surface.

AR-089 – Plywood surfacing used at exit stair (WN) exterior door (Door 45) to compensate for uneven surface.

AR-090 – Mismatched vinyl tile used in localized area replacement.

AR-091 – Close-up of vinyl tile used in localized area replacement shows 3 distinct tile colour/patterns used.

AR-092 – Vinyl tile flooring standing-up poorly at this particular lab – surfaces badly stained and degraded.


AR-093 – Newer vinyl tile not holding-up as well as older tile.


AR-094 – Vinyl tile breaking at building control joint.


AR-095 – Vinyl tile flooring heavily worn in heavy traffic area adjacent to freight elevator.

AR-096 – Vinyl sheet flooring standing-up poorly at this particular lab – surfaces badly stained and degraded.

AR-097 – Epoxy flooring standing-up poorly at this particular lab – localized deterioration.

AR-098 – Mismatched ceramic floor tile at localized area replacement in washroom.

AR-099 – Wrinkling throughout carpet in individual office area.

AR-100 – Minor damage to carpet in individual office area will require area patch or full replacement.

AR-101 – Deteriorated paint finish at janitor room floor.

AR-102 – Missing vinyl base – localized throughout.

AR-103 – Acoustic ceiling tile with surface damage – cause unknown.

AR-104 – Acoustic ceiling tile with water stain – cause unknown.

AR-105 – Several acoustic ceiling tile with water stain – cause(s) unknown.

AR-106 – Coffered ceiling in cafeteria (same as library and conference rooms).

AR-107 – Coffered ceiling in conference room – components no longer commercially available.

AR-108 – Conference room ceiling with part of original coffered type replaced with conventional flat type.


AR-109 – Damaged plastic laminate door finish.


AR-110 – Dirty/stained plastic laminate door finish at bottom of lab door.


AR-111 – Deteriorated paint finish at metal door in high-traffic location.


AR-112 – Original wood cabinetry in lab.

AR-113 – Deteriorated paint finish and rusting metal at Boiler Plant stair.

AR-114 – Mall open circulation stair guards with unprotected openings and handrails without extensions and returns.

AR-115 – Guards with unprotected openings at Mall 2nd floor.

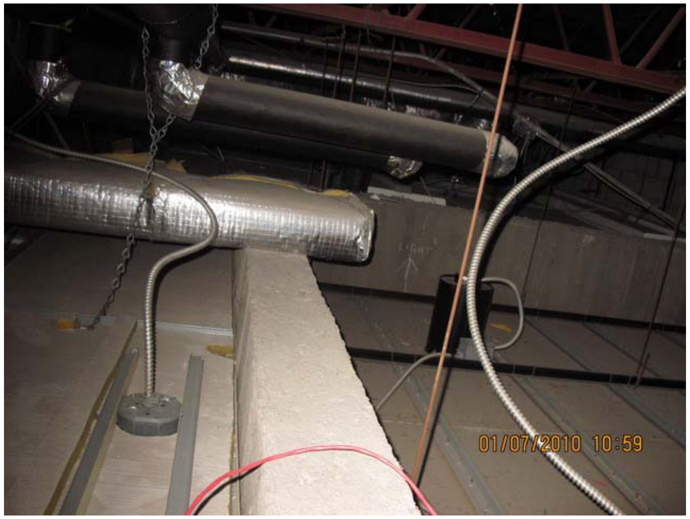
AR-116 – Exit stair handrails without extensions and returns.

AR-117 – Exit stair guards with unprotected openings and handrails without extensions and returns.


AR-118 – Unsealed penetration in fire separation between lab and service core.

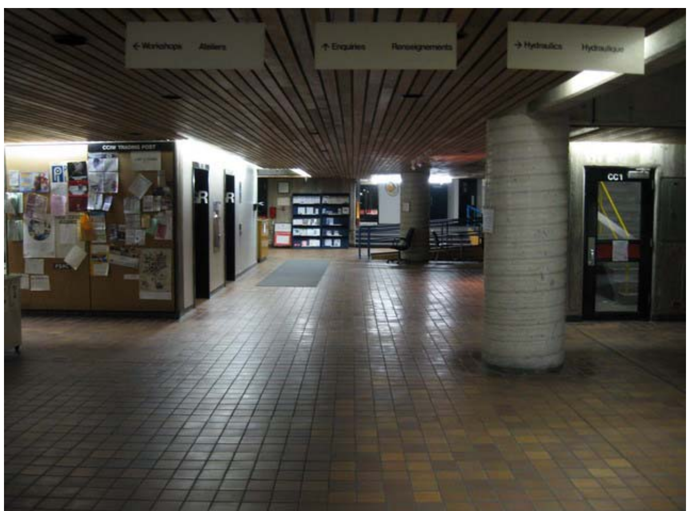

AR-119 – Unprotected openings in fire separation between lab and service core.


AR-120 – Opening in fire separation between corridor and exit stairwell (HE)



AR-121 – Fire separation between corridor and exit stairwell (HE) only extends to above suspended ceiling.

AR-122 – Mall area linking several structures – A&L (left), R&D (right), Hydraulics Lab (ahead) and Warehouse (behind) – with questionable fire separations.



AR-123 – Exit stairwell (CC) at right, leading into 1st floor main entrance/Mall area 'exit lobby' with excessive travel distance to exit door.

AR-124 – Superfluous items stored in exit stair.

AR-125 – Vestibule at exit stair (NW) with clear glazing and no latching hardware.

AR-126 – Glazing at exit stair vestibule may exceed allowable limits.

AR-127 – Electric door strike in fire separation – unconfirmed if operation is 'fail secure' or 'fail safe'.

AR-128 – Equipment stored in service room – aluminum ladder with electrical equipment no less.


ELE-001 – Main transformers and high voltage switchgear.


ELE-002 – Typical main 600 V electrical distribution switchboard.


ELE-003 – Typical main 120/208 V electrical distribution switchboard.


ELE-004 – Typical main 600 V electrical distribution switchboard.

ELE-005 – Main 4160 V switchgear.

ELE-006 – Stored materials around electrical equipment.

ELE-007 – Typical main 120/208 V electrical distribution switchboard.

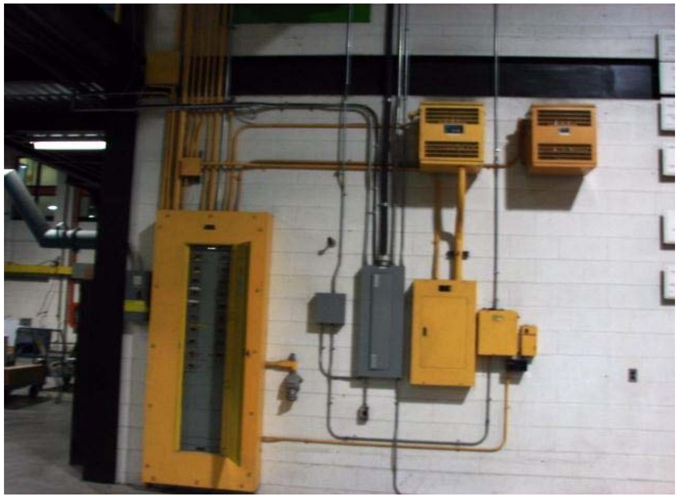
ELE-008 – Typical main 120/208 V electrical distribution switchboard.

ELE-009 – Typical Lab panelboards viewed from service corridor.


ELE-010 – Stored materials around electrical equipment.


ELE-011 – Mechanical area older panelboards.


ELE-012 – Bus duct which feeds all upper floor lab panels.


ELE-013 – Wet Lab panels with no guarding.


ELE-014 – Typical MCC.


ELE-015 – Typical Wharf Kiosk for ship power.


ELE-016 – Wharf Kiosk and WTC supply transformers.


ELE-017 – Stored material around electrical equipment and no guarding.


ELE-018 – Stored material around electrical equipment and no guarding.

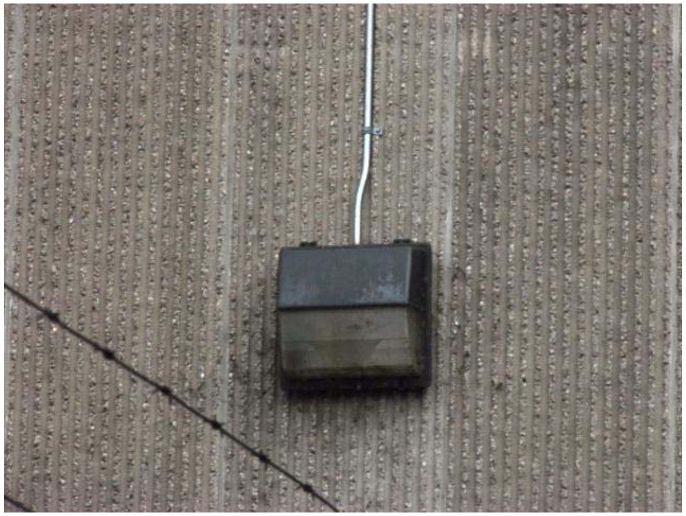

ELE-019 – Cogeneration unit.


ELE-020 – Emergency power Diesel Generator.

ELE-021 – Cogeneration control and transfer switch.

ELE-022 – Cogeneration unit.

ELE-023 – Typical exterior wall pack.



ELE-024 – Typical exterior wall pack.

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ELE-025 – Typical roadway and parking lights.


ELE-026 – Boiler room lighting.


ELE-027 – Main hall lighting (mall area).


ELE-028 – Tunnel lighting.


ELE-029 – Office and Lab Corridor lighting.


ELE-030 – Typical office lighting.

ELE-031 – Third floor mechanical room lighting.


ELE-032 – Typical Wet lab, warehouse and shops lighting.

ELE-033 – Typical emergency battery pack.

ELE-034 – Typical emergency battery pack.

ELE-035 – Exit light sample.

ELE-036 – Exit light sample.

ELE-037 – Exit light sample.

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ELE-038 – Exit light sample.

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ELE-039 – Main fire alarm panel.

ELE-040 – Security Desk fire alarm annunciator.


ELE-041 – Additional fire alarm booster panels.


ELE-042 – Additional fire alarm booster panels.


ELE-043 – Pull station and emergency voice telephone.


ELE-044 – Typical security camera.


ELE-045 – Typical security camera.

ELE-046 – Typical card access control panels.

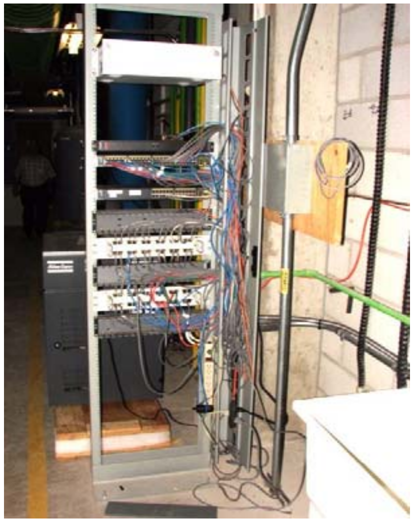
ELE-047 – Typical card access control panels.


ELE-048 – Main telephone equipment.

ELE-049 – Main telephone BIX board.

ELE-050 – Main telephone battery rack.

ELE-051 – Main building computer room servers.



ELE-052 – Typical LAN rack fed from main comp. room in floor areas.

APPENDIX A2

PHOTOGRAPHS - WTC BUILDING


AR-001 – East and south elevations of ‘east-side’ addition.


AR-002 – South elevation of original portion of building.


AR-003 – West elevation.

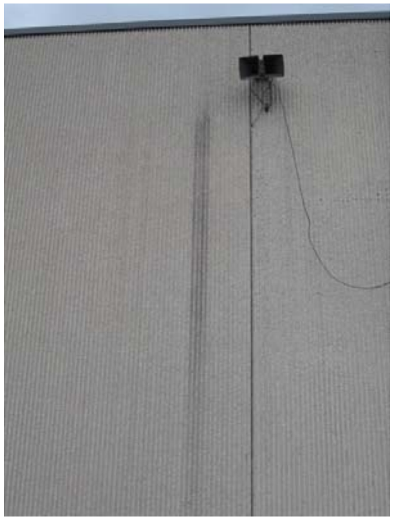

AR-004 – North elevation.

AR-005 – Debonded sealant at precast concrete sandwich panel joints.

AR-006 – Stained wall surfaces below louver without sill.

AR-007 – Moisture leakage through wall.

AR-008 – Unsealed wall penetrations.


AR-009 – Random wall surface staining.


AR-010 – Unsealed wall openings.


AR-011 – Deteriorated paint finish and rusting metal surfaces at exterior door.


AR-012 – Dirty surfaces (webs, debris, etc.) and deteriorated paint finish at underside of canopy.

AR-013 – Rooftop debris and tangled heat trace wire at canopy drain.

AR-014 – Sealed hole with spalling concrete at wall panel.

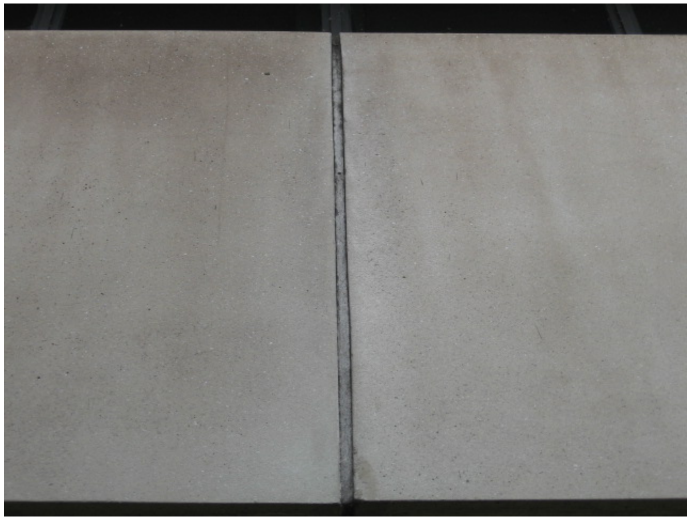
AR-015 – Holes and deteriorated concrete surface at wall panel.

AR-016 – Deteriorated paint finish at metal siding above canopy.

AR-017 – Deteriorated paint finish and damaged soffit at canopy.

AR-018 – Deteriorated paint finish and rusting metal surfaces at exterior overhead door.

AR-019 – Dirty surfaces (nests, webs, debris, etc.) at walls and soffits.



AR-020 – Debonded sealant at precast concrete panel joints.


AR-021 – Missing sealant at precast concrete panel joints.

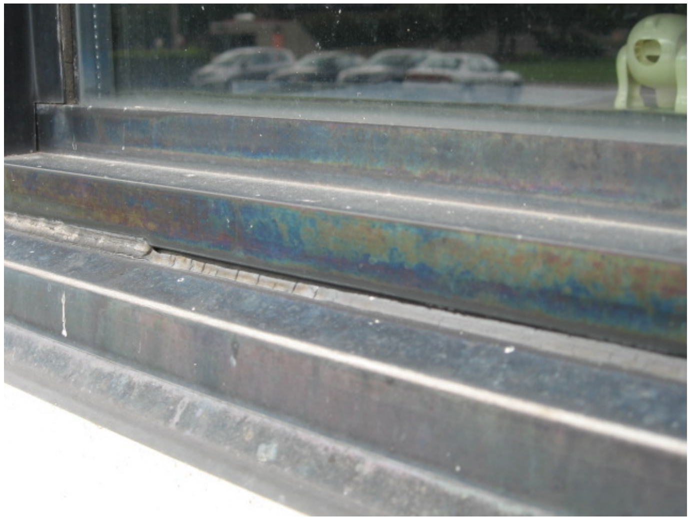

AR-022 – Surface staining at precast concrete panel surfaces.


AR-023 – Defective precast concrete panel at ‘east-end’ addition.


AR-024 – Cracks and discolouration at precast concrete panel.

AR-025 – Efflorescence accumulating around cracks in precast concrete panel.

AR-026 – Deteriorating sealants at ‘east-end’ addition wall panel and window.



AR-027 – Deteriorating sealants at ‘east-end’ addition windows.

AR-028 – Open wall joints at ‘east-end’ addition - now an active wasp nest.


AR-029 – Exposed, shifted and deteriorating foundation insulation.


AR-030 – Deteriorating paint finish and rusting surfaces at mechanical penthouse siding.


AR-031 – Vegetation growth at SBS membrane stack flashing.


AR-032 – PH roof (north side) looking west - rusting metal equipment supports and stained SBS membrane with sediment/debris build-up.


AR-033 – Broken strainer and debris/sediment build-up at stairwell roof.


AR-034 – PH roof (south side) looking east - rusting metal equipment supports and stained SBS membrane.


AR-035 – Old fasteners lying on SBS membrane - a puncture waiting to happen.


AR-036 – Sediment/debris build-up on SBS membrane source from standing water.

AR-037 – Wrinkling/distortion of SBS membrane.

AR-038 – Deteriorating paint finish and rusting metal surfaces at PH roof access ladder.

AR-039 – Staining and sediment build-up indicating standing water areas throughout SBS roof.

AR-040 – Asphalt bleed-through at field area on BUR.


AR-041 – Asphalt bleed-through along/around flashings on BUR.


AR-042 – Deteriorating paint finish and rusting metal surfaces at equipment support frame.


AR-043 – Deteriorated filler in equipment support frame pitch pockets.


AR-044 – Debris around BUR area drains.

AR-045 – Discoloured SBS membrane from standing water - view looking west.

AR-046 – Accumulation of debris in corners of SBS roofing.

AR-047 – Deteriorated filler in abandoned pitch pocket.

AR-048 – If this is your idea of an acceptable roofing detail . . . you may be a redneck.

AR-049 – Ridging throughout SBS membrane at insulation joint locations.

AR-050 – Fracture of SBS membrane.

AR-051 – Asphalt bleed-out at SBS membrane roll edges.

AR-052 – Loss of granular surfacing of SBS membrane roll in field.


AR-053 – Loss of granular surfacing at SBS membrane roll at access door location.


AR-054 – Cracking of SBS membrane surface in field.


AR-055 – Ponding throughout main roof.


AR-056 – Ponding and blocked drain at main roof.

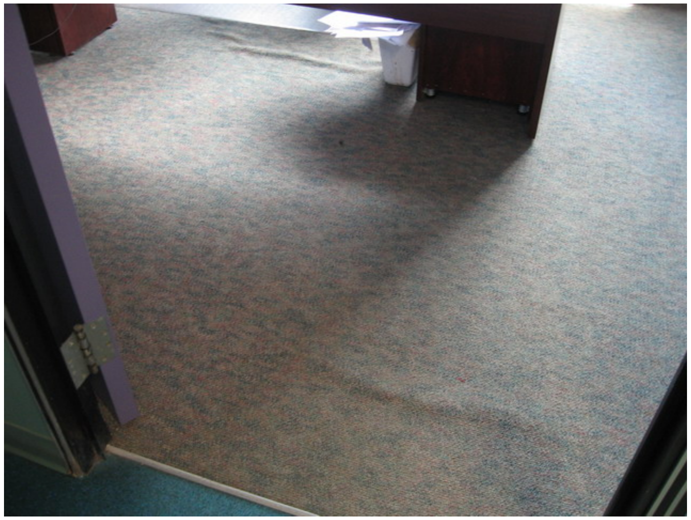
AR-057 – Water stained surfaces at basement level.

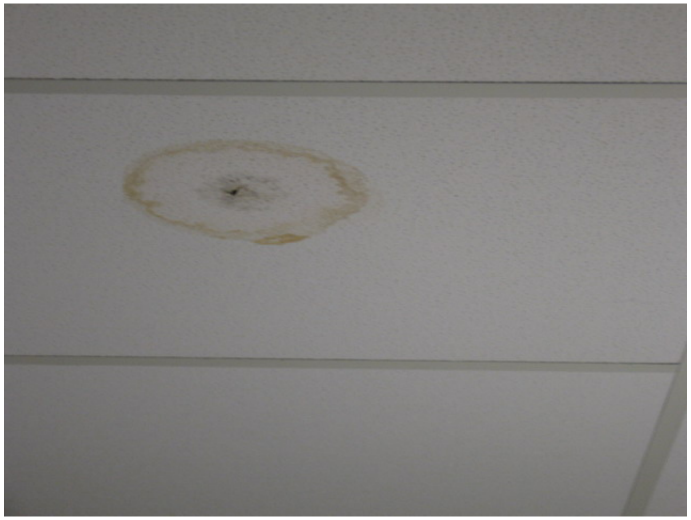
AR-058 – Open block joints at wall in high-bay area.

AR-059 – Cracked/shifted concrete floor in high-bay area.

AR-060 – Shifted floor in 1st floor washroom/change room vestibule.


AR-061 – Damaged wall surfaces in 1st floor corridor.


AR-062 – Wrinkling of carpet flooring in office.


AR-063 – Water damaged/stained acoustic ceiling tile.


AR-064 – Deteriorating paint finish and rusting metal surfaces at PH/rooftop access door and frame.

ELE-001 – Main 600V distribution for Labs and Offices.

ELE-002 – Main 120/208V distribution for Labs and Offices.

ELE-003 – Main 4160V and return 600 V bus duct from primary transformer.

ELE-004 – Primary Transformer – 4160 to 600 volts.

ELE-005 – Typical Lab/Office Area MCC.

ELE-006 – Typical High Bay area MCC.

ELE-007 – Typical Exterior Lighting.

ELE-008 – Typical main corridor lighting.

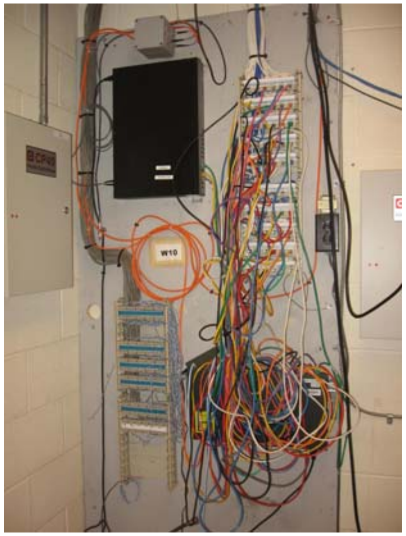
ELE-009 – Lab area lighting.

ELE-010 – High bay area lighting.

ELE-011 – Typical emergency power battery pack.

ELE-012 – Sample of exit signage.


ELE-013 – Main Fire Alarm Panel in WTC.



ELE-014 – Main telephone/communications – WTC.

APPENDIX A3

PHOTOGRAPHS - ANNEX BUILDING

AR-001 – West and north elevations.

AR-002 – West elevation.

AR-003 – East and south elevations.

AR-004 – Exit door at east elevation.


AR-005 – Cementitious coating on.


AR-006 – Deteriorating paint finish (flaking and rusting) at metal siding.


AR-007 – Damaged metal siding at south elevation.


AR-008 – Damaged metal siding at south elevation.


AR-009 – Damaged metal siding at south elevation.


AR-010 – Deteriorated sealant at window.


AR-011 – Open space at south elevation between warehouse and office structures.


AR-012 – Open space at north elevation between warehouse and office structures.

AR-013 – Poorly sealed wall penetration at now abandoned downspout.

AR-014 – Rusting metal lintel at window opening.

AR-015 – Deteriorating paint finish and rusting metal surfaces at roof access ladder.

AR-016 – Built-up roofing at office area (view looking north from WTC Building).

AR-017 – Modified bitumen roofing at warehouse area (view looking north from WTC Building).

AR-018 – Ridging of membrane throughout warehouse area roof.

AR-019 – Roofing at northwest corner of warehouse completed with ‘end cuts’.

AR-020 – Damage to granular surface of SBS membrane - cause of marks unknown.

AR-021 – Staining and debris at warehouse area roof from standing water.

AR-022 – Areas of asphalt bleed-through and exposed bitumen at BUR.

AR-023 – Exposed bitumen/membrane at BUR corner.

AR-024 – Exposed bitumen/membrane at BUR scupper drain.

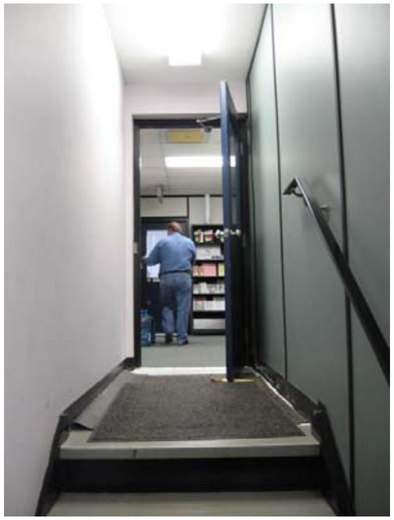
AR-025 – Deteriorated sealant at joints BUR metal counter flashing.

AR-026 – Fire door wedged in open position at 1st floor entrance lobby.

AR-027 – Open tile joints (from shrinkage) at 1st floor entrance lobby.

AR-028 – Wrinkled and stained carpet flooring throughout length of 1st floor corridor.


AR-029 – Wrinkled and stained carpet flooring in 1st floor corridor.


AR-030 – Fire door at top of exit stair wedged in open position.


AR-031 – Uneven surface at bottom of overhead door, with daylight at several spots.


AR-032 – Cracked concrete floor slab in warehouse area office.

ELE-001 – Main Annex warehouse service.

ELE-002 – Typical office panelboards.

ELE-003 – Typical exterior lighting.

ELE-004 – Typical office area lighting.

ELE-005 – Warehouse area lighting.

ELE-006 – Typical exit sign.

ELE-007 – Typical emergency battery pack.

ELE-008 – Telephone communications main.

APPENDIX B

DRAWINGS

No suitable electronic drawings (i.e. simplified to be readable at this scale) are available for inclusion with this report.

APPENDIX C

ODS INVENTORY

ENVIRONMENT CANADA, CANADA CENTRE FOR INLAND WATERS
BURLINGTON, ONTARIO
BUILDING CONDITION REPORT

APPENDIX "C"

NWRI Building

PART A: REFRIGERANT INVENTORY
Section III = Small Cooling Equipment (SCE) generally less than 5 Tons Cooling Capacity

Facility Information		Equipment Description/Content				Equipment Management					
(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)
Client ID	Facility Name	Equipment Type	Equipment Quantity	Refrigerant Type	Refrigerant Quantity in Use (kg)	Region/ Service (See list)	Responsibility Centre	Number of Recharge (#)	Number Owned (#)	Number Leased (#)	Comments
	A&L L112A	AC Hiross	1	R-22	n/a						2006
	A&L L224/roof	AC Comfort Air	1	R-22	4						1993
	A&L L727	chiller glycol Nestlab	1	R-12 (CFC-12)	6						1991
	A&L L510	AC Buffalo	1	R-22	3						1981
	A&L L702	AC Comfort Air	1	R-22	4						1976
	A&L 727	AC Comfort Air	1	R-22	4						1987
	A&L 725	AC Climate Master	1	R-22	4						1989
	A&L 721	AC Comfort Air	1	R-22	4						1983
	A&L 755	chiller Nestlab	1	R-22	3						1992
	A&L 742	AC Comfort Air	1	R-22	3						1982
	A&L L465A	ice machine	1	R-409A	2						1978
	A&L L431	AC Comfort Air	1	R-22	4						1982
	A&L L411A	incubator	1	PM-39	8						1970
	A&L L448	AC Comfort Air	1	R-22	2						1984
	A&L L738	AC split	1	n/a	n/a						
	A&L L553	walk-in coldroom	1	R-12 (CFC-12)	8						1983
	A&L 563B	walk-in coldroom	1	R-12 (CFC-12)	12						1990
	A&L L141	walk-in cooler	1	R-409A	4						1990

	A&L L141	freezer	1	R-404A	4						1997
	A&L L141	walk-in cooler	1	R-12	6						1971
	A&L L141	reach-in cooler	1	R-22	2						1997
	A&L L141	reach-in cooler	1	R-409A	3						1996
	A&L L141	display cooler	1	R-409A	3						1996
	A&L L771	walk-in cooler	1	R-12	6						1989
	A&L L460	walk-in freezer	1	R-404A	6						1996
	A&L L463	walk-in freezer	1	MP-39	10						1970
	A&L L465	reach-in freezer	1	R-502 (CFC)	4						1998
	A&L L469	walk-in coldroom	1	R-409A	8						1990
	A&L L472	walk-in coldroom	1	R-22	4						1994
	A&L 472	walk-in cooler	1	R-12 (CFC)	10						1988
	A&L L428	walk-in coldroom	1	R-22	3						1995
	A&L L411C	walk-in coldroom	1	R-22	4						1995
	A&L L411B	walk-in freezer	1	R-502 (CFC)	6						1984
	R&D R245	AC ComfortAir	1	R-22	2						1988
	R&D R101	ice machine	1	R-12	2.5						1988
	Hydraulics H155	AC Keeprite	1	R-22	1						1976
	Hydraulics H151	walk-in coldroom	1	R-22	n/a						n/a
	W/W W238	Ice machine	1	R-408A	1						1990
	W/W W219	AC Keeprite	1	R-22	4						1972
	W/W W118A&B	AC Keeprite	1	R-22	4						1992
	W/W W108B	AC ComfortAir	1	R-22	3						1989
	W/W W209	AC ComfortAir	1	R-22	2						1980

	W/W W221	AC ComfortAir	1	R-22	3						1980
	W/W W105	walk-in coldroom Tecumseh	1	R-12	10						1998
	W/W W203A	walk-in coldroom Tecumseh	1	R-12	8						1992
	W/W W251	walk-in coldroom Rapid	1	R-22	8						1990
	W/W W251B	walk-in coldroom Rapid	1	R-22	8						1999
	W/W W251A	walk-in freezer Rapid	1	R-408A	8						1999
	W/W W236A	walk-in freezer Coldmatic	1	R-408A	9						1999
	W/W W236B	walk-in freezer Coldmatic	1	MP-39	8						1991
	W/W W232A	walk-in coldroom Foster	1	R-22	5						1994
	W/W W232B	walk-in coldroom Foster	1	R-22	5						1992
	W/W W232C	walk-in coldroom Foster	1	R-22	5						1994
	W/W W234A	walk-in coldroom Constant Temp	1	R-22	5						1994
	W/W W234B	walk-in coldroom Constant Temp	1	R-22	5						1994
	W/W W234C	walk-in coldroom Constant Temp	1	R-22	5						1994
	W/W	walk-in cooler portable	1	R-12	3						1975
	Power Plant	air drier Thompson	1	R-12	2.5						1988
	Power Plant	air drier Thompson	1	R-12	2.5						1988
	Wildlife WL115	walk-in freezer Curtis	1	n/a	n/a						n/a
	Wildlife WL115	walk-in freezer Curtis	1	n/a	n/a						n/a
	Portable #4	AC Keeprite	1	R-22	3						1989
	Portable #4	AC York	1	R-22	3						1998

	Portable #2	AC Keeprite	1	R-22	4						2006
	Portable #1	AC York	1	R-22	4						1999
	Portable #5	AC Evcon	1	R-22	3						1992
	Portable #5	walk-in coldroom	1	MP-39	3						1992

ENVIRONMENT CANADA, CANADA CENTRE FOR INLAND WATERS
BURLINGTON, ONTARIO
BUILDING CONDITION REPORT

APPENDIX "C"

NWRI Building

PART A: REFRIGERANT INVENTORY
Section II = Mid Range Cooling Equipment (MCE) between 5 and 100 Tons Cooling Capacity

Facility Information			Equipment Description				Equipment Content			Equipment Management						
(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)	(M)	(N)	(O)	(P)	(Q)
Client ID	Facility Name	Equipment Location	Equipment Type	Equipment Make	Equipment Model	Equipment Serial No.	Cooling Capacity (Tons)	Refrigerant Type (See list)	Refrigerant Quantity in Use (kg)	Region/ Service (See list)	Responsibility Centre	Liquid/Air Cooled ? (A, L)	Leak Test Frequency (times/year)	Maintenance Team Certified? (Y, N)	Make Up Volume (kg/year)	Comments
	CCIW	A&L Ultratreace - Lab System #33	AC split	McQuay	ACZ045A		40	R-22 (HCFC-22)	66,2 kg (146 lb)			A				
		Hydraulics - RTU #44	RTU	Aquaref - Trane	RAUCC405BL03DE	J96E81655	40	R-22 (HCFC-22)	TBD			A				1996
		R&D Penthouse Unit #5	chiller	Keeprite	CCV10CHRHB2		10	R-22 (HCFC-22)	20 kg							1991
		R&D Penthouse	chiller	Carrier			25	R-22 (HCFC-22)	65 kg							1992
		R&D Penthouse	chiller	Ref Plus			10	R-22 (HCFC-22)	30 kg							In process to be decommissioned
		Warehouse/ Workshop system #14	RTU	Trane	YSC092E	909 1000 54L	7.5	R-410 A (HFC-410A)	TBD							

ENVIRONMENT CANADA, CANADA CENTRE FOR INLAND WATERS
BURLINGTON, ONTARIO
BUILDING CONDITION REPORT

APPENDIX "C"

NWRI Building

PART A: REFRIGERANT INVENTORY
Section I = Large Commercial Cooling Equipment (LCE) over 100 Tons Cooling Capacity (e.g., Building Chillers)

Facility Information			Equipment Description				Equipment Content				Equipment Incidents			Equipment Management											
(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)	(M)	(N)	(O)	(P)	(Q)	(R)	(S)	(T)	(U)	(V)	(W)	(X)	(Y)	(Z)
Client ID	Facility Name	Equipment Location	Equipment Type	Equipment Make	Equipment Model	Equipment Serial No.	Cooling Capacity (Tons)	Operating Load (% of Capacity)	Refrigerant Type (See list)	Refrigerant Quantity in Use (kg)	Recorded Releases (#/year)	Quantity Released (kg)	Cause of Release	Region/ Service	Responsi-bility Centre	Purchase/ Installation Year	Liquid/Air Cooled (A, L)	Purge System ? (Y, N)	Purge Efficiency (ratio)	Containment Equipment? (Y, N)	Leak Test Frequency (times/year)	Maintenance Team Certified? (Y, N)	Make Up Volume (kg/year)	Operation Time (month/year)	Comments
	CCIW	Boiler Room	Chiller centrifugal	Trane	CVHE080	L89J03059	800		R-123 (HCFC-123)	619.2 (1365 lb)						1990	L								
	CCIW	Boiler Room	Chiller centrifugal	Trane	CVHE080	L89J03063	800		R-123 (HCFC-123)	619.2 (1365 lb)						1990	L								

ENVIRONMENT CANADA, CANADA CENTRE FOR INLAND WATERS
BURLINGTON, ONTARIO
BUILDING CONDITION REPORT

APPENDIX "C"

WTC Building

PART A: REFRIGERANT INVENTORY
Section III = Small Cooling Equipment (SCE) generally less than 5 Tons Cooling Capacity

Facility Information		Equipment Description/Content				Equipment Management					
(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)
Client ID	Facility Name	Equipment Type	Equipment Quantity	Refrigerant Type	Refrigerant Quantity in Use (kg)	Region/ Service (See list)	Responsibility Centre	Number of Recharge (#)	Number Owned (#)	Number Leased (#)	Comments
	WTC	walk-in cooler Curtis	1	n/a	n/a						n/a
	WTC	walk-in cooler Curtis	1	n/a	n/a						n/a

ENVIRONMENT CANADA, CANADA CENTRE FOR INLAND WATERS
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BUILDING CONDITION REPORT

APPENDIX "C"

Annex Building

PART A: REFRIGERANT INVENTORY
Section III = Small Cooling Equipment (SCE) generally less than 5 Tons Cooling Capacity

Facility Information		Equipment Description/Content				Equipment Management					
(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)
Client ID	Facility Name	Equipment Type	Equipment Quantity	Refrigerant Type	Refrigerant Quantity in Use (kg)	Region/ Service (See list)	Responsibility Centre	Number of Recharge (#)	Number Owned (#)	Number Leased (#)	Comments
	Annex	RTU Lennox	1	n/a	R-22						n/a
	Annex	RTU Carrier	1	n/a	R-22						n/a

APPENDIX D

HERITAGE CHARACTER STATEMENT

No heritage review of this building has been carried out to date.

APPENDIX E

ACCESSIBILITY AUDIT

ACCESSIBILITY AUDIT

CANADA CENTRE FOR INLAND WATERS
867 LAKESHORE ROAD
BURLINGTON, ONTARIO

TB DFRP IDENTIFIER 10251:00

PREPARED BY:
MAINTENANCE MANAGEMENT SERVICES
PROFESSIONAL & TECHNICAL PROGRAMS
REAL PROPERTY SERVICES
PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

Site Visit: September/October 2009 **PROJECT/WSBE NO: R.034379.001**
Report Date: January 2010 **EDRM NO: 475953**

Public Works and Government Services Canada
Travaux publics et Services gouvernementaux Canada

Canada

ACCESSIBILITY EVALUATION: CANADA CENTRE FOR INLAND WATERS

TABLE OF CONTENTS

1.0 INTRODUCTION

This Accessibility Audit report has been initiated by Public Works and Government Canada Asset and Facility Management Services in response to the 2005 'Accessibility for All' report, prepared by the Subcommittee on the Status of Persons with Disabilities for the Standing Committee on Human Resources, Skills Development, Social Development and the Status of Persons with Disabilities.

The Subcommittee on the Status of Persons with Disabilities was mandated to examine various issues related to accessibility for persons with disabilities including the accessibility of buildings and transportation under federal jurisdiction; issues of accessibility related to Parliament Hill, the accessibility of benefits from the Canada Pension Plan, the accessibility of jobs in the federal public service; as well as tax measures for persons with disabilities.

As a result of the Subcommittee's examination of the accessibility of buildings under federal jurisdiction, Recommendation 3 of the 'Accessibility for All' recommended:

> *The Subcommittee recommends that the Department of Public Works and Government Services Canada establish in 2005 an ongoing audit program of the compliance of federal buildings with technical standard CAN/CSA-B651-04, as formulated by the Canadian Standards Association. A progress report should be tabled in 2007, and all federal buildings must be audited by no later than 2009.*

In it's formal response to the Subcommittee, PWGSC stated:

> *Public Works and Government Services Canada (PWGSC) is developing an auditing strategy, electronic database system, and training tools, to establish a program to audit the accessibility of all its facilities, both owned and leased. The audit program will simultaneously follow twin tracks. Firstly, it will audit for compliance with the Treasury Board Accessibility Policy. Secondly, it will audit for compliance with the Canadian Standards Association's technical standard, CAN/CSA-B651-04 Accessible Design for the Built Environment. The federal government is the only jurisdiction in Canada, so far, to adopt this rigorous standard.*
>
> *The approach PWGSC has chosen for its audit program will help identify gaps between the requirements of Treasury Board policy and the 2004 version of CAN/CSA-B651-04, and provide valuable information for future investments in renovations and acquisitions. A further benefit of the audit will be the opportunity to optimize the department's monitoring and reporting on accessibility within its inventory.*
>
> *The audit program will comply with, and be guided by, the Treasury Board Accessibility Policy. PWGSC will work with Social Development Canada to ensure that the offices of the latter and its Ministers are among the first public spaces to be audited for accessibility. A progress report on the audit program will be tabled by December 2007, for completion by December 2009.*

Consequently, the objective of this accessibility audit is to:

> Identify any remaining accessibility improvements required in order to bring the base building elements of the facility in compliance with the *Appendix: Barrier-Free Design Implementation Requirements* of the Treasury Board *Real Property Accessibility* policy, and the CAN CSA B651 95 Barrier-Free Design Standard.

Identify the incremental improvements required in order to bring the base building elements of the facility in compliance with the *Appendix: Barrier-Free Design Implementation Requirements* of the Treasury Board *Real Property Accessibility* policy, and the CAN CSA B651 04 Accessible Design for the Built Environment Standard.

Identify the Class C construction Costs associated with compliance with each of the above.

Document facilities and areas exempted from the requirements of Treasury Board *Real Property Accessibility* and the rationale supporting the exemptions.

1.1 Federal Accessibility Standards

The current policy regulating accessibility to federal facilities is identified in the Treasury Board of Canada *Federal Real Property Accessibility* (FRPA) Standard, which will replace the 1998 *Treasury Board Real Property Accessibility Policy* referenced in the introduction in early 2006. For reference purposes, a copy of the FRPA standard has been included as Appendix A of this document.

Section 4.1 of the FRPA standard, *Accessibility Requirements*, provides a detailed 'scoping' of accessibility requirements for federal real property, and these requirements have been included under the headings for the various base building and/or site elements audited in this study.

Section 4.2 of the FRPA standard also specifies the use of the Canadian Standards Association B651 Standard as the technical reference for accessibility, and PWGSC's 1990-1995 Accessibility Program resulted in upgrading of its inventory of Crown Owned and Leased inventory to comply with the *CAN/CSA B-651-M90* and *CAN CSA B651 95* editions of the *Barrier-Free Design Standard*. Although amendments between the M90 and 95 editions of the standard were relatively minor, the standard was superceded in August 2004 by the *CAN CSA B651 04 Accessible Design for the Built Environment* standard. B651 04 presents numerous technical changes from the two 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.

In March, 1992, the Accessibility Office, PWC Headquarters issued an Accessibility Evaluation Guide that identifies various 'Assessment Considerations' for existing installations that vary slightly from the technical requirements identified in the BFDS and do not compromise effective use by persons with disabilities. These have been noted where applicable. While the Accessibility Evaluation Guide contains additional Assessment Considerations in addition to those identified in this report, those that have been problematic or open to interpretation have not been referenced in this document. Note also that these Assessment Considerations are not intended for application in new construction, which should be designed fully in accordance with the requirements of the BFDS.

2.0 FACILITY OVERVIEW

Facility Name:	Canada Centre for Inland Waters
Municipal Address:	867 Lakeshore Road, Burlington, ON
Crown-Owned or Leased:	Crown-Owned
Asset Number:	n/a
Cost Centre Number(s):	n/a
Total Rentable Area (m2):	n/a
Building Height (Storeys):	7
Total Parking:	495 (approximate)
Date of Construction and major capital Improvements:	1970 (approximate)
Client Departments in Facility/Floor Location:	Environment Canada (EC) and the Department of Fisheries and Oceans (DFO)
Service/utility areas not audited:	Janitors closets, mechanical, electrical and telecommunications rooms, loading docks, long-term ‘dead’ storage areas at basement level, etc.

3.0 WALKWAYS

Accessibility Requirements of the Treasury Board *Accessibility Standard for Real Property:*

5.1. In the management of real property, custodians shall at a minimum, provide access to and use of the following:

c) public areas (including, but not limited to…. walkways);

k) Accessibility shall include routes from accessible parking areas, local public transit stops and all drop-off areas that are within the limits of the federal property to main entrances.

3.1 Existing Conditions

Reference Checklists:
Accessibility Checklist B - Passenger Pick-Up Areas
Accessibility Checklist C - Curb Ramps
Accessibility Checklist D - Accessible Routes
Accessibility Checklist E - Ramps and Platform Lifts
Accessibility Checklist I - Stairs and Stairwells

Access between the accessible parking area and the building includes crossing the driveway, a curb-ramp to the sidewalk, and a ramp and stair to the entrance landing. Access between the NWRI and WTC buildings includes a sidewalk, a ramp and stair (adjacent to the old Guardhouse), and curb cuts where the route crosses the driveway.

The following are below the minimum standard requirement:

- The horizontal strip along nosing edges of the *main entrance stair* and the *guardhouse stair* are: too deep, fading, and are not slip-resistant (also the risers have been painted).
- No intermediate handrails (max 1650mm spacing as per NBC 3.4.6.4) have been provided at the *main entrance stair.*
- No handrails have been provided at the *guardhouse stair.*
- No detectable warning has been provided at the top of the *main entrance stair* and the *guardhouse stair.*
- The clear width of the *guardhouse ramp* is too small.
- No handrails have been provided at the *guardhouse ramp.*
- The guard at the *guardhouse ramp* has no edge protection.
- No colour contrasting strips have been provided at the top of the *main entrance ramp* and the *guardhouse ramp* (04).
- The surface colour and texture of the *curb ramps* are not contrasted with adjacent surfaces.
- The *curb ramps* are not provided with detectable hazard indicators (04).

3.2 Modifications Required to Comply with CAN CSA B651 95 Barrier-Free Design Standard

- Modify the treads/risers at the *main entrance stair* and the *guardhouse stair,* including: removal of existing paint, cleaning of stained surfaces (rusting), rebuilding of deteriorated surfaces (broken concrete, including exposed rebar), installation of new horizontal strips (along nosing edges).
- Provide intermediate handrails along the *main entrance stair.*
- Provide handrails (both sides) at the *guardhouse stair.*

- Provide detectable warnings at the top of the *main entrance stair* and the *guardhouse stair.*
- The clear width of the *guardhouse ramp* is too small.
- Provide handrails at the *guardhouse ramp.*
- Modify the guard at the *guardhouse ramp* to provide edge protection.
- Replace the *curb ramps* with new, having surfaces colour and texture of not contrasted with adjacent surfaces.

NOTE: Implementation of required modifications under '4.0 Parking' and 5.0 Building Entrances' may require modifications additional to those indicated above.

3.3 Incremental Modifications Required to Comply with CAN CSA B651 04 Accessible Design for the Built Environment

In addition to modification listed in 3.2, the following modifications will ensure compliance with CAN/CSA-B651-04:

- Provide the *main entrance ramp* and the *guardhouse ramp* with colour contrasting strips at top and bottom.
- Provide the *curb ramps* with with detectable hazard indicators.

4.0 PARKING

Accessibility Requirements of the Treasury Board *Accessibility Standard for Real Property:*

5.1. In the management of real property, custodians shall at a minimum, provide access to and use of the following:

j) Where employee or visitor parking is provided, the quantity of accessible parking spaces provided shall conform with municipal by-laws or the following table, whichever has the higher number of accessible spaces:

Total parking spaces	***Minimum No. of accessible spaces***	***Total parking spaces***	***Minimum No. of accessible spaces***
up to 25	*1*	*151-200*	*6*
26-50	*2*	*201-300*	*7*
51-75	*3*	*301-400*	*8*
76-100	*4*	*401-500*	*9*
101-150	*5*	*more than 500*	*2% of total*

Accessible parking spaces shall be within a reasonable and safe proximity of the federal facility but may be distributed among distinct parking areas .

4.1 Existing Conditions

Reference Checklists:
Accessibility Checklist A - Car & Van Parking

Parking areas are located throughout the site, with an approximate total of 495 spaces for both staff and visitors. There are 5 designated accessible parking stalls, all located near the NWRI Building main entrance (3 in the visitor parking lot, 2 in the access driveway). There are no designated passenger pick-up areas.

The following are below the minimum standard requirement:

- There are 3 too few accessible parking stalls provided - based on the total number of parking spaces on site.
- The 'safe' access route for the 2 parallel accessible parking spaces requires traveling along the access driveway adjacent to a fire hydrant.
- The access aisles for the 3 accessible parking spaces are not identified with diagonal pavement markings (a 'general use' access aisle, leading to the curb cut, is adjacent to 2 of the spaces).
- The 2 parallel accessible parking stalls are not identified by a vertical mounted sign (a single undersized sign is present).
- The 2 parallel accessible parking spaces are too narrow and too short.

4.2 Modifications Required to Comply with CAN CSA B651 95 Barrier-Free Design Standard

- Provide an additional 3 accessible parking stalls, compete with access aisles, pavement markings and vertical signage (see also required modifications for '5.0 Building Entrances' below when considering locations).
- Provide access aisles at the 3 existing accessible parking.
- Relocate the 2 parallel accessible parking stalls to a safer, albeit further, location.

4.3 Incremental Modifications Required to Comply with CAN CSA B651 04 Accessible Design for the Built Environment

Modification listed in 4.2 will ensure compliance with CAN/CSA-B651-04.

5.0 BUILDING ENTRANCES

Accessibility Requirements of the Treasury Board *Accessibility Standard for Real Property:*

5.1. In the management of real property, custodians shall at a minimum, provide access to and use of the following:

a. Entrances. Frequently used points of access to the property must be equipped with a power door operator at main entrances to real property. Where entry to or exit from the facility is through a series of doors in a vestibule-like arrangement, at least one complete set of doors allowing access to the vestibule area shall be so equipped.

PWGSC Assessment Considerations:

Where fixed building constraints preclude the modification of a ...vestibule (i.e., to provide sufficient manoeuvring space at doors or adequate space between two doors in series), automatic door openers prove to be a relatively low cost solution.

Where vestibules or privacy screens restrict manoeuvring space, doors can sometimes be removed for easy access as long as privacy is not inhibited.

5.1 Existing Conditions

Reference Checklists:
Accessibility Checklist F - Entrances
Accessibility Checklist G - Doors
Accessibility Checklist Q - Secure Areas

NWRI Building – This building is served by several entrances, as follows:
The *main building entrance (A&L, east elevation)*, equipped with a power operated door, is used by staff in the southeast parking areas and all visitors entering and leaving the facility.
There is a *restricted-access entrance (Mall north)* used by staff in the northeast parking areas and leading to the exterior access route to the WTC Building.
There are *restricted-access entrances (R&D northwest, and R&D centre west)* used by staff in the west parking areas and the staff outdoor rest area.
There is also an *entrance (R&D southwest)* which is exclusive to the EC Enforcement unit.

The following are below the minimum standard requirement:

- The main building entrance is not provided with signage to indicate an accessible entrance.
- There are too few accessible entrances (TBS ASRP refers to 'frequently used points of access', however NBC requires that a minimum of 50% of pedestrian entrances be accessible.

WTC Building –

- This building is served by a single entrance, equipped with a power operated door.

Annex Building –

- This building is served by a single entrance, equipped with a power operated door.

5.2 Modifications Required to Comply with CAN CSA B651 95 Barrier-Free Design Standard

NWRI Building –

- Provided signage at the main building entrance to indicate an accessible entrance.
- Modify 3 additional entrances to meet the requirements of accessible entrances (see also required modifications for '4.0 Parking' above when considering locations)

WTC Building – none.

Annex Building – none.

5.3 Incremental Modifications Required to Comply with CAN CSA B651 04 Accessible Design for the Built Environment

Modification listed in 5.2 will ensure compliance with CAN/CSA-B651-04.

6.0 VERTICAL MOVEMENT

Accessibility Requirements of the Treasury Board *Accessibility Standard for Real Property:*

5.1. In the management of real property, custodians shall at a minimum, provide access to and use of the following:
b) passenger elevators;

In addition to the above ASRP requirement, PWGSC generally includes platform lifts, ramps and open circulation stairs related to internal routes of travel.

PWGSC Assessment Considerations:

Elevators
Undersized elevator cabs need not be replaced unless they cannot provide the required 1200 mm depth required for a person in a wheelchair to pull in. If there are two identical control panels, only one need be modified to be accessible.

Additional PWGSC Assessment Considerations:

Elevators:

As handrails in elevator cabs are utilized for stabilization purposes only, existing handrails are left as is. Since the BFDS requires handrails on all non-access walls, new handrails are installed where they are not yet provided on all non-access walls and any existing handrail(s) are replaced to match.

6.1 Existing Conditions

Reference Checklists
Accessibility Checklist E - Ramps and Platform Lifts
Accessibility Checklist H - Elevators
Accessibility Checklist I - Stairs and Stairwells

NWRI Building –
There is a small *stair* (4 risers) and ramp roviding access between the main entrance and the auditorium area (including washrooms).
There are 5 *open circulation stairs* located throughout the main entrance/Mall providing access between the 1st and 2nd floors (remaining stairs are within enclosed stairwells and have not been assessed).
There are 2 *passenger elevators* providing access between the 1st and 7th floors (remaining elevators are freight devices and have not been assessed).

The following are below the minimum standard requirement:
- No horizontal strips have peen provided along the nosing edges of the *auditorium stair* and the *circulation stairs*.
- The handrail is without ‘circular section’ (i.e. not round) at the *auditorium stair*.
- No intermediate handrails (max 1650mm spacing as per NBC 3.4.6.4) have been provided at the *auditorium stair*.
- No extensions and returns are provided on the handrails of the *auditorium stair, the auditorium ramp* and the *circulation stairs*.
- No detectable warning indicators are provided at the top of stairs the *auditorium stair* and the *circulation stairs*.
- No colour contrasting strips at top/bottom and landing of the auditorium ramp
- No visible/audible hall signals (at each hoistway) are provided at the 4th to 7th floors (1st and 2nd floors are OK, restricted access at 3rd floor).
- No raised and Braille floor designations are provided (on both door jambs of each hoistway) at the 1st to 7th floors.

WTC Building –
There is a partially *open circulation stair (1st floor only)* located in the main entrance providing access between the 1st and 2nd floors (remaining stairs are within enclosed stairwells and have not been assessed).

There is a *passenger elevator* providing access between the basement, 1st floor, 2nd floor, and the mechanical penthouse.

The following are below the minimum standard requirement:

- Nosing edge horizontal strips (inset ceramic tiles) are not colour contrasted, not slip resistant, and are too deep.
- A handrail is provided on only one side.
- No detectable warning indicator is provided at the top of the stair (each level).
- The existing elevator has too many specific deficiencies to list (generally: car dimensions, controls, emergency communication, signal, and signage).

Annex Building – A single *stair* provides access between the 1st and 2nd floors (the exterior stair is for emergency use only and has not been assessed).

The following are below the minimum standard requirement:

- Nosings have abrupt undersides.
- No nosing edge horizontal strips are provided.
- The existing handrail is without 'circular section' (i.e. not round).
- The existing handrail is not continuous.
- A handrail is provided on only one side.
- No detectable warning indicator is provided at the top of the stair.

6.2 Modifications Required to Comply with CAN CSA B651 95 Barrier-Free Design Standard

NWRI Building –

- Provide horizontal strips along the nosing edges of the *auditorium stair* and the *circulation stairs*.
- Replace the existing handrail at the *auditorium stair* with one having a 'circular section'.
- Provide intermediate handrails at the *auditorium stair*.
- Provide extensions and returns on the handrails of the *auditorium stair, the auditorium ramp* and the *circulation stairs*.
- Provide detectable warning indicators at the top of stairs the *auditorium stair* and the *circulation stairs*.
- Provide visible/audible hall signals for each hoistway at the 4th to 7th floors.
- Provide raised and Braille floor designations on both door jambs of each hoistway at the 1st to 7th floors.

WTC Building –

- Provide horizontal strips along the nosing edges to be colour contrasted, slip resistant, and the correct depth.
- Provide an additional handrail.
- Provide detectable warning indicators at the top of the stair (each level).
- Modernize the elevator (including replacement of car with larger size).

Annex Building –

- Modify stair risers to eliminate abrupt undersides at nosings.
- No nosing edge horizontal strips are provided.
- Replace the existing handrail is a continuous handrail with a 'circular section'.
- Provide an additional handrail.
- No detectable warning indicator is provided at the top of the stair.

6.3 Incremental Modifications Required to Comply with CAN CSA B651 04 Accessible Design for the Built Environment

In addition to modification listed in 6.2, the following modifications will ensure compliance with CAN/CSA-B651-04:

NWRI Building –

- Provide colour contrasting strips at top/bottom and landing of the *auditorium ramp*.

WTC Building – none.

Annex Building – none.

7.0 INTERIOR DOORS AND CORRIDORS (Base Building)

Accessibility Requirements of the Treasury Board *Accessibility Standard for Real Property:*

5.1. In the management of real property, custodians shall at a minimum, provide access to and use of the following:

e) interior doors and corridors;

7.1 Existing Conditions

Reference Checklists:
Accessibility Checklist D - Accessible Routes
Accessibility Checklist G - Doors

NWRI Building –
R&D 1st floor – door width is too small, and the lavatory impedes the door clear area in the female washroom.
Hydraulics Lab 1st floor - door approach side clearance is inadequate in both the male and female washrooms.
R&D 2nd floor - door width is too small, and the lavatory impedes the door clear area in the female washroom.

WTC Building – no issues identified.

Annex Building – no issues identified.

7.2 Modifications Required to Comply with CAN CSA B651 95 Barrier-Free Design Standard

NWRI Building –

- Provide power operators to washroom doors (4) to compensate for inadequate floor areas (alternately, reconfigure entrances and/or re-swing doors if practicable).

WTC Building – none.

Annex Building – none.

7.3 Incremental Modifications Required to Comply with CAN CSA B651 04 Accessible Design for the Built Environment

Modification listed in 7.2 will ensure compliance with CAN/CSA-B651-04.

8.0 WASHROOMS

Accessibility Requirements of the Treasury Board *Accessibility Standard for Real Property*:

5.1. In the management of real property, custodians shall at a minimum, provide access to and use of the following:
f) Washrooms

PWGSC Assessment Considerations:

*One accessible male washroom and female washroom, or alternatively one accessible individual washroom, is required on each floor in existing buildings based on the ASRP 5.2 ' **Note**: This technical standard …does not apply retroactively to accessibility requirements of real property in the inventory prior to October 1, 2004'.*

Only one lavatory per washroom has to be accessible.

Where fixed building constraints preclude the modification of a washroom vestibule (i.e., to provide sufficient manoeuvring space at doors or adequate space between two doors in series), automatic door openers prove to be a relatively low cost solution.

Where vestibules or privacy screens restrict manoeuvring space, doors can sometimes be removed for easy access as long as privacy is not inhibited.

If the toilet was installed with its centerline located at 430 mm from the wall carrying the grab bar…it need not be moved.

Flush controls that are not on the transfer side of the toilet need not be relocated.

Where existing urinals do not meet the CAN/CSA B651 requirements, they do not have to be replaced if toilet fixtures are available in accessible stalls.

8.1 Existing Conditions

Reference Checklists:
Accessibility Checklist J - Washrooms
Accessibility Checklist K - Individual Washrooms
Accessibility Checklist L - Bathing Facilities

NWRI Building – washrooms are provided at numerous locations throughout this building, as follows:

A&L 1st floor – separate male and female, multi-person washrooms/locker rooms (cafeteria kitchen, original from 1970); and separate male and female, multi-person b-f washrooms (auditorium lobby, renovated from original).

The following are below the minimum standard requirement:
- No accessible stall is provided in the female washroom.
- Vanity is too low (both top and underside clearance in the female washroom.

- Accessible stall depth is inadequate in the male washroom (04).
- No grab bars and no vertical markers are provided at the urinal (04).

The following exceed the maximum permitted standard requirement:

- TP dispenser in mounted too high in both the male and female washrooms (04).

Urinal is mounted too high (04).

R&D 1st floor – a female individual b-f washroom (renovated from original); a male multi-person b-f washroom (renovated from original).
The following are below the minimum standard requirement:

- Door width is too small, and the lavatory impedes the door clear area in the female washroom.
- A floor mounted disposal unit impedes the door clear area in the female washroom.
- Floor mounted sanity and waste disposal units impede the transfer space in the female washroom.
- The flush control is not on transfer side in both the male and female washrooms.
- The lavatory HW and DWV lines are not insulated in both the male and female washrooms.
- Accessible stall depth is inadequate in the male washroom (04).
- The floor area in front of the accessible stall is inadequate in the male washroom (04).
- The side grab bar distance beyond the toilet front edge is inadequate in the male washroom.
- No grab bars and no vertical markers are provided at the urinal (04).

The following exceed the maximum permitted standard requirement:

- The urinal is mounted too high.
- TP dispenser too high in both the male and female washrooms (04).

Warehouse 1st floor - separate male and female multi-person washrooms (original from 1970).

Hydraulics Lab 1st floor - a female individual b-f washroom (renovated from original); and a male multi-person b-f washroom (renovated from original).
The following are below the minimum standard requirement:

- door approach side clearance is inadequate in both the male and female washrooms.
- The lavatory (and shelf in female) impedes the door clear area in both the male and female washrooms.
- A floor mounted waste disposal unit impedes the door clear area in the female washroom.
- A floor mounted sanity disposal unit impedes the transfer space in the female washroom.
- The lavatory HW and DWV lines are not insulated in both the male and female washrooms.
- The clear area in front of the accessible stall is inadequate in the male washroom (04).
- The transfer space is inadequate in the male washroom.
- No d-pulls are provided on stall door in the male washroom.
- The clear area in front of the accessible lavatory is inadequate in the male washroom.
- No grab bars and no vertical markers are provided at the urinal (04).

The following exceed the maximum permitted standard requirement:

- TP dispenser too high in both the male and female washrooms (04).
- The coat hook too high in the female washroom.
- The urinal is mounted too high.

A&L 2nd floor – separate male and female multi-person washrooms (centre, original from 1970); a male multi-person washroom (north, original from 1970); and a female multi-person washroom/shower room (original from 1970).

R&D 2nd floor - a female individual b-f washroom (renovated from original); a male multi-person b-f washroom (renovated from original).
The following are below the minimum standard requirement:

- Door width is too small, and the lavatory impedes the door clear area in the female washroom.
- A floor mounted disposal unit impedes the door clear area in the female washroom.
- Floor mounted sanity and waste disposal units impede the transfer space in the female washroom.
- The flush control is not on transfer side in both the male and female washrooms.
- The lavatory HW and DWV lines are not insulated in both the male and female washrooms.
- Accessible stall depth is inadequate in the male washroom (04).
- The floor area in front of the accessible stall is inadequate in the male washroom (04).
- The side grab bar distance beyond the toilet front edge is inadequate in the male washroom.
- No grab bars and no vertical markers are provided at the urinal (04).

The following exceed the maximum permitted standard requirement:

- The urinal is mounted too high.
- TP dispenser too high in both the male and female washrooms (04).

Warehouse 2nd floor - a male multi-person washroom/shower room (original from 1970); a female individual washroom (original from 1970); and a female b-f washroom (renovated from original).
The following are below the minimum standard requirement:

- The lavatory impedes the door clear area.
- Floor mounted disposal units (3) impede the door clear area and the transfer space.
- The clear area in front of the accessible lavatory is inadequate.
- The lavatory HW and DWV lines are not insulated.

The following exceed the maximum permitted standard requirement:

- TP dispenser is too high (04).

Hydraulics Lab 2nd floor – a female individual b-f washroom (renovated from original); and a male multi-person b-f washroom (renovated from original).
The following are below the minimum standard requirement:

- door approach side clearance is inadequate in both the male and female washrooms.
- The lavatory (and shelf in female) impedes the door clear area in both the male and female washrooms.
- A floor mounted waste disposal unit impedes the door clear area in the female washroom.
- A floor mounted sanity disposal unit impedes the transfer space in the female washroom.
- The lavatory HW and DWV lines are not insulated in both the male and female washrooms.
- The clear area in front of the accessible stall is inadequate in the male washroom (04).
- The transfer space is inadequate in the male washroom.
- No d-pulls are provided on stall door in the male washroom.
- The clear area in front of the accessible lavatory is inadequate in the male washroom.
- No grab bars and no vertical markers are provided at the urinal (04).

The following exceed the maximum permitted standard requirement:

- TP dispenser too high in both the male and female washrooms (04).

- The coat hook too high in the female washroom.
- The urinal is mounted too high.

A&L upper floors (4 to 7) - separate male and female multi-person washrooms (male-centre and female-north, original from 1970); and separate male and female individual* b-f washrooms (male-north and female-centre, renovated from original multi-person facilities).
The following are below the minimum standard requirement:

- The flush control is not on transfer side in the female washrooms.
- Furnishings impede the transfer spaces in the 4th and 7th floor female washroom.
- No coat hooks are provided on the side walls of the female washrooms.
- The lavatory HW and DWV lines are not insulated in both the male and female washrooms.
- No grab bars and no vertical markers are provided at the urinal (04).

The following exceed the maximum permitted standard requirement:

- TP dispenser too high in both the male and female washrooms (04).
- The urinal is mounted too high.

* Female 'individual' b-f washrooms at A&L upper floors are capable of being used as multi-person facilities (toilet within stall).

2nd floor Shower facilities (both male and female) – access to and clearances within are inadequate, as are the facilities themselves.

WTC Building –
1st floor – separate male and female multi-person washrooms/shower rooms (original from 1970); and a unisex individual washroom (from 1995 addition).
2nd floor – separate male and female multi-person b-f washrooms (original from 1970); and a unisex individual washroom (from 1995 addition).
The following are below the minimum standard requirement:

- Transfer space obstructed by floor mounted sanitary disposal unit in the unisex washrooms.
- Tank lid not securely attached in the unisex washrooms.
- Flush control not on transfer side in the unisex washrooms.
- No clear floor area at (stainless steel) towel dispenser in the 2nd floor unisex washroom.
- Clear floor area at (plastic) towel dispenser obstructed by floor mounted disposal unit in the 2nd floor unisex washroom.
- Shower facilities – access to and clearances within are inadequate, as are the facilities themselves.

The following exceed the maximum permitted standard requirement:

- TP dispenser in mounted too high (04).
- (plastic) towel dispenser mounted too high in the 2nd floor unisex washroom.

Annex Building –
1st floor – separate male and female individual washrooms (from 1991 addition).
2nd floor – none.
The following are below the minimum standard requirement:

- No grab bars and no vertical markers are provided at the urinal (04).

The following exceed the maximum permitted standard requirement:

- TP dispenser in mounted too high (04).
- Urinal is mounted too high (04).

8.2 Modifications Required to Comply with CAN CSA B651 95 Barrier-Free Design Standard

NWRI Building –

A&L 1st floor –

- Modify 2 existing stalls into a single accessible stall in the female washroom.
- Modify existing vanity (or provide a b-f lavatory) Vanity in the female washroom.

R&D 1st floor –

- Door – see required modifications under '7.0 Interior Doors & Corridors' above.
- Provide wall mounted disposal units (both sanity and waste - which do not impede on required clear areas) in the female washroom.
- Replace the flush control in both the male and female washrooms (locate on transfer side).
- Insulate the lavatory HW and DWV lines in both the male and female washrooms.
- Relocate the side grab bar in the male washroom.

Warehouse 1st floor – not applicable.

Hydraulics Lab 1st floor -

- Door – see required modifications under '7.0 Interior Doors & Corridors' above.
- Provide wall mounted disposal units (both sanity and waste - which do not impede on required clear areas) in the female washroom.
- Insulate the lavatory HW and DWV lines in both the male and female washrooms.
- Reconfigure/reconstruct the male washroom.

A&L 2nd floor – not applicable.

R&D 2nd floor -

- Door – see required modifications under '7.0 Interior Doors & Corridors' above.
- Provide wall mounted disposal units (both sanity and waste - which do not impede on required clear areas) in the female washroom.
- Replace the flush control in both the male and female washrooms (locate on transfer side).
- Insulate the lavatory HW and DWV lines in both the male and female washrooms.
- Relocate the side grab bar in the male washroom.

Warehouse 2nd floor -

- Reconfigure/reconstruct the washroom.

Hydraulics Lab 2nd floor –

- Door – see required modifications under '7.0 Interior Doors & Corridors' above.
- Provide wall mounted disposal units (both sanity and waste - which do not impede on required clear areas) in the female washroom.
- Insulate the lavatory HW and DWV lines in both the female washrooms.
- Reconfigure/reconstruct the male washroom.

A&L upper floors (4 to 7) -

- Replace the flush control in the female washrooms (locate on transfer side).
- Remove furnishings from the transfer spaces in the 4th and 7th floor female washroom.
- Provide coat hooks on the side walls of the female washrooms.
- Insulate the lavatory HW and DWV lines in both the male and female washrooms.

2nd floor Shower facilities (both male and female) –

- Provide accessible shower facilities.

WTC Building –

- Provide a wall mounted disposal unit in the unisex washrooms (which does not impede on required clear areas).
- Replace toilet tanks in the unisex washrooms (securable lids, flush controls on transfer side).
- Relocate the (plastic) towel dispenser in the 2nd floor unisex washroom.
- Provide accessible shower facilities.

Annex Building – none.

8.3 Incremental Modifications Required to Comply with CAN CSA B651 04 Accessible Design for the Built Environment

In addition to the modification listed in 8.2, the following modifications will ensure compliance with CAN/CSA-B651-04:

NWRI Building –
A&L 1st floor –

- Accessible stall depth is inadequate in the male washroom (04).
- No grab bars and no vertical markers are provided at the urinal (04).
- TP dispenser in mounted too high in both the male and female washrooms (04).

Urinal is mounted too high (04).

R&D 1st floor –

- Accessible stall depth is inadequate in the male washroom (04).
- The floor area in front of the accessible stall is inadequate in the male washroom (04).
- No grab bars and no vertical markers are provided at the urinal (04).
- The urinal is mounted too high (04).
- TP dispenser too high in both the male and female washrooms (04).

Warehouse 1st floor – not applicable.

Hydraulics Lab 1st floor -

- The clear area in front of the accessible stall is inadequate in the male washroom (04).
- No grab bars and no vertical markers are provided at the urinal (04).
- TP dispenser too high in both the male and female washrooms (04).
- The urinal is mounted too high (04).

A&L 2nd floor – not applicable.

R&D 2nd floor -

- Accessible stall depth is inadequate in the male washroom (04).
- The floor area in front of the accessible stall is inadequate in the male washroom (04).
- No grab bars and no vertical markers are provided at the urinal (04).
- The urinal is mounted too high (04).
- TP dispenser too high in both the male and female washrooms (04).

Warehouse 2nd floor –

- TP dispenser is too high (04).

Hydraulics Lab 2nd floor –

- The clear area in front of the accessible stall is inadequate in the male washroom (04).
- No grab bars and no vertical markers are provided at the urinal (04).
- TP dispenser too high in both the male and female washrooms (04).
- The urinal is mounted too high (04).

A&L upper floors (4 to 7) -

- No grab bars and no vertical markers are provided at the urinal (04).
- TP dispenser too high in both the male and female washrooms (04).
- The urinal is mounted too high (04).

WTC Building – none.

Annex Building –

- Remove urinal and remount at correct height.
- Provide grab bars and vertical markers at the urinal.

9.0 DRINKING FOUNTAINS

Accessibility Requirements of the Treasury Board *Accessibility Standard for Real Property:*

5.1. In the management of real property, custodians shall at a minimum, provide access to and use of the following:

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

PWGSC Assessment Considerations:

PWGSC Standards for Leased Accommodation only require one accessible fountain per floor.

9.1 Existing Conditions

Reference Checklists:
Accessibility Checklist M – Drinking Fountains

NWRI Building – drinking fountain are provided at numerous locations throughout this building, as follows:
A&L 1st floor – 3 locations (north, center and south) with original non-b-f fountains; also 2 fixtures at the auditorium, one of which has been replaced with a b-f fixture.
R&D 1st floor – 2 locations (center and north), the original centre fountain has been replaced with a b-f fixture.
Warehouse 1st floor – none (access to R&D center fixture).
Hydraulics Lab 1st floor – 2 locations (east and west), the original east fountain has been replaced with a b-f .
A&L 2nd floor – 1 location (north) with original non-b-f- fountain (access to R&D center fixture).
R&D 2nd floor - 2 locations (center and north), the original centre fountain has been replaced with a b-f fixture.
Warehouse 2nd floor – none (access to R&D center fixture).
Hydraulics Lab 2nd floor - 2 locations (east and west), the original east fountain has been replaced with a b-f fixture.

A&L upper floors (4 to 7) - each floor is provided with 3 drinking fountains (north, center and south); the original north fountain at each floor has been replaced with a b-f fixture.

WTC Building – there are no drinking fountains provided in this building.

Annex Building – there are no drinking fountains provided in this building.

9.2 Modifications Required to Comply with CAN CSA B651 95 Barrier-Free Design Standard

NWRI Building – none, b-f drinking fountains are provided at each level of this building.

WTC Building – not applicable.

Annex Building – not applicable.

9.3 Incremental Modifications Required to Comply with CAN CSA B651 04 Accessible Design for the Built Environment

The modification listed in 9.2 ensures compliance with CAN/CSA-B651-04.

10.0 TACTILE SIGNAGE and PUBLIC TELEPHONES

Accessibility Requirements of the Treasury Board *Accessibility Standard for Real Property:*

5.1. In the management of real property, custodians shall at a minimum, provide access to and use of the following:

g) public telephones. When banks of public telephones are provided, there must be at least one public telephone per bank accessible to persons in wheelchairs and one public telephone per bank accessible to persons with hearing impairments. All direct-line telephones and at least one charge-a-call telephone, when provided, shall be similarly accessible

Tactile signage. Tactile signs shall be provided for the following: washrooms, emergency exits, elevators, and stairwells.

PWGSC Assessment Considerations

Public telephones located in the entrance lobbies of PWGSC leased facilities are generally not modified as they do not constitute part of the leased premises.

10.1 Existing Conditions

Reference Checklists
Accessibility Checklist M - Tactile Signage
Accessibility Checklist N - Public Telephones

NWRI Building – various signage is provided throughout; there are no 'public use' telephones present in this building.
The following are below the minimum standard requirement:

- No tactile signage is provided at the washrooms (accessible and non-accessible), the enclosed stairwells, and the exit locations.

WTC Building – various signage is provided throughout; there are no 'public use' telephones present in this building.
The following are below the minimum standard requirement:

- No tactile signage is provided at the washrooms (accessible and non-accessible), the enclosed stairwells, and the exit locations.

Annex Building – various signage is provided throughout; there are no 'public use' telephones present in this building.
The following are below the minimum standard requirement:

- No tactile signage is provided at the washrooms, the stair and the exit locations.

10.2 Modifications Required to Comply with CAN CSA B651 95 Barrier-Free Design Standard

NWRI Building –

- Provide tactile signage at the washrooms (accessible and non-accessible), the enclosed stairwells, and the exit locations – approximately 104 locations.

WTC Building –

- Provide tactile signage at the washrooms (accessible and non-accessible), the enclosed stairwells, and the exit locations – approximately 16 locations.

Annex Building –

- Provide tactile signage at the washrooms, the stair, and the exit locations – approximately 6 locations.

10.3 Incremental Modifications Required to Comply with CAN CSA B651 04 Accessible Design for the Built Environment

Modification listed in 10.2 will ensure compliance with CAN/CSA-B651-04.

11.0 PUBLIC AREAS

Accessibility Requirements of the Treasury Board *Accessibility Standard for Real Property*:

5.1. In the management of real property, custodians shall at a minimum, provide access to and use of the following:

c) Public areas (including, but not limited to, cafeterias, lounges, recreation areas, eating areas, patios, libraries, and walkways);

l) 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.

m) 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.

11.1 Existing Conditions

Reference Checklists:
Accessibility Checklist P- Other employee & Public Area

NWRI Building – there are several ‘public areas’ present throughout this building, including the reception desk, the auditorium, the cafeteria, the library, various kitchenettes, and the staff outdoor rest area.
The following are below the minimum standard requirement:

- The existing kitchenettes throughout the facility have several deficiencies, including: inadequate clearance between counter and adjacent surfaces, work surface too high, no knee space, shelves above counter too high.
- No assistive listening device is provided in the auditorium.
- No wheelchair viewing positions are provided in the auditorium.

The following exceed the maximum permitted standard requirement:

- The coat rod in the auditorium lobby is too high.

WTC Building – the only ‘public area’ applicable to this building is the 2nd floor kitchen.
The following are below the minimum standard requirement:

- Both the kitchenettes in this facility have several deficiencies, including: inadequate clearance between counter and adjacent surfaces, work surface too high, no knee space, shelves above counter too high.

Annex Building – a kitchenette is provided on the 2nd floor, but not on the 1st floor (there is no wheelchair access to the 2nd floor).

11.2 Modifications Required to Comply with CAN CSA B651 95 Barrier-Free Design Standard

NWRI Building –

- Modify kitchenettes to meet b-f access requirements.
- Provide assistive listening devices in the auditorium.
- Provide wheelchair viewing positions in the auditorium.
- Provide lower coat rods in the auditorium lobby.

WTC Building –

- Modify kitchenettes to meet b-f access requirements.

Annex Building –

- Provide a kitchenette on the 1st floor.

11.3 Incremental Modifications Required to Comply with CAN CSA B651 04 Accessible Design for the Built Environment

Modification listed in 11.2 will ensure compliance with CAN/CSA-B651-04.

12.0 BUILDING EXEMPTIONS

With regards to exempting all or parts of facilities from accessibility requirements, the Accessibility Standard for Real Property standard includes the following reference:

12.1

Exemptions and Minor Variations

5.5. Certain elements of real property may be exempted from the full accessibility requirements unless the intended use requires public access or the job requirements are such that a person with a disability could meet these requirements. Custodians shall establish internal procedures for identifying and seeking the deputy head’s approval of full or partial exemptions from the accessibility requirements of this standard. They shall *document the rationale for these exemptions and maintain records of all real property that is partially or fully exempted in accordance with this standard.*

5.6. If the criteria that justified the exemption change, the custodian shall reassess the real property against this standard to ensure that the exemption is still justified.

5.7. Custodians may allow minor variations from the accessibility requirements of this standard (including the technical standard). However, such variations shall be consistent with the general intent of this standard and shall not affect the general accessibility of a specific property.

5.8. Where the accessibility requirements of this standard will significantly reduce the heritage quality of the property, some deviation from this standard is permitted. In deviating from the standard, custodians shall ensure that the following requirements are met:

a. access shall be provided to at least one main level of the building;

b. there shall be full access to government services and employment opportunities;

c. where washroom facilities are provided in an inaccessible location, equivalent facilities that are accessible shall also be provided; and

d. for inaccessible exhibitions, another version of the exhibition, such as a video display, shall be provided in an accessible area.

In response to 5.2 above, PWGSC has adopted the exemption criteria identified in the 1998 Real Property Accessibility policy (eg. which preceded the current Accessibility Standard for Real Property) for the purposes of formalizing exemptions under the 2005-2009 Audit Program.

Various new buildings or structures, due to their specialized design function or requirements, may be candidates for a reduced level of accessibility or can be completely exempted from barrier-free design requirements. Such facilities include, but are not limited to, the following:

1. Naturally inaccessible facilities in remote locations
This would include, for example, mountain top installations not accessible by vehicles, facilities on islands not served by accessible ferry systems, below-grade excavations not serviced by elevators, etc.

2. Unattended monitoring stations
This would include facilities which are not occupied on a full time-basis such as:
-facilities housing monitoring/test/experimental equipment or instrumentation which are monitored on an intermittent basis.
-lookout/observation towers.

3. Facilities designed and constructed to accommodate able-bodied personnel (i.e where being able-bodied is a specific part of the job requirement)
This would include such facilities as guardhouses, service garages, utility buildings, warehouses, processing plants etc. Offices and support functions provided for the sole use of the able-bodied staff located in these facilities can also be exempted.

4. Facilities where operational requirements preclude reasonable access by persons with disabilities
This could include facilities where immediate evacuation is required in the event of an accident. See also **Hazardous Occupancies** and **Facilities designed and constructed to accommodate able-bodied personnel**.

5. Hazardous Occupancies

In some cases, access need not be provided to certain parts of a facility such as boiler rooms, roofs, elevator pits, elevator penthouses, mechanical rooms, electrical vaults, piping or equipment catwalks, or areas of hazardous occupancy (as defined by the National Building Code of Canada and the National Fire Code of Canada), unless the intended use requires public access or the job requirements are such that a person with a disability could meet these requirements.

Based on the definitions of the National Building Code of Canada, this would include the following:
-high hazard industrial occupancy means an industrial occupancy containing sufficient quantities of highly combustible and flammable or explosive materials which, because of their inherent characteristics, constitute a special fire hazard.
-medium hazard industrial occupancy means an industrial occupancy containing in which the combustible content is more than 50 kg/m2 or 1200 MJ/m2 of floor area and not classified as high hazard industrial occupancy).

6. No barrier free access is required to the second storey of a two-storey building if the second storey is less than 600 m2 rentable and there is full access to government services and employment opportunities on the ground floor. The same provisions apply to single-storey buildings where the basement is used as an operational second floor.

This would include facilities where, for example, government services, offices and employee amenities (meeting rooms, kitchenettes, photocopy and business machine areas, etc.) are already located on an accessible Ground Floor and the second storey and/or basement level is less than 600 m2 rentable and consists of private offices only. Where a person in a wheelchair is located on an accessible ground floor, staff that supervises or is supervised by, this person should be co-located on the same floor.

7. Facilities to be permanently vacated or removed from federal inventory within one year

This would include facilities which, for example, are to be vacated dispose of, demolish, decommission or otherwise within the course of the 2005 to 2009 audit program. While RPA identifies a one year term, take into consideration planning, design and implementation time frames.

12.2 Recommended Exemptions

The following parts of the facility are identified for exemptions under the Accessibility Standard for Real Property and were therefore not examined in this accessibility audit:

Janitors closets, mechanical, electrical and telecommunications rooms, loading docks, long-term ‘dead’ storage areas at Basement level, etc.

13.0 ACCESSIBILITY COMPLIANCE SCORE

13.1 Existing Compliance with B651 95

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A	B	C	D	
Accessible Element	**Weighting (%)**	**Scoring (0 to/à 4)**	**Weighted Score (B X C)**	Full Compliance Ranking Score (for info only)
Walkways	5	3.0	15	20
Parking Spaces	5	3.0	15	20
Entrances to Property	20	3.0	60	80
Passenger Elevators-Platform Lifts	20	3.0	60	80
Interior Doors and Corridors (Base Building)	10	3.0	30	40
Washrooms	20	3.0	60	80
Water Coolers - Drinking Fountains	5	4.0	20	20
Public Telephones	5	4.0	20	20
Tactile Signage	5	3.0	15	20
Public Areas	5	3.0	15	20
Total	100%		310	400
% Compliance of Asset / % de conformité de l'Actif			**78%**	

% Compliance of Asset = Total D / 400

Scoring *

- 4 = Full compliance - Fully meets Treasury Board Accessibility Standard for Real Property (ASRP) and CAN/CSA B651 technical requirements or PWGSC acceptable technical variances.
- 3.5 = Excellent - Requires minor adjustment of existing element to comply with ASRP and CAN CSA technical requirements (sign/ accessory/grab bar relocations, maintenance items, painting, etc)
- 3 = Very Good - Requires replacement of existing element to comply with ASRP and CSA technical requirements (sign/ accessory installations, new controls for existing door operators, new grab bars etc)
- 2.5 = Good - Requires installation of new element to comply with ASRP and CSA technical requirements (installation of power door operators, grab bars, elevator control panels, etc)
- 2 = Moderate - Requires minor architectural/structural or mechanical interventions to comply with ASRP and CSA technical requirements (modification of ramp, reconfiguration of accessible stall, replacement of elevator panels, lowering of drinking fountain etc)
- 1.5 = Poor - Requires major architectural/structural or mechanical interventions to comply with ASRP and CSA technical requirements (extension of ramp, reconfiguration of washroom, replacement of elevator cab, replacement of drinking fountain etc)
- 1 = Very Poor - Requires construction of new accessibility element to meet ASRP or CSA technical requirements (construction or installation of new ramp, washroom, lift/elevator, drinking fountain etc)
- 0 = ASRP Accessibility element cannot be accommodated due to architectural, structural or other limitations

If a particular accessible element is not applicable to a specific facility (e.g. single storey building with no elevator, no public telephones, etc) assign a full score for that specific element. This is to avoid need for redistributing the scoring to the other accessible elements.

13.2 Existing Compliance with B651 04

A	B	C	D	
Accessible Element	Weighting (%)	Scoring (0 to/à 4)	Weighted Score (B X C)	Full Compliance Ranking Score (for info only)
Walkways	5	2.0	10	20
Parking Spaces	5	3.0	15	20
Entrances to Property	20	3.0	60	80
Passenger Elevators-Platform Lifts	20	2.0	40	80
Interior Doors and Corridors (Base Building)	10	3.0	30	40
Washrooms	20	2.0	40	80
Water Coolers - Drinking Fountains	5	3.0	15	20
Public Telephones	5	4.0	20	20
Tactile Signage	5	3.0	15	20
Public Areas	5	3.0	15	20
Total	100%		260	400
% Compliance of Asset / % de conformité de l'Actif			**65%**	

% Compliance of Asset = Total D / 400

Scoring *

- 4 = Full compliance - Fully meets Treasury Board Accessibility Standard for Real Property (ASRP) and CAN/CSA B651 technical requirements or PWGSC acceptable technical variances.
- 3.5 = Excellent - Requires minor adjustment of existing element to comply with ASRP and CAN CSA technical requirements (sign/ accessory/grab bar relocations, maintenance items, painting, etc)
- 3 = Very Good - Requires replacement of existing element to comply with ASRP and CSA technical requirements (sign/ accessory installations, new controls for existing door operators, new grab bars etc)
- 2.5 = Good - Requires installation of new element to comply with ASRP and CSA technical requirements (installation of power door operators, grab bars, elevator control panels, etc)
- 2 = Moderate - Requires minor architectural/structural or mechanical interventions to comply with ASRP and CSA technical requirements (modification of ramp, reconfiguration of accessible stall, replacement of elevator panels, lowering of drinking fountain etc)
- 1.5 = Poor - Requires major architectural/structural or mechanical interventions to comply with ASRP and CSA technical requirements (extension of ramp, reconfiguration of washroom, replacement of elevator cab, replacement of drinking fountain etc)
- 1 = Very Poor - Requires construction of new accessibility element to meet ASRP or CSA technical requirements (construction or installation of new ramp, washroom, lift/elevator, drinking fountain etc)
- 0 = ASRP Accessibility element cannot be accommodated due to architectural, structural or other limitations

If a particular accessible element is not applicable to a specific facility (e.g. single storey building with no elevator, no public telephones, etc) assign a full score for that specific element. This is to avoid need for redistributing the scoring to the other accessible elements.

BIBLIOGRAPHY

Accessibility for All, Report of the Standing Committee on Human Resources, Skills Development, Social Development and the Status of Persons with Disabilities, June, 2005.

Federal Real Property Accessibility Standard (Draft dated June 2005), Treasury Board of Canada Secretariat, 2005

Real Property Accessibility, Treasury Board of Canada Secretariat, June 30, 1998.

CAN/CSA B651 95 Barrier-Free Design, Canadian Standards Association, September 1995.

CAN/CSA B651 04 Accessible Design for the Built Environment, Canadian Standards Association, August, 2004.

Accessibility Evaluation Guide, Accessibility Office, Public Works Canada, January, 1994.

Canada Labour Code, Part II: Canada Occupational Safety and Health Regulations, December 23, 1998.

APPENDIX A: Accessibility Standard for Real Property (November 1, 2006)
ACCESSIBILITY STANDARD FOR REAL PROPERTY

Table of Contexts

Accessibility Standard for Real Property

1. Effective date

This standard is effective November 1, 2006.

2. Application

This standard applies to all departments within the meaning of section 2 of the *Financial Administration Act*, unless specific acts or regulations override it.

3. Context

The *Canadian Human Rights Act* (CHRA) gives effect to the principle that all individuals should have equal opportunity to have their needs accommodated, consistent with their duties and obligations and to function as members of society, without being hindered in, or prevented from, doing so by discriminatory practices.
The *CHRA* prohibits discrimination in the provision of goods, services, facilities or accommodation customarily available to the general public and prohibits the adverse differentiation between individuals.

4. Purpose

The Treasury Board *Policy on the Management of Real Property* holds Deputy Heads responsible for providing barrier-free access to, use of and exit from real property in accordance with this standard. This standard establishes minimum requirements for the accessibility of real property to meet the objectives of the policy.
This standard is issued pursuant to the Financial Administration Act, subsections 7(1), 9(1.1), 9(2) and the Federal Real Property and Federal Immovables Act, subsection 16(4).

5. Accessibility requirements

5.1. In the management of real property, custodians shall at a minimum, provide access to and use of the following:

a. Entrances. Frequently used points of access to the property must be equipped with a power door operator at main entrances to real property. Where entry to or exit from the facility is through a series of doors in a vestibule-like arrangement, at least one complete set of doors allowing access to the vestibule area shall be so equipped.

b. Passenger elevators.

c. Public areas (including, but not limited to, cafeterias, lounges, recreation areas, eating areas, patios, libraries, and walkways).

d. Federal work areas (including, but not limited to, offices, on-floor storage areas, meeting and training rooms, computer rooms and spaces for business machines).

e. Interior doors and corridors.

f. Washrooms.

g. Public telephones. When banks of public telephones are provided, there must be at least one public telephone per bank accessible to persons in wheelchairs and one public telephone per bank accessible to persons with hearing impairments. All direct-line telephones and at least one charge-a-call telephone, when provided, shall be similarly accessible.

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

i. Tactile signage. Tactile signs shall be provided for the following: washrooms, emergency exits, elevators and stairwells.

j. Where employee or visitor parking is provided, the quantity of accessible parking spaces provided shall conform with municipal by-laws or the following table, whichever has the higher number of accessible spaces:

Total Parking Spaces	***Minimum No. of Accessible Spaces***	***Total Parking Spaces***	***Minimum No. of Accessible Spaces***
up to 25	*1*	*151–200*	*6*
26–50	*2*	*201–300*	*7*
51–75	*3*	*301–400*	*8*
76–100	*4*	*401–500*	*9*
101–150	*5*	*more than 500*	*2% of total*

Accessible parking spaces shall be within a reasonable and safe proximity of the federal facility but may be distributed among distinct parking areas.

k. Accessibility shall include routes from accessible parking areas, local public transit stops and all drop-off areas that are within the limits of the federal property to main entrances.

l. Accessible seating spaces shall be provided within auditoriums, theatres and other general assembly areas in the quantities identified in the *National Building Code of Canada*.

m. Classrooms, auditoriums, meeting rooms and theatres of more than 100 square metres shall be equipped with an assistive listening system encompassing the entire seating area.

5.2.In meeting accessibility requirements for real property, departments shall apply the technical standard found in the publication entitled “Accessible Design For the Built Environment’’ (CAN/CSA-B651-04).

Note: This technical standard has applied to the accessibility requirements of real property acquired (including lease renewal), under construction or undergoing major refit since October 1, 2004. It does not apply retroactively to accessibility requirements of real property in the inventory prior to October 1, 2004.

5.3. For Crown-leased real property outside Canada, custodians shall make best efforts to meet the standard.

5.4. Departments shall adapt residential units to the technical standard when employees or their immediate dependants require accessibility.

Exemptions and minor variations

5.5. Certain elements of real property may be exempted from the full accessibility requirements unless the intended use requires public access or the job requirements are such that a person with a disability could meet these requirements. Custodians shall establish internal procedures for identifying and seeking the deputy head's approval of full or partial exemptions from the accessibility requirements of this standard. They shall document the rationale for these exemptions and maintain records of all real property that is partially or fully exempted in accordance with this standard.

5.6. If the criteria that justified the exemption change, the custodian shall reassess the real property against this standard to ensure that the exemption is still justified.

5.7. Custodians may allow minor variations from the accessibility requirements of this standard (including the technical standard). However, such variations shall be consistent with the general intent of this standard and shall not affect the general accessibility of a specific property.

5.8. Where the accessibility requirements of this standard will significantly reduce the heritage quality of the property, some deviation from this standard is permitted. In deviating from the standard, custodians shall ensure that the following requirements are met:

e. access shall be provided to at least one main level of the building;

f. there shall be full access to government services and employment opportunities;

g. where washroom facilities are provided in an inaccessible location, equivalent facilities that are accessible shall also be provided; and

h. for inaccessible exhibitions, another version of the exhibition, such as a video display, shall be provided in an accessible area.

6. Reference

Treasury Board policy instruments

- Federal Identity Program Manual, Section 4.3b. Tactile Signage
- Management of Information Technology Standards
- Policy on the Duty to Accommodate Persons with Disabilities in the Federal Public Service
- Policy on the Management of Real Property

7. Enquiries

Please direct enquiries about this standard to your departmental headquarters. For interpretation of this standard, headquarter officials should contact:

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