Public Works and Government Services Canada | Travaux publics et Services gouvernementaux Canada

RETURN BIDS TO:
RETOURNER LES SOUMISSIONS À:

Regional Manager/Real Property Contracting/PWGSC
Ontario Region, Tendering Office
12th Floor, 4900 Yonge Street
Toronto, Ontario
M2N 6A6
Ontario

Revision to a Request for a Standing Offer
Révision à une demande d'offre à commandes

Departmental Individual Standing Offer (DISO)

Offre à commandes individuelle du département(OCID)

The referenced document is hereby revised; unless otherwise indicated, all other terms and conditions of the Offer remain the same.

Ce document est par la présente révisé; sauf indication contraire, les modalités de l'offre demeurent les mêmes.

Comments - Commentaires

Vendor/Firm Name and Address
Raison sociale et adresse du fournisseur/de l'entrepreneur

Issuing Office - Bureau de distribution

Regional Manager/Real Property Contracting/PWGSC
Ontario Region, Tendering Office
12th Floor, 4900 Yonge Street
Toronto, Ontario
M2N 6A6
Ontario

Title - Sujet Architectural Services RFSO	
Solicitation No. - N° de l'invitation EQ754-161519/A	**Date** 2016-02-09
Client Reference No. - N° de référence du client 20161519	**Amendment No. - N° modif.** 007
File No. - N° de dossier PWL-5-38165 (027)	**CCC No./N° CCC - FMS No./N° VME**
GETS Reference No. - N° de référence de SEAG PW-$PWL-027-2095	
Date of Original Request for Standing Offer **Date de la demande de l'offre à commandes originale**	2015-12-21
Solicitation Closes - L'invitation prend fin **at - à 02:00 PM** **on - le 2016-02-23**	**Time Zone** **Fuseau horaire** Eastern Standard Time EST
Address Enquiries to: - Adresser toutes questions à: Jackson, Dahlia	**Buyer Id - Id de l'acheteur** pwl027
Telephone No. - N° de téléphone (416) 512-5918 ( )	**FAX No. - N° de FAX** (416) 512-5862
Delivery Required - Livraison exigée	
Destination - of Goods, Services, and Construction: **Destination - des biens, services et construction:** Ontario Region	
Security - Sécurité This revision does not change the security requirements of the Offer. Cette révision ne change pas les besoins en matière de sécurité de la présente offre.	

Instructions: See Herein

Instructions: Voir aux présentes

Acknowledgement copy required **Accusé de réception requis**	**Yes - Oui** ☐	**No - Non** ☐

The Offeror hereby acknowledges this revision to its Offer.
Le proposant constate, par la présente, cette révision à son offre.

Signature **Date**

Name and title of person authorized to sign on behalf of offeror. (type or print)
Nom et titre de la personne autorisée à signer au nom du proposant.
(taper ou écrire en caractères d'imprimerie)

For the Minister - Pour le Ministre

Canada

Amendment No. 007

This amendment is being raised to 1) incorporate changes to the following sections of the RFSO: i) Standing Offer Brief, and ii) Appendix D – Doing Business with A&E Ontario Region – Standing Offers and 2) provide responses to Requests for Clarification.

1. Revisions to Request for Standing Offer

(i) Reference: Standing Offer Brief

a) Standing Offer Brief, Agreement Administration (AA), AA 2 Functional Requirements, AA 2.1 Design Codes, Regulations and Reference Documents, article 2.1.2:

"Refer to PWGSC document "Doing Business with A&E Ontario Region - Standing Offers" attached in Appendix D for a minimal list of applicable codes, regulations, standards and guidelines."

Proponents are hereby instructed to:

Delete: In it's entirety.

Insert: "Refer to PWGSC document "Doing Business with PWGSC", attached as Appendix D, and "PWGSC Base Building Standard for Office Buildings – Draft", attached as Appendix E, for a minimal list of applicable codes, regulations, standards and guidelines.

b) Standing Offer Brief, Agreement Administration (AA), AA 2 Functional Requirements, AA 2.4 General Project Deliverable, article 2.4.3:

"The standards in the PWGSC document "Doing Business with A&E Ontario Region - Standing Offers" and requirements at each project delivery stage as described in each individual Call-up must be adhered to in conjunction with this scope of services."

Proponents are hereby instructed to:

Delete: In it's entirety.

Insert: "The standards in the PWGSC document "PWGSC Base Building Standard for Office Buildings - Draft" and requirements at each project delivery stage as described in each individual Call-up must be adhered to in conjunction with this scope of services."

c) All other references to "Doing Business with A&E Ontario Region - Standing Offers" in the solicitation document are to be changed to "Doing Business with PWGSC".

(ii) Reference: Appendix D – Doing Business with A&E Ontario Region – Standing Offers

Proponents are hereby instructed to:

Delete: In it's entirety.

Insert: Doing Business with PWGSC (*appended to this amendment*)

(iii) Reference: Appendix E – PWGSC Base Building Standard for Office Buildings

Proponents are hereby instructed to:

Add: PWGSC Base Building Standard for Office Buildings (*appended to this amendment*) as Appendix E.

2. Responses to Requests for Clarification

Q1. What, if any, are the licencing requirements for the Heritage Conservation Specialist for RFSO - EQ754-161519/A?

R1. There are no licencing requirements associated with this specialist. However, the specialist needs to demonstrate relevant experience and expertise in the field of heritage conservation and be a member of a heritage conservation organization, such as the Canadian Association of Heritage Professional (CAHP). The specialist also needs to be knowledgeable with the Standards and Guidelines for the Conservation of Historic Places in Canada.

Q2. The RFSO documents, Doing Business with A&E sections 4.15 and 4.16 appear to indicate that it is not a requirement to use NMSEdit Professional, provided a hard and soft electronic copy compatible with NMSEdit Professional version 3.00.01G or MS Word 2010, and PDF is supplied. Please confirm that it is not mandatory to use the NMSEdit software and that the Ontario Region amended NMS Sections are to be made available for download in .rtf for MS Word format.

R2. The use of NMSEdit software is currently not mandatory, as Ontario Region provides the amended NMS Sections in .rtf for MS Word format. However, Ontario Region may no longer offer this option in the future depending on further direction from Ottawa.

Q3. Page 2, Section SI 3 of the RFSO document states that “some call-ups against the Standing Offers might require that the consultants and their personnel possesses a Facility Security Clearance (FSC) at the Reliability level”. As Facility Security Clearances start at the Secret level, would PWGSC confirm whether consultants and our personnel require a Facility Security Clearance at the Secret level or a Designated Organizational Screening clearance at the Reliability level?

R3. Please refer to Solicitation Amendment No. 006, 2) Revisions to the Supplementary Instruction to Proponents (SI), SI 3 Security Requirements.

Q4. Addendum 5, Question and Response #5 indicate that a copy of the certificate of practice and/or authorization must be supplied. Does this proof of licensing apply only to the prime consultant/Architect or does it extend to all the key sub-consultants/specialists? If it does would you please indicate what sort of proof of authorization you expect to see for these disciplines?

R4. A copy of the certificate of practice and/or authorization should be provided by the Proponent. Sub-Consultants and specialists may indicate current professional license and/or how they intend to meet the Ontario provincial licensing requirements on the Team Identification form submitted under Appendix C.

Q5. Where in the proposal do you want Acknowledgement for the Amendments? Are we to fax to you that we have received or within the proposal?

R5. Acknowledged front pages of Solicitation Amendments may be submitted with the proposal.

Q6. On the Front page of the Revision(s) to the RFSO document. In the bottom right hand corner it says *Acknowledgement Copy Required. Yes or No.* Im not sure what that means - please advise.

R6. A checkmark should appear in the 'Yes' box. Please submit acknowledged front pages of the solicitation amendments with the proposal.

Q7. Is it possible to identify the same individual as 3.2.4 Senior Personnel and 3.2.5 Project Personnel?

R7. Yes, it is possible. However, the individual needs to meet the higher expectation as a minimum.

Q8. Request for clarification between the use of 'Senior Personnel' and 'Senior Architect' or 'Senior Engineer':

In Appendix B– Price Proposal, the following Senior roles are indicated as follows:

1. Architectural : Senior Architect

2. Structural Engineer: Senior Engineer

3. Mechanical Engineer: Senior Engineer

4. Electrical Engineer: Senior Engineer

In Section 3.2.4, we have been asked to identify them as Senior Personnel. This is also reflected in Appendix C – Team Identification.

Please clarify if Senior Technologists and Technicians are to be categorized the same as Senior Engineers / Senior Architects. If not, can the Senior Engineer/Senior Architect be categorized as Senior Personnel?

R8. Only Senior Engineers and Architects with the relevant experience should be identified as Senior Personnel.

Q9. Regarding GI 2.3, could you clarify the value of individual call ups. "*Proponents should also note that Call-ups may vary from $10,000.00 for smaller requirements up to the $1,000,000.00 limitation under exceptional circumstances."* Could you clarify whether those figures refer to project cost (hard + soft costs), construction cost or professional fees. This will help us select reference projects best suited in our response.

R9. These estimated Call-up values refer to the total fees for Consultant services (i.e. professional fees).

All other terms and conditions of the solicitation remain the same.

APPENDIX D

DOING BUSINESS WITH PUBLIC WORKS AND GOVERNMENT SERVICES CANADA (PWGSC)

Public Works and Government Services Canada | Travaux publics et Services gouvernementaux Canada

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Last updated: April 8, 2013

TABLE OF CONTENTS

SECTION 1 INTRODUCTION

This document must be used in conjunction with the Terms of Reference (TOR), as the two documents are complimentary. The TOR describes project-specific requirements while this document deals with information common to all projects. In case of a conflict between the two documents, the requirements of the TOR override this document.

SECTION 2 PWGSC NATIONAL CADD STANDARD

Drawings shall be in accordance with PWGSC National CADD Standards and Canadian Standards Association (CSA) B78.3.

Refer to:
http://www.tpsgc-pwgsc.gc.ca/biens-property/cdao-cadd/index-eng.html

The above link is subject to change. The Consultant shall check with the Project Manager to ensure that the link and related information are current and relevant with regards to PWGSC National CADD Standards.

SECTION 3 GUIDE TO PREPARATION OF CONSTRUCTION DOCUMENTS FOR PWGSC

1 Purpose

This document provides direction in the preparation of construction contract documents (namely specifications, drawings and addenda) for Public Works and Government Services Canada (PWGSC).

Drawings, specifications and addenda must be complete and clear, so that a contractor can prepare a bid without guesswork. Standard practice for the preparation of construction contract documents requires that:

- drawings are the graphic means of showing work to be done, as they depict shape, dimension, location, quantity of materials and relationship between building components.
- specifications are written descriptions of materials and construction processes in relation to quality, colour, pattern, performance and characteristics of materials, installation and quality of work requirements.
- Addenda are changes to the construction contract documents or tendering procedures, issued during the tendering process.

2 Principles of PWGSC Contract Documents

PWGSC's contract documents are based on common public procurement principles. PWGSC does not use Canadian Construction Document Committee (CCDC) documents.

The terms and conditions are prepared and issued by PWGSC as well as other related bidding and contractual documents. For information, the clauses are available on the following web site: **http://sacc.pwgsc.gc.ca/sacc/query-e.jsp**. Any questions should be directed to the Project Manager.

3 Quality Assurance

Consultants are required to undertake their own quality control process and must review, correct and coordinate (between disciplines) their documents before sending them to PWGSC.

SPECIFICATIONS

1 National Master Specification

The National Master Specification (NMS) is a master construction specification available in both official languages, which is divided into 48 Divisions and used for a wide range of construction and/or renovation projects. In preparing project specifications, the Consultant must use the current edition of the NMS in accordance with the “NMS User’s Guide”.

The Consultant retains overriding responsibility for content and shall edit, amend and supplement the NMS as deemed necessary to produce an appropriate project specification free from conflict and ambiguity.

2 Specification Organization

Narrowscope sections describing single units of work are preferred for more complex work, however, broadscope sections may be more suitable for less complex work. Use either the NMS 1/3 - 2/3 page format or the Construction Specifications Canada full-page format.

Start each Section on a new page and show Project Number, Section Title, Section Number and Page Number on each page. Specification date, project title, and consultant’s name are not to be indicated.

3 Terminology

Use the term "Departmental Representative" instead of Engineer, PWGSC, Owner, Consultant or Architect. "Departmental Representative" means the person designated in the Contract, or by written notice to the Contractor, to act as the Departmental Representative for the purposes of the Contract, and includes a person, designated and authorized in writing by the Departmental Representative to the Contractor.

Notations such as: "verify on site", "as instructed", “to match existing”, “example”, “equal to” or “equivalent to”, "to be determined on site by “Departmental Representative", should not be indicated in the specifications as this promotes inaccurate and inflated bids. Specifications must permit bidders to calculate all quantities and bid accurately. If quantities are impossible to identify (i.e. cracks to be repaired) give an estimated quantity for bid purposes (unit prices). Ensure that the terminology used throughout the specifications is consistent and does not contradict the applicable standard construction contract documents.

4 Dimensions

Dimensions are to be in metric only (no dual dimensioning).

5 Standards

As references in the NMS may not be up to date, it is the responsibility of the consultant to ensure that the project specification uses the latest applicable edition of all references quoted. The following is a list of some of the Internet websites which provide the most current publications of standards for reference in the construction specification document.

- CSA standards: http://www.csa.ca
- CGSB standards: http://www.pwgsc.gc.ca/cgsb
- ANSI standards: http://www.ansi.org
- ASTM Standards: http://www.astm.org
- ULC standards: http://www.ulc.ca
- General reference of standards: http://www.cssinfo.com

The NMS website (http://www.tpsgc-pwgsc.gc.ca/biens-property/ddn-nms/index-eng.html) also links to other documents references in the NMS under its "Links" feature.

6 Specifying Materials

The practice of specifying actual brand names, model numbers, etc., is against departmental policy except for special circumstances. The method of specifying materials shall be by using recognized standards such as those produced by Canadian Gas Association (CGA), Canadian General Standards Board (CGSB), Canadian Standards Association (CSA), and Underwriters' Laboratories of Canada (ULC), or by trade associations such as Canadian Roofing Contractors' Association (CRCA) and Terrazzo, Tile, Marble Association of Canada (TTMAC). Canadian standards should be used wherever possible.

If the above method cannot be used and where no standards exist, specify by a non-restrictive, non-trade name "prescription" or "performance" specifications.

In exceptional or justifiable circumstances or if no standards exist and when a suitable non-restrictive, non-trade name "prescription" or "performance" specification cannot be developed, specify by trade name. Include all known materials acceptable for the purpose intended, and in the case of equipment, identify by type and model number.

Acceptable Materials: set up the paragraph format as follows:

Acceptable Materials:

1. ABC Co. Model [_____].
2. DEF Co. Model [_____].
3. GHI Co. Model [_____].

Alternative materials to those specified may be considered during the solicitation period, however, the onus will be on the Consultant to review and evaluate all requests for approval of alternative materials.

The term "Acceptable Manufacturers" should not be used, as this restricts competition and does not ensure the actual material or product will be acceptable. A list of words and phrases that should be avoided is included in the NMS User's Guide.

Sole Sourcing: Sole sourcing for materials and work can be used for proprietary systems (ie. fire alarm systems, EMCS systems). Substantiation and/or justification will be required.

Wording for the sole source of work should be in Part 1 as:

"Designated Contractor

.1 Hire the services of [_____] to do the work of this section."

Wording for the sole source of EMCS systems should be in Part 1 as

"Designated Contractor

.1 Hire the services of [_____] or its authorized representative to complete the work of all EMCS sections."

and in Part 2 as "Materials

.1 There is an existing [_____] system presently installed in the building. All materials must be selected to ensure compatibility with the existing [_____] system.

Wording for the sole source of materials (ie. fire alarm systems) should be in Part 2 as:

"Acceptable materials

.1 The only acceptable materials are [_____] ."

Prior to including sole source materials and/or work, the Consultant should contact the Project Manager to obtain the approval for the sole sourcing.

7 Unit Prices

Unit prices are used where the quantity can only be estimated (eg. earth work) and the approval of the Project Manager must be sought in advance of their use.

Use the following wording:

> [The work for this section] or [define the specific work if required, e.g. rock excavation] will be paid based on the actual quantities measured on site and the unit prices stated in the Bid and Acceptance Form.

In each applicable NMS section, replace paragraph title "Measurement for Payment" with "Unit Prices".

Sample of Unit Price Table:

> The Unit Price Table designates the Work to which a Unit Price Arrangement applies.
>
> (a) The Price per Unit and the Estimated Total Price must be entered for each Item listed.
>
> (b) Work included in each item is as described in the referenced specification section.

Item	Specification Reference	Class of Labour, Plant or Material	Unit of Measurement	Estimated Quantity	Price per Unit GST/HST extra	Estimated Total Price GST / HST extra
					TOTAL ESTIMATED AMOUNT Transfer amount to subparagraph 1)(b) of BA03	

8 Cash Allowances

Construction contract documents should be complete and contain all of the requirements for the contractual work. Cash allowances are to be used only under exceptional circumstances (ie. utility companies, municipalities), where no other method of specifying is appropriate. Obtain approval from the Project Manager in advance to include cash allowances and then use "Section 01 21 00 - Allowances" of the NMS to specify the criteria.

9 Warranties

It is the practice of PWGSC to have a 12 month warranty and to avoid extending warranties for more than 24 months. When necessary to extend beyond the 12 month warranty period provided for in the General Conditions of the contract, use the following wording in Part 1 of the applicable technical sections, under the heading "Extended Warranty":

- "For the work of this Section [_____], the 12 month warranty period is extended to 24 months.
- Where the extended warranty is intended to apply to a particular part of a specification section modify the above as follows: "For [_____] the 12 month ... [_____] months."

Delete all references to manufacturers' guarantees.

10 Scope of Work
No paragraphs noted as "Scope of Work" are to be included.

11 Summary and Section Includes in Part -1 General of Section
Do not use "Summary" and "Section Includes."

12 Related Sections
In every section of the specification at 1.1 "Related Sections": coordinate the list of related sections and appendices. Ensure co-ordination among the sections of the specification and ensure not to reference any section or appendices which do not exist.

13 Index
List all the plans and specification sections with correct number of pages, section names and correct drawing titles in the format shown in Appendix A.

14 Regional Guide
The Consultant should contact the Project Manager to obtain the region's requirements for Division 01 or other short form specifications as might be appropriate. For example, it is required in the National Capital Region that regional Section 01 00 10 - General Instructions be used on all projects.

15 Health and Safety
It is required that all project specifications include "Section 01 35 29.06 - Health and Safety Requirements." Confirm with the Project Manager to determine if there are any instructions to meet regional requirements.

16 Designated Substances Report
Include "Section 01 14 25 - Designated Substances Report"

17 Subsurface Investigation Reports
Subsurface Investigation Report(s) are to be included after Section 31 and the following paragraph should be added to Section 31:

Subsurface investigation report(s)

.1 Subsurface investigation report(s) are included in the specification following this section.

When the Project Manager determines that it is not practical to include the subsurface investigation report(s), alternate instructions will be provided.

Where tender documents are to be issued in both official languages, the subsurface investigation report(s) shall be issued in both languages.

In addition to the provision of the Subsurface Investigation Report, the foundation information required by the National Building Code of Canada 2005 (Division C, Part 2, 2.2.4.6) shall be included on foundation drawings.

18 Experience and Qualifications

Remove experience and qualification requirements from specification sections.

19 Prequalification and Pre-award submissions

Do not include in the specification any mandatory contractor and/or subcontractor prequalification or pre-award submission requirements that could become a contract award condition. If a prequalification process or a pre-award submission is required, contact the Project Manager.

There should be no references to certificates, transcripts or license numbers of a trade or subcontractor being included with the bid.

20 Contracting Issues

Specifications describe the workmanship and quality of the work. Contracting issues should not appear in the specifications. Division 00 of the NMS is not used for PWGSC projects.

Remove all references within the specifications, to the following:

- General Instructions to Bidders
- General Conditions
- CCDC documents
- Priority of documents
- Security clauses
- Terms of payment or holdback
- Tendering process
- Bonding requirements
- Insurance requirements
- Alternative and separate pricing
- Site visit (Mandatory or Optional)
- Release of Lien and deficiency holdbacks

DRAWINGS

1 Title Blocks

Use PWGSC title block for drawings and sketches (including addenda).

2 Dimensions

Dimensions are to be in metric only (no dual dimensioning).

3 Trade Names

Trade names on drawings are not acceptable. Refer to SECTION 3, SPECIFICATIONS, 6.0 Specifying Materials for specifying materials by trade name.

4 Specification Notes

No specification type notes are to appear on any drawing.

5 Terminology

Use the term "Departmental Representative" instead of Engineer, PWGSC, Owner, Consultant or Architect. "Departmental Representative" means the person designated in the Contract, or by written notice to the Contractor, to act as the Departmental Representative for the purposes of the Contract, and includes a person, designated and authorized in writing by the Departmental Representative to the Contractor.

Notations such as: "verify on site", "as instructed", “to match existing”, “example”, “equal to” or “equivalent to”, "to be determined on site by “Departmental Representative", should not be indicated in the specifications as this promotes inaccurate and inflated bids. Specifications must permit bidders to calculate all quantities and bid accurately. If quantities are impossible to identify (i.e. cracks to be repaired) give an estimated quantity for bid purposes (unit prices). Ensure that the terminology used throughout the specifications is consistent and does not contradict the applicable standard construction contract documents.

6 Information to be included

Drawings should show the quantity and configuration of the project, the dimensions and details of how it is constructed. There should be no references to future work and no any information that will be changed by future addenda. The scope of work should be clearly detailed and elements not in contract should be eliminated or kept to an absolute minimum.

7 Drawing Numbers: Number drawings in sets according to the type of drawing and the discipline involved as follows (The requirements of SECTION 2 PWGSC NATIONAL CADD STANDARD will supercede these requirements, where warranted).

During the Design Phase of the project each submission and review must be noted on the Notes block of the drawing title, but at the time of construction document preparation, all revision notes should be removed.

Discipline	Drawing
Demolition	D1, D2, etc.
Architectural	A1, A2, etc.
Civil	C1, C2, etc.
Landscaping	L1, L2, etc.
Mechanical	M1, M2, etc.
Electrical	E1, E2, etc.
Structural	S1, S2, etc.
Interior Design	ID1, ID2, etc.

8 **Presentation Requirements:** Present drawings in sets comprising the applicable demolition, architectural, structural, mechanical and electrical drawings in that order. All drawings should be of uniform standard size.

9 **Prints:** Print with black lines on white paper. Blue prints are acceptable for document submissions at 33%, 66% and 99% stages. Confirm with Project Manager the size of prints to be provided for review purposes.

10 **Binding:** Staple or otherwise bind prints into sets. Where presentations exceed 20 sheets, the drawings for each discipline may be bound separately for convenience and ease of handling.

11 **Legends:** Provide a legend of symbols, abbreviations, references, etc., on the front sheet of each set of drawings or, in large sets of drawings, immediately after the title sheet and index sheets.

12 **Schedules:** Where schedules occupy entire sheets, locate them next to the plan sheets or at the back of each set of drawings for convenient reference. *See CGSB 33-GP-7 Architectural Drawing Practices for schedule arrangements.*

13 **North Points:** On all plans include a north point. Orient all plans in the same direction for easy cross-referencing. Wherever possible, lay out plans so that the north point is at the top of the sheet.

14 **Drawing Symbols:** Follow generally accepted drawing conventions, understandable by the construction trades, and in accordance with PWGSC publications.

ADDENDA

1 Format

Prepare addenda using the format shown in Appendix B. No signature type information is to appear.

Every page of the addendum (including attachments) must be numbered consecutively. All pages must have the PWGSC project number and the appropriate addendum number. Sketches shall appear in the PWGSC format, stamped and signed.

No Consultant information (name, address, phone #, consultant project # etc.) should appear in the addendum or its attachments (except on sketches).

2 Content

Each item should refer to an existing paragraph of the specification or note/detail on the drawings. The clarification style is not acceptable.

DOCUMENTATION

Translation

When required, all documentation included in the construction contract documents shall be in both official languages.

Ensure that English and French documents are equal in all respects. There can be no statement that one version takes precedence over the other.

Consultant shall provide:

- Per construction document submission, a completed and signed Checklist for the Submission of Construction Documents. See Appendix 'A'.
- Specification: originals printed one side on 216 mm x 280 mm white bond paper.
- Index: as per Appendix 'C'
- Addenda (if required): as per Appendix 'B' (to be issued by PWGSC).
- Drawings: reproducible originals, sealed and signed by the design authority.
- Tender information:
  - Including a description of all units and estimated quantities to be included in unit price table.
  - Including a list of significant trades including costs. PWGSC will then determine which trades, if any, will be tendered through the Bid Depository.
  - Government Electronic Tendering System (MERX): Consultants to provide an electronic true copy of the final documents (specifications and drawings) on one or multiple CD-ROM in Portable Document Format (PDF) without password protection and printing restrictions. The electronic copy of drawings and specifications is for bidding purposes only and do not require to be signed and sealed. See Appendix 'D' and Appendix 'E'.

PWGSC shall provide:

- General and Special Instructions to Bidders
- Bid and Acceptance Form
- Standard Construction Contract Documents

SECTION 4 CLASSES OF CONSTRUCTION COST ESTIMATES USED BY PWGSC

DESCRIPTION OF THE CLASSES OF ESTIMATES USED BY PWGSC FOR CONSTRUCTION COSTING OF BUILDINGS PROJECTS

Class 'D' (Indicative) Estimate:

Based upon a comprehensive statement of requirements, and an outline of potential solutions, this estimate is to provide an indication of the final project cost, and allow for ranking all the options being considered.

Submit Class D cost estimates in elemental cost analysis format latest edition issued by the Canadian Institute of Quantity Surveyors with cost per m² for current industry statistical data for the appropriate building type and location. Include a summary in the cost estimate, plus full back up, showing items of work, quantities, unit prices, allowances and assumptions.

The level of accuracy of a class D cost estimate shall be such that no more than a 20% contingency allowance is required.

Class 'C' Estimate:

Based on a comprehensive list of requirements and assumptions, including a full description of the preferred schematic design option, construction/design experience, and market conditions. This estimate must be sufficient for making the correct investment decision.

Submit Class C cost estimates in elemental cost analysis format latest edition issued by the Canadian Institute of Quantity Surveyors with cost per m² for current industry statistical data for the appropriate building type and location. Include a summary in the cost estimate, plus full back up, showing items of work, quantities, unit prices, allowances and assumptions.

The level of accuracy of a class C cost estimate shall be such that no more than a 15% contingency allowance is required.

Class 'B' (Substantive) Estimate:

Based on design development drawings and outline specifications, which include the design of all major systems and subsystems, as well as the results of all site/installation investigations. This estimate must provide for the establishment of realistic cost objectives and be sufficient to obtain effective project approval.

Submit Class B cost estimates in elemental cost analysis format latest edition issued by the Canadian Institute of Quantity Surveyors. Include a summary in the cost estimate, plus full back up, showing items of work, quantities, unit prices, allowances and assumptions.

The level of accuracy of a class B cost estimate shall be such that no more than a 10% design contingency allowance is required.

Class 'A' (Pre-Tender) Estimate:

Based on completed construction drawings and specifications prepared prior to calling competitive tenders. This estimate must be sufficient to allow a detailed reconciliation/negotiation with any contractor's tender.

Submit Class A cost estimates in both elemental cost analysis format and trade divisional format latest edition issued by the Canadian Institute of Quantity Surveyors. Include a summary in the cost estimate, plus full back up, showing items of work, quantities, unit prices, allowances and assumptions.

The level of accuracy of a class A cost estimate shall be such that no more than a 5% design contingency allowance is required.

SECTION 5 TIME MANAGEMENT

1 Time Management, Planning, and Control

The Time Management, Planning, and Control Specialist (scheduler) shall provide a Project Planning and Control System (Control System) for Planning, Scheduling, Progress Monitoring and Reporting and a Time Management, Planning, and Control Report (Progress Report). It is required that a fully qualified and experienced Scheduler play a major role in providing services in the development and monitoring of the project schedule.

The scheduler will follow good industry practices for schedule development and maintenance as recognized by the Project Management Institute (PMI).

PWGSC presently utilizes the Primavera Suite software and MicroSoft Project for it's current Control Systems and any software used by the consultant should be fully integrated with these, using one of the many commercially available software packages.

1.1 Schedule Design

Project Schedules are used as a guide for execution of the project as well as to communicate to the project team when activities are to happen, based on network techniques using Critical Path Method (CPM).

When building a Control System you must consider:

1. The level of detail required for control and reporting;
2. The reporting cycle- monthly and what is identified in the Terms of Reference, but also includes Exception Reports;
3. That the duration must be in days;
4. What is required for reporting in the Project Teams Communications Plan and
5. The nomenclature and coding structure for naming and reporting requirements of activities, schedules and reports.

1.2 Schedule Development

For purposes of monitoring and reporting of project progress and ease of schedule review it is important to maintain a standard for all schedules and reports starting with the Work Breakdown Structure (WBS), identification of Milestones, naming of activities as well as schedule outputs and paper sizing and orientation.

Work Breakdown Structure

When developing the schedule the consultant needs to use PWGSC standards and practices. Two basic requirements are the National Project Management System

(NPMS) and a Work Breakdown Structure (WBS), structured supporting the NPMS (Levels 1-4).

The WBS is as follows:

- Level 1 Project Title (NPMS)
- Level 2 Project Stage (NPMS)
- Level 3 Project Phase (NPMS)
- Level 4 Processes to meet Deliverables/Control Points Milestones (NPMS)
- Level 5 Sub-Processes and Deliverables in support of Level 4
- Level 6 Discrete activities. (Work Package)

Not all the Stages, Phases and Processes in the NPMS will be required on all the projects, however the structure remains the same.

Major and Minor Milestones

The Major Milestones are standard Deliverables and Control Points within NPMS and are required in all schedule development. These Milestones will be used in Management Reporting within PWGSC as well as used for monitoring project progress using Variance Analysis. The Minor milestones are process deliverables (Level 4) or sub-process deliverables (level 5) also used in Variance Analysis.

Each Milestone will also be assigned appropriate coding for Status Reporting and Management Reporting.

Milestones must have zero duration and are used for measuring project progress.

Milestones may also be external constraints such as the completion of an activity, exterior to the project, affecting the project.

Activities

All activities will need to be developed based on Project Objectives, Project Scope , Major and Minor Milestones, meetings with the project team and the scheduler's full understanding of the project and it's processes.

Subdivide the elements down into smaller more manageable pieces that organize and define the total scope of work in Levels 5-6 that can be scheduled, costed, monitored and controlled. This process will develop the Activity List for the project.

Each activity is a discrete element of work and is the responsibility of one person to perform.

Each activity will describe the work to be performed using a verb and noun combination (i.e. Review Design Development Report).

Activities should not have durations longer that 2 update cycles, with exception of activities not yet defined in a "Rolling Wave".

Each activity will be assigned at WBS level 6 and appropriately coded for Status Reporting and Management Reporting.

These elements will become activities, interdependently linked in Project Schedules.

Project Logic

Once the WBS, Milestones and Activity List have been developed the activities and milestones can be linked in a logical manner starting with a Project Start Milestone. Every activity and milestone must be linked in a logical manner using either a Finish to Start (FS), Finish to Finish (FF), Start to Start (SS) or Start to Finish (SF) relationship. There can be no open-ended activities or milestones.

A Finish to Start (FS) is the preferred relationship.

When developing relationships avoid the use of lags and constraints in place of activities and logic.

Activity Duration

The activity duration (in days) is the estimated length of time it will take to accomplish a task.

Consideration needs to be taken in how many resources are needed and are available, to accomplish any activity. (Example: availability of Framers during a “Housing Boom”.) Other factors are the type or skill level of the available resources, available hours of work, weather etc.

There will be several types of lists and schedules produced from this process, which will form part of the Progress Report.

Activity List

An Activity List identifies all activities including milestones required to complete the whole project.

Milestone List

A Milestone List identifies all project Major and Minor milestones.

Master Schedule

A Master Schedule is a schedule used for reporting to management at WBS level 4 and 5 that identifies the major activities and milestones derived from the detailed schedule. Cash Flow projections can be assigned at WBS level 5 for monitoring the Spending Plan.

Detailed Project Schedule

A Detailed Project Schedule is a schedule in reasonable detail (down to WBS Level 6 and 7) for progress monitoring and control, this will ensure that the schedule shall be in sufficient detail to ensure adequate planning and control.

1.3 Schedule Review and Approval

Once the scheduler has identified and properly coded all the activities; put them into a logical order and then determined the appropriate durations. The scheduler can then analyze the schedule to see if the milestone dates meet the contractual requirements and then adjust the schedule accordingly by changing durations, resource leveling or changing logic.

When the schedule has been satisfactorily prepared the scheduler can present the detailed schedule to the Project Team for approval and be Baselined. There may be several iterations before the schedule meets with the Project Teams agreement and the contractual requirements.

The final agreed version must be copied and saved as the Baseline to monitor variances for reporting purposes.

1.4 Schedule Monitoring and Control

Once Baselined the schedule can be better monitored, controlled and reports can be produced.

Monitoring is performed by, comparing the baseline activities % complete and milestone dates to the actual and forecast dates to identify the variance and record any potential delays, outstanding issues and concerns and provide options for dealing with any serious planning and scheduling issues in report form.

Analyze and report from early start sequence on all activities due to start, underway, or finished for the complete project.

Thee will be several reports generated from the analysis of the baseline schedule and will form part of the Time Management Report in the Required Services Sections (RS)

Progress Reports

A Progress Report reflects the progress of each activity to the date of the report, any logic changes, both historic and planned, projections of progress and completion the actual start and finish dates of all activities being monitored.

The Progress Report includes:

A Narrative Report, detailing the work performed to date, comparing work progress to planned, and presenting current forecasts. This report should summarize the progress to date, explaining current and possible deviations and delays and the required actions to resolve delays and problems with respect to the Detail Schedule, and Critical Paths.

Narrative reporting begins with a statement on the general status of the project followed by a summarization of delays, potential problems and project status criticality, any

potential delays, outstanding issues and concerns and options for dealing with any serious planning and scheduling issues.

A Variance Report, with supporting schedule documentation, detailing the work performed to date, comparing work progress to planned. This report should summarize the progress to date, explaining all causes of deviations and delays and the required actions to resolve delays and problems with respect to the Detail Schedule, and Critical Paths.

A Criticality Report identifying all activities and milestones with negative, zero and up to five days Total Float used as a first sort for ready identification of the critical, or near critical paths through the entire project.

Included in the Progress Report as attachments are: WBS chart, Activity Lists, Milestone Lists, Master Schedules, Detailed Project Schedule

Exception Report

The Scheduler is to provide continuous monitoring and control, timely identification and early warning of all unforeseen or critical issues that affect or potentially affect the project.

If unforeseen or critical issues arise, the Scheduler will advise the Project Manager and submit proposed alternative solutions in the form of an Exception Report.

An Exception Report will include sufficient description and detail to clearly identify:

1. Scope Change: Identifying the nature, reason and total impact of all identified and potential project scope changes affecting the project.
2. Delays and accelerations: Identifying the nature, the reason and the total impact of all identified and potential duration variations.
3. Options Enabling a Return to the project baseline: Identifying the nature and potential effects of all identified options proposed to return the project within baselined duration.

1.5 Standard Submissions

At each submission or deliverable stage provide a complete and updated Progress Report, the contents of each report will vary with requirements and at each project phase. Typically a Progress Report has:

1. Executive Summary;
2. Narrative Report;
3. Variances Report;
4. Criticality Report;
5. Exception Report (as required)
6. Work Breakdown Structure Chart;
7. Activity List;
8. Milestone List;
9. Master Schedule with Cash Flow Projections;
10. Detail Project Schedule (Network Diagram or Bar Charts);

1.6 Schedule Outputs and Reporting Formats

The sheet sizing and orientation is more a suggestion that a role, changes to the paper format may vary to accommodate the information and column information required.

Progress Reports

Paper Size: Letter

Paper Format: Portrait

Title Format: Project Title; Report Type; Print Date; Data Date; Revision Block

Body Text: Narratives for each report to match other reports generated in the D.S.S.

Variance Report Columns: Activity ID, Activity Name, Planned Finish, Revised Finish, Variance, Activity % Complete,

Criticality Report Columns: Activity ID, Activity Name, Duration, Start, Finish, Activity % Complete, Total Float.

Exception Reports

Paper Size: Letter
Paper Format: Portrait
Title Format: Project Title; Report Type; Print Date; Data Date; Revision
Body Text: Narrative to match other reports generated in the D.S.S.

Paper Size: Letter
Paper Format: Landscape
Title Format: Project Title; Report Type; Print Date; Data Date; Revision
Columns: Activity ID, Activity Name, Duration, Remaining Duration, Start, Finish, Total Float.
Work Breakdown Structure (indent tree):

Paper Size: Letter
Paper Format: Portrait
Columns: WBS Code, WBS Name, Duration, Cost estimate, start and finish dates.
Footer Format: Project Title; Report Type; Print Date; Data Date; Revision Block

Activity Lists

Paper Size: Letter
Paper Format: Portrait
Columns: Activity ID, Activity Name, Start, Finish, Predecessor, Successor.
Footer Format: Project Title; Report Type; Print Date; Data Date; Revision Block

Sort with Early Start, then Early Finish, then Activity ID and with the WBS.

Milestone Lists

Paper Size: Letter
Paper Format: Portrait

Footer Format: Project Title; Report Type; Print Date; Data Date; Revision Block
Columns: Activity ID, Activity Name, Start, Finish.

Sort with Early Start, then Early Finish, then Activity ID and without the WBS.

Master Schedule (Bar Chart)

Paper Size: 11X17
Paper Format: Landscape
Footer Format: Project Title; Report Type; Print Date; Data Date; Revision Block
Columns: Activity ID, Activity Name, Duration, Activity % Complete, Start, Finish, Total Float.

Sort with Early Start, then Early Finish, then Activity ID and with the WBS.

Detailed Project Schedules (Bar Chart)

Paper Size: 11X17
Paper Format: Landscape
Footer Format: Project Title; Report Type; Print Date; Data Date; Revision Block
Columns: Activity ID, Activity Name, Duration, Activity % Complete, Start, Finish, Total Float.

Sort with Early Start, then Early Finish, then Activity ID and with the WBS.

APPENDIX 'A' - Checklist for the Submission of Construction Documents to PWGSC

Last updated November 21, 2012

Date:	
Project Title:	**Project Location:**
Project Number:	**Contract Number:**
Consultant's Name:	**PWGSC Project Manager:**
Review Stage: **66%** **99%** **100%**	

Item	Verified by:	Comments:	Action by:
Specifications:			
1 National Master Specifications			
1a The current edition of the NMS has been used.			
1b Sections have been included for all work identified on drawings and sections edited.			
2 Specification Organization			
2a Either the NMS 1/3 - 2/3 page format or the Construction Specifications Canada full page format is used.			
2b Each Section starts on a new page and the Project Number, Section Title, Section Number and Page Number show on each page.			
2c Specification date and consultant's name are not indicated.			
3 Terminology			
3a The term Departmental Representative is used instead of Engineer, PWGSC, Owner, Consultant or Architect.			
3b Notations such as: "verify on site", "as instructed", "to match existing", "example", "equal to", "equivalent to" and "to be determined on site by" are not used.			
4 Dimensions			
4a Dimensions are provided in metric only.			
5 Standards			
5a The latest edition of all references quoted is used.			

6 Specifications Materials			
6a The method of specifying materials uses recognized standards. Actual brand names and model numbers are not specified.			
6b Materials are specified using standards and performance criteria (if not, the correct form of acceptable materials has been used).			
6c Identify if non-restrictive, non-trade name “prescription” or “performance” specifications are used.			
6d Indicate if a list of acceptable materials have been used.			
6e The term “Acceptable Manufacturers” is not used.			
6f No sole sourcing has been used.			
6g If sole sourcing has been used, the correct wording has been used and a justification provided to RPCD for the sole sourced products.			
7 Unit Prices			
7a Unit prices are used only for work that is difficult to estimate.			
8 Cash Allowances			
8a Indicate if cash allowances have been used.			
9 Warranties			
9a Indicate if warranties extend more than a 12 or 24 months period.			
9b Manufacturers guarantees are not indicated.			
10 Scope of Work			
10 No paragraphs noted as “Scope of Work” are included.			
11 Summary and Section Includes			
11a In part 1 of section, paragraphs “Summary” and “Section Includes” are not used.			
12 Related Sections			
12a The list of related sections and appendices are coordinated.			
13 Index			
13a The index shows a complete list of plans and specification sections with the correct number of pages and correct drawing titles and section names.			
14 Regional Guide Specifications			
14a General Instructions is included (Section 01 00 10 in the NCA).			

15 Health and Safety			
15a Section 01 35 29.06 - Health and Safety Requirements is included.			
16 Designated Substances Report			
16 a Section 01 14 25 - Designated Substances Report is included.			
***17* Subsurface Investigation Reports**			
17a Subsurface Investigation Reports are included in Division 31.			
18 Experience and qualifications			
18a Experience and qualification requirements do not appear in the specification sections			
19 Pre-qualifications			
19a There are no mandatory contractor and/or subcontractor pre-qualification requirements or references to certificates, transcripts or license numbers of a trade or subcontractor being included in the bid.			
20 Contracting Issues			
20a Contracting issues do not appear in the specifications.			
20b Division 00 of the NMS is not used.			
21 Quality Issues			
21a There are no specification clauses with square brackets "[ ]" or lines "__" indicating that the document is incomplete or missing information.			

Item	Verified by:	Comments:	Action By:
Drawings:			
1 Title Blocks			
1a The PWGSC title block is used.			
2 Dimensions			
2a Dimensions are provided in metric only.			
3 Trade Names			
3a Trade names are not used.			
4 Specification Notes			
4a There is no specification type notes.			
5 Terminology			
5a The term Departmental Representative is used instead of Engineer, PWGSC, Owner,			

Consultant or Architect.			
5b Notations such as: “verify on site”, “as instructed”, “to match existing”, “example”, “equal to”, “equivalent to” and “to be determined on site by” are not used.			
6 Information to be included			
6a Architectural and Engineering Drawings have been stamped and signed by the design authority.			
6b The project quantity and configuration, dimensions and construction details are included.			
6c References to future work and elements not in contract do not appear or are kept to an absolute minimum and clearly marked.			

I confirm that the plans and specifications have been thoroughly reviewed and that the items listed above have been addressed or incorporated. I acknowledge and accept that by signing, I am certifying that all items noted above have been addressed.

Consultant's Representative: _____

Firm name: _____

Signature: _____ Date: _____

APPENDIX 'B' - Sample of Addendum
Last updated April 22, 2008

ADDENDUM No. _____

Project Number: _____

The following changes in the bid documents are effective immediately. This addendum will form part of the contract documents

DRAWINGS

SPEC NOTE: indicate drawing number and title, then list changes or indicate revision number and date, and re-issue drawing with addendum.

1 A1 Architectural

.1

SPECIFICATIONS

SPEC NOTE: indicate section number and title.

1 Section 01 00 10 - General Instructions

SPEC NOTE: list all changes (i.e. delete, add or change) by article or paragraph

.1 Delete article (xx) entirely.
.2 Refer to paragraph (xx.x) and change ...

2 Section 23 05 00 - Common Work Results - Mechanical

.1 Add new article (x) as follows:

APPENDIX 'C' - Sample of Index
Last updated April 22, 2008

Project No: _____ **Index**
Page 1 of ___

DRAWINGS AND SPECIFICATIONS

DRAWINGS:

SPEC NOTE: List all Drawings by number and title.

C-1	Civil
L-1	Landscaping
A-1	Architectural
S-1	Structural
M-1	Mechanical
E-1	Electrical

SPECIFICATIONS:

SPEC NOTE: List all Divisions, Sections (by number and title) and number of pages.

DIVISION	SECTION	NO. OF PAGES
DIVISION 01	01 00 10 - General Instructions.....	xx
	01 14 25 - Designated Substances Report.....	xx
	01 35 30 - Health and Safety.....	xx
DIVISION 23	23 xx xx	
DIVISION 26	26 xx xx	

APPENDIX 'D'

USER MANUAL ON DIRECTORY STRUCTURE AND NAMING CONVENTION STANDARDS FOR CONSTRUCTION TENDER DOCUMENTS ON CD ROM

Issued by:

Real Property Contracting Directorate

PWGSC

May 2005

Last Updated: June 3, 2008

Version 1.0

PREFACE

The Government of Canada (GoC) has committed to move towards an electronic environment for the majority of the services it offers. This covers the advertisement and distribution of contract opportunities, including construction solicitations. As a result, it is necessary to obtain a copy of construction drawings and specifications (in PDF format ***without*** password protection) on one or multiple CD-ROM to facilitate for the GoC the transfer of the construction drawings and specifications electronically to the Government Electronic Tendering System (GETS).

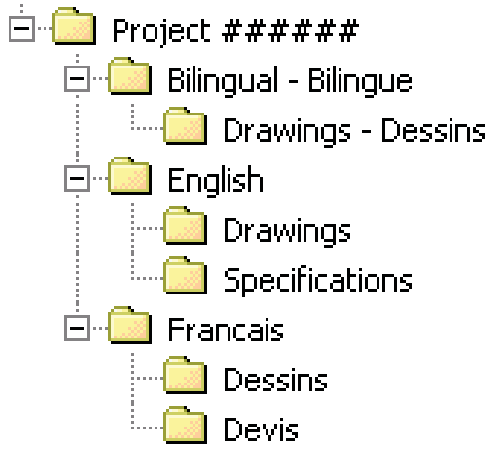
There is therefore a need to adopt a common directory structure and file-naming convention to ensure that the information made available to contractors electronically and in hard (printed) copy is in accordance with the sequence adopted in the real property industries, both for design and construction. This manual defines the standard to be followed by both consultants and print shops at time of formatting and organizing the information, whether drawings and specifications are created by scanning print documents or saved as PDF files from the native software (AutoCAD, NMS Edit, MS-Word, etc…) in which these were created.

It is important to note that the procedure described in this manual is not an indication that consultants are relieved from following the established standards for the production of drawings and specifications. The sole purpose of this manual is to provide a standard for the organization and naming of the electronic files that will be recorded on CD-ROM.

1. DIRECTORY STRUCTURE

1.1 1st, 2nd and 3rd Tier Sub-Folders

Each CD-ROM, whether it is for the original solicitation (tender call) or for an amendment (addendum), must have the applicable elements of the following high-level Directory Structure created:



The following important points are to be noted about the Directory Structure:

- The "*Project ######*" folder is considered the 1st Tier of the Directory Structure where ###### represents each digit of the Project Number. The Project Number must always be used to name the 1st Tier folder and it is always required. Free text can be added following the Project Number, to include such things as a brief description or the project title;

- The "*Bilingual - Bilingue*", "*English*" and "*Français*" folders are considered the 2nd Tier of the Directory Structure. The folders of the 2nd Tier **cannot** be given any other names since GETS uses these names for validation purposes. At least one of the "*Bilingual - Bilingue*", "*English*" and "*Français*" folders is always required, and these must always have one of the applicable sub-folders of the 3rd Tier;

- The "*Drawings - Dessins*", "*Drawings*", "*Specifications*", "*Dessins*" and "*Devis*" folders are considered the 3rd Tier of the Directory Structure. The folders of the 3rd Tier **cannot** be given any other names since GETS also uses these names for validation purposes. There must be always at least one of the applicable 3rd Tier folder in each document.

IMPORTANT:	The applicable elements of the Directory Structure (1st, 2nd and 3rd Tier folders) are always required and cannot be modified.

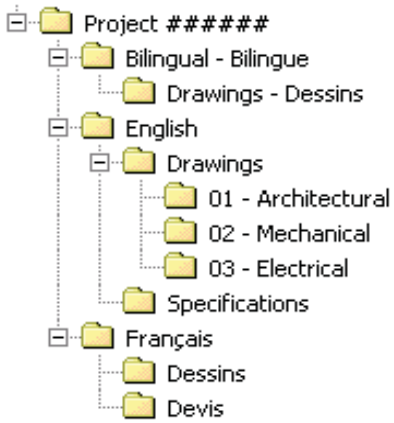
1.2 4th Tier Sub-Folders for Drawings

The "*Drawings – Dessins*", "*Drawings*" and "*Dessins*" folders must have 4th Tier sub-folders created to reflect the various disciplines of the set of drawings.

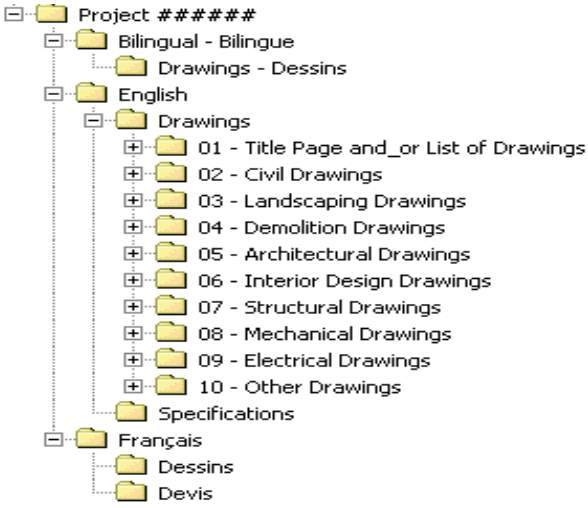
Because the order of appearance of the sub-folders on the screen will also determine the order of printing, it is necessary to start with a number the identification name of the sub-folders in the "*Drawings – Dessins*", "*Drawings*" and "*Dessins*" folders.

Note: The first sub-folder must be always reserved for the Title Page and/or the List of Drawings unless the first drawing of the set is an actual numbered discipline drawing.

Examples of 4th Tier sub-folders for drawings:



or



1.2.1 Naming Convention

The 4th Tier sub-folders for drawings must adhere to the following standard naming convention.

For the "*Drawings*" and "*Dessins*" folders:

- Y

Where:

= A two digit number ranging from 01 to 99 (leading zeros must be included)

Y = The title of the folder

Example: 03 – Mechanical

For the "*Drawings - Dessins*" folder:

- Y - Z

Where:

= A two digit number ranging from 01 to 99 (leading zeros must be included)

Y = The English title of the folder

Z = The French title of the folder

Example: 04 - Electrical - Électricité

It should be noted that the numbering of the 4th Tier sub-folders is for sorting purposes only and is not tied to a specific discipline. For example, "*Architectural*" could be numbered 05 for a project where there is four other disciplines before "*Architectural*" in the set of drawings or 01 in another project where it's the first discipline appearing in the set.

It is essential to ensure that the order of the drawings on the CD-ROM be exactly the same as in the hard copy set. GETS will sort each drawing for both screen display and printing as per the following rules:

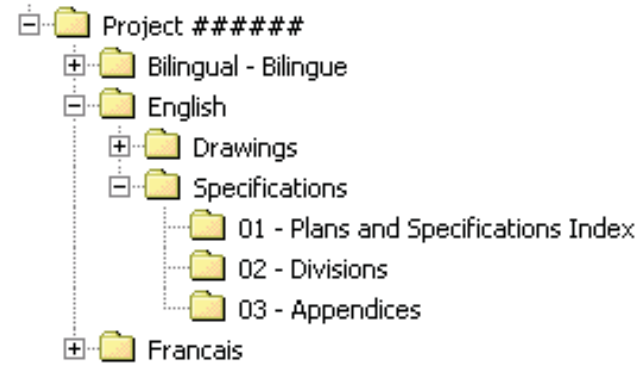
- The alphanumerical sorting is done on an ascending order;
- The alphanumerical order of the sub-folders determines the order of appearance on the screen as well as the order of printing (as an example: all the drawing PDF files in the 01 sub-folder will be printed in alphanumerical order before the drawings in the 02 sub-folder etc…);
- Each drawing PDF file within each sub-folder will also be sorted alphanumerically. This will determine the order of appearance on the screen as well as the order of printing (i.e. Drawing A001 will be printed before Drawing A002, Drawing M02 before Drawing M03, etc…).

1.3 4th Tier Sub-Folders for Specifications

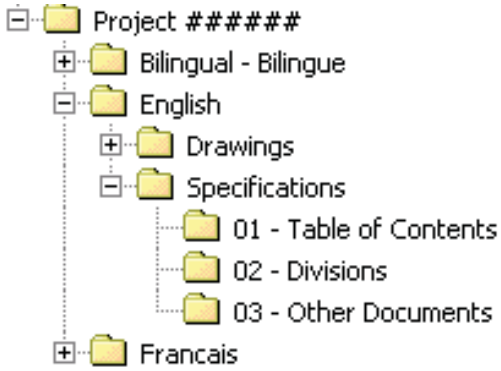
The "*Specifications*" and "*Devis*" folders must have 4th Tier sub-folders created to reflect the various elements of the specifications.

Because the order of appearance of the sub-folders on the screen will also determine the order of printing, it is necessary to start with a number the identification name of the sub-folders in the "*Specifications*" and "*Devis*" folders.

Examples of 4th Tier sub-folders for specifications:



or



1.3.1 Naming Convention

The 4th Tier sub-folders for specifications must adhere to the following standard naming convention.

For the "*Specifications*" and "*Devis*" folders:

- Y

Where:

## =	A two digit number ranging from 01 to 99 (leading zeros must be included)
Y =	The title of the folder

Example: 02 – Divisions

It should be noted that the numbering of the 4th Tier sub-folders is for sorting purposes only and is not tied to an element of the specifications.

It is essential to ensure that the order of the elements of the specifications on the CD-ROM be exactly the same as in the hard copy. GETS will sort each element of the specifications for both

screen display and printing as per the following rules:

- The alphanumerical sorting is done on an ascending order;
- The alphanumerical order of the sub-folders determines the order of appearance on the screen as well as the order of printing (as an example: all the specifications PDF files in the 01 sub-folder will be printed, in alphanumerical order before the PDF files in the 02 sub-folder, etc…);
- Each specifications PDF file within each sub-folder will also be sorted alphanumerically. This will determine the order of appearance on the screen as well as the order of printing (i.e. Division 01 will be printed before Division 02, 01 - Appendix A before 02 - Appendix B, etc…).

2. NAMING CONVENTION FOR PDF FILES

Each drawing, specifications division or other document that are part of the tender documents must be converted in PDF format (without password protection) in accordance with the following standard naming convention and each PDF file must be located in the appropriate sub-folder of the Directory Structure.

2.1 Drawings

Each drawing must be a **separate single page** PDF file. The naming convention of each drawing must be:

X### - Y

Where:

X =	The letter or letters from the drawing title block ("*A*" for Architectural or "*ID*" for Interior Design for example) associated with the discipline
### =	The drawing number from the drawing title block (one to three digits)
Y =	**The drawing name from the drawing title block (for bilingual drawings, the name in both English and French is to appear)**
Example:	A001 - First Floor Details

Each drawing that will be located in the appropriate discipline 4th Tier sub-folders must be named with the same letter ("*A*" for Architectural Drawings for example) and be numbered. The drawing number used to name the PDF file must match as much as possible the drawing number of the actual drawing (the exception being when leading zeros are required).
The following important points about drawings are to be noted:

- The drawing PDF files within each sub-folder are sorted alphanumerically for both displaying and printing. If there are more than 9 drawings in a particular discipline the numbering must use at least two numerical digits (i.e. A01 instead of A1) in order to avoid displaying drawing A10 between A1 and A2. The same rule applies when there are more than 99 drawings per discipline i.e. three digits instead of two must be used for the numbering (for example M003 instead of M03);

- If drawing PDF files are included in the "*Bilingual - Bilingue*" folder, these cannot be included as well in the "*English*" and/or "*Français*" folders;

- If drawings not associated with a particular discipline are not numbered (Title Page or List of Drawings for example), these will be sorted alphabetically. While this does not represent a problem if there is only one drawing in the sub-folder, it could disrupt the order when there are two or more drawings. If the alphabetical order of the drawings name does not represent the order on the hard copy set, the drawings are to be named as per the following standard convention when converted in PDF format to ensure proper display and printing order.

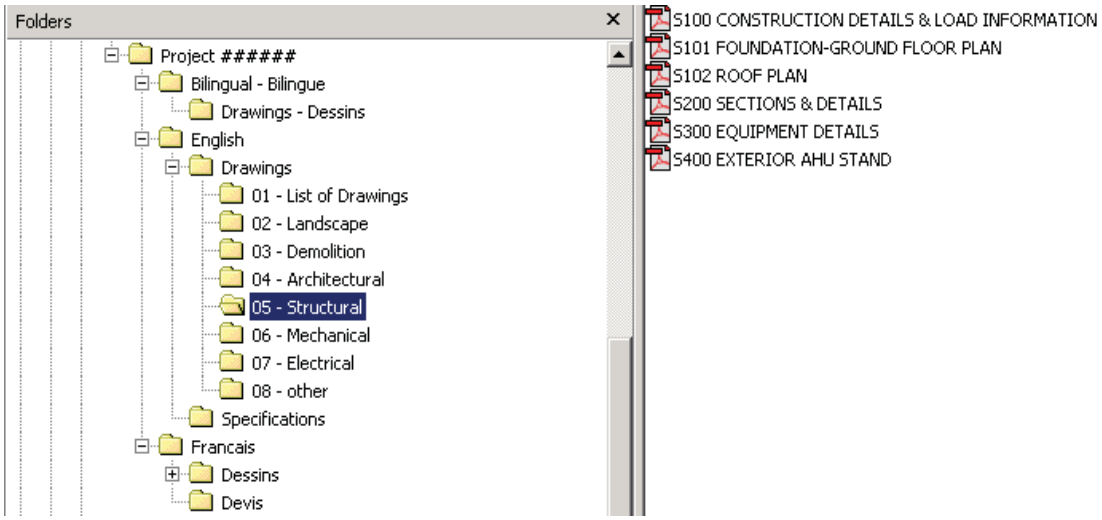
  ## - Y

  Where:

## =	A two digit number ranging from 01 to 99 (leading zeros must be included)
Y =	The name of the drawing
Example:	01 - Title Page 02 - List of Drawings

  If numbers are not used in the PDF files name, "*List of Drawings*" will be displayed before "*Title Page*" because "L" comes before "T" in the alphabet.

Example of a 4th Tier Drawings sub-folder's content:



2.2. Specifications

Each Specifications Division must be a separate PDF file and all pages contained in each PDF file must have the same physical size (height, width). The Plans and Specifications Index must

also be a separate PDF file. If there are other documents that are part of the Specifications (e.g. Appendix or other) these are to be separate PDF files as well.

2.2.1 Documents other than Specifications Divisions

Because PDF files within the Specifications sub-folders are sorted alphanumerically (in ascending order) for both on screen display and printing order, all files that appear in folders other than the "*Divisions*" sub-folder must be named using a number:

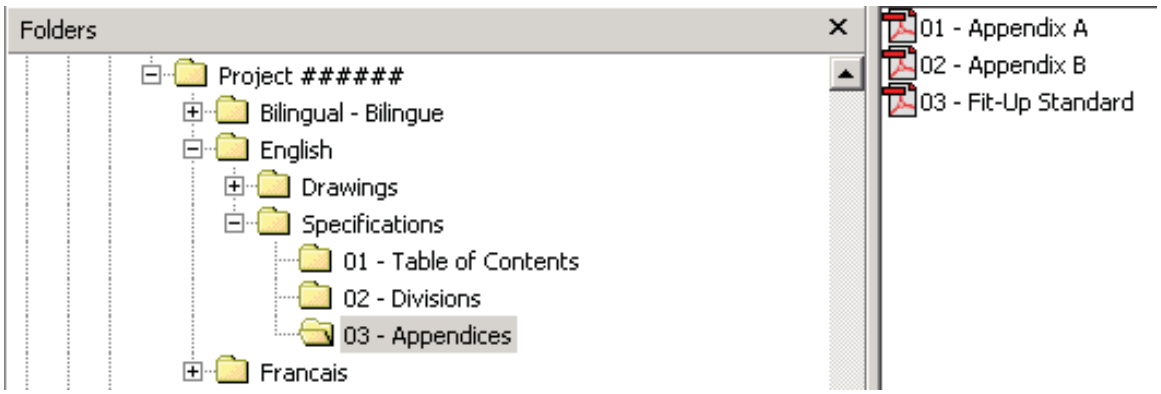
- Y

Where:

## =	Two digit number ranging from 01 to 99 with leading zeros required
Y =	Name of the document

Example: 01 - Plans and Specifications Index

Example of a sub-folder content (sub-folder other than "*Divisions*"):



2.2.2 Specifications Divisions

The Specifications Divisions must be named as follows:

Division ## - Y

Where:

Division ## =	The actual word "*Division*" followed by a space and a two digit number ranging from 01 to 99 (with leading zeros required)
Y =	Name of the Specifications Division as per **CSC/CSI MasterFormat™**

Example: Division 05 – Metals

The following important point about specifications is to be noted:

- The Numbering of the Divisions **cannot** be altered from **CSC/CSI MasterFormat™** even if some Divisions are not used in a given project. For example, Division 05 will always remain Division 05 even if Division 04 is not used for a given project.

Example of a "*Divisions*" sub-folder content:

3. CD-ROM LABEL

Each CD-ROM is to be labeled with the following information:

Project *Number* / *Numéro* de projet
Project Title / *Titre du projet*
Documents for Tender / Documents pour appel d'offres
CD *X* of/de *X*

Example:

Project 123456 / Projet 123456
Repair Alexandra Bridge / Réparation du pont Alexandra

Documents for Tender / Documents pour appel d'offres
CD 1 of/de 1

APPENDIX 'E'

BASIC REFRENCE GUIDE ON CONVERTING CONSTRUCTION DRAWINGS INTO PORTABLE DOCUMENT FORMAT (PDF)

Issued by:

Real Property Contracting Directorate

PWGSC

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PREFACE

Portable Document Format (PDF) is the standard format for documents that are posted on the Government Electronic Tendering System (GETS). There is therefore a need to obtain from architectural and engineering consultants an electronic copy of drawings and specifications in PDF for tendering Government of Canada (GoC) construction projects.

In order to have the highest quality in term of resolution and printing, consultants should to the greatest extent possible have the PDF drawing and specification files derived from the native software in which they were created. Scanning is permissible but only in special circumstances, for example when there is no electronic version of a drawing being included in a construction tender package.

The purpose of this document is to provide basic information on the conversion of Computer Aided Design and Drafting (CADD) drawings in PDF. Creating a PDF file from a CADD drawing is a relatively simple process once all the necessary configurations and settings are in place. It actually should not take any longer than it would take to create a plot file or to send a drawing to a printer. The information in this guide is not intended to cover all technical aspects of the conversion, which can be done using various methods, but rather to highlight important points about the process and file settings. The conversion of specifications is not covered in this basic reference guide since it does not require any special configuration or setting.

The information provided in this basic reference guide is not an indication that consultants are relieved from following the established standards for the production of drawings and specifications. The sole purpose of this guide is to provide basic information on the PDF conversion process bearing in mind that additional detailed technical information is available from the various software manufacturers.

1. PRINTER DRIVERS

Adobe Acrobat provides two different printer drivers that are able to convert CADD drawing into PDF format, Acrobat PDF Writer and Acrobat Distiller. Before creating a PDF file from a CADD drawing, a choice must be made as to which one will be used.

Acrobat PDF Writer is a non-PostScript printer driver that works best with documents that don't contain complex graphics

Acrobat Distiller is a PostScript printer driver that works best with documents that contain PostScript fills, Encapsulated PostScript (EPS) graphics, or other complex elements.

It is recommended that Acrobat Distiller be used to create PDF file of architectural and engineering drawings due to their size and complex graphical nature.

2. PRINTER CONFIGURATION

Before converting a CADD drawing to PDF, an Acrobat printer configuration file for the PDF paper size needs to be created. This function can be done in the CADD software rather than using a custom paper size defined for the Acrobat distiller feature. The recommended method is to add a PostScript Adobe plotter in the CADD software and making the necessary setting in terms of media source and size, scale and orientation. The configuration can then be re-used to simplify the conversion process for future files that use the same page size.

As an alternative, although not recommended, a custom-defined size can be created in Acrobat Distiller in the *properties* menu.

3. CREATING PDF FILES

Once the printer configuration has been done in the CADD software, open up Acrobat Distiller and make the necessary settings in the *preferences* and *job options* sub-menu. Ensure that the page size match the sheet size selected in the CADD software to create the file. Particular settings can be saved under different names for future use.

With the Acrobat Distiller application open, ensure the required sheet size is displayed in the *job options* window. Then it is simply a matter of bringing the CADD file into the Acrobat Distiller creation box.

A progress bar will show during the conversion and the newly converted PDF file should open up and be displayed for verification.

4. PDF FILES SETTINGS

4.1 Security

Adobe Acrobat contains security features that can de used to secure the files by restricting any changes to the files. However, since the files will be posted on GETS and will be used for printing copies, the files **must not** be password protected and **must** allow printing.

4.2 Drawing Orientation

The final PDF drawing files must be displayed on the screen in the same direction that the users are intended to view them. This can be achieved by adjusting the setup of the plotter. If the drawing is not oriented properly after the conversion, it can be rotated manually within Adobe Acrobat.

4.3 Font Type

In order to avoid any problems during the conversion and to minimize the potential for font display errors, the fonts used for the production of construction drawings must be *PostScript or True Type fonts.*

4.4 Resolution
Since the PDF files will be used for printing, it is important that a proper resolution be selected. It is recommended to select 600 dots per inch (dpi).

4.5 Scale
When choosing the Plot scale in Adobe, it is important to choose the 1:1 scale to ensure the integrity of the scale from which the drawings were created in the CADD software.

5.SCANNING
Scanning is not recommended and should be done only when the drawing is not available electronically. When scanning a drawing, it is important that it be done in real size (scale 1:1) to ensure that the scale remains intact in subsequent printing. It is recommended that each scanned drawing be opened and verified to ensure that the resolution, scale and border are of an acceptable quality.

6.FINAL CHECKLIST
When the drawing file has gone trough the PDF conversion, it is recommended to open it and verify the following:

- That the sheet size displayed is what was intended to be created (the size is viewable in the lower left corner of the drawing).
- That the orientation of the sheet is correct.
- That the line types, line weights and fonts match the CADD drawing.
- That the PDF file is in black and white.
- That each drawing is a single PDF file.
- That the PDF file is not password protected and printable.

If all the items are verified, the PDF file is useable

7.ADDITIONAL INFORMATION
For more information about the creation of PostScript and EPS files please refer to the User's Guide of the CADD software being used to produce the drawings. For more information about creating PDF file please refer to the Acrobat Distiller User's Guide and/or visit the Adobe Web site at www.adobe.com.

APPENDIX E

PWGSC BASE BUILDING STANDARD

FOR OFFICE BUILDINGS

PWGSC BASE BUILDING STANDARD

FOR OFFICE BUILDINGS

Date: 2015-10-13

How to Use This Document:

This document is divided into sections that describe both the general approach endorsed by Public Works and Government Services Canada (PWGSC) and the technical standards that apply to each major discipline involved in the design of the base building.

Under Section 7.1, General Design Objectives; high level goals for the project are identified. These have applicability for all subsequent sections. An example is the goals of functional suitability which has as its guide for evaluation a functional program. Flexible and Adaptable can be weighed against project planning, efficiency of mechanical systems etc.

For the service provider:

- In the case of a new facility, follow this Standard.
- In the case of a building rehabilitation, this Standard requires an evaluation of the existing conditions before commencement of the project in order to evaluate and identify the variances from the Standard that would be applicable. Refer to Appendix for Variance Procedure.
-

For the regional centre of expertise (COE):

- In the case of new construction or renovations, project reporting must follow the processes identified in the *Design and Technical Oversight Procedure* for Architectural and Engineering Services.

1 Effective Date:

2 Cancellation

This Standard is to be used in place of an informal draft Real Property Branch (RPB) *Federal Office Building Standard* (FOBS) that has been circulated internally.

3 Authority

This Standard is issued under the authority of the Assistant Deputy Minister (ADM), Real Property Branch (RPB), Public Works and Government Services Canada (PWGSC).

4 Context

This Standard is issued pursuant to the *Department of Public Works and Government Services Act* and the *Federal Real Property and Federal Immovables Act*. It also supports the PWGSC *Sustainable Buildings Policy* and complements the PWGSC *National Project Management System* and the *Government of Canada Workplace 2.0 Fit-up Standards*.

5 Scope

This Standard applies to all new PWGSC office buildings, major renovations of existing office buildings, as well as rehabilitations of Federal Heritage Buildings Review Office designated heritage office buildings. The focus of the standard is primarily buildings. Buildings are often designed as part of campuses as well as the urban design and landscape. In addition, there is an exemption process to address the limitations found with projects for existing buildings.

This Base Building Standard is recommended for office buildings under the administration of Crown Corporations and other custodial departments. However, where PWGSC provides optional services to departments and agencies, PWGSC will promote and recommend the application of this Standard. All custodial departments are encouraged to adopt and apply the *PWGSC Base Building Standard* in order to support a government-wide approach.

6 Purpose

The purpose of this document is to establish minimum base building design standards and technical requirements for office buildings in order to ensure the following:

- That service providers understand our unique requirements when delivering design and construction services.
- Requirements are clear such that base lines for funding responsibilities can be identified.
- The development, construction, and maintenance of PWGSC's portfolio of buildings reflect a high level of design quality.
- The approach to design is performed consistently and to a level of quality that satisfies PWGSC requirements.
- The project achieves sustainable targets as well as life cycle costing goals.

7 Details

7.1 General Design Objectives

Most of the interactions between the Canadian Federal Government and Canadians occur in buildings delivered by PWGSC, thus, the quality of these buildings must project a consistent and positive image of the Government of Canada to the public. Design solutions therefore must:

- Meet the standards prescribed in this document. Where standards cannot be met, alternative solutions must be provided;
- Satisfy the immediate occupancy needs outlined in the functional program and strive to anticipate future building uses; and,
- Make building systems to be adaptable to future uses and changing priorities.

General design objectives are noted below must be incorporated and applied to all design solutions for the base building standards for offices and illustrate:

- Functional Suitability
- Health, Safety and Security
- Sustainable and Enduring Development
- Creativity, Innovation and Technical Competence
- Inspiring and Attractive
- Financial Performance based upon Life-Cycle Costing

7.1.1 Functional Suitability

Ensure design solutions are appropriate to their use and consider performance of the asset over its entire life. Design solutions must:

- respond effectively and efficiently to the operational requirements of the project;
- respond effectively to site-specific context and conditions considering urban design and landscape architecture;
- meet local urban design and planning guidelines; and
- be flexible and adaptable.

7.1.2 Health, Safety, Universal Accessibility and Security

Ensure design solutions create environments that promote health, safety, and security. Design solutions must:

- comply specifically (but not limited to):
    - National Building Code;
    - National Fire Code;
    - Canada Labour Code;
    - Canada Occupational Health and Safety Code;
    - CAN/CSA B651-12: Accessibility for the Built Environment; and
    - Treasury Board's Government Security Policy.
- comply with additional health and safety codes and standards outlined in Appendices;
- ensure security requirements form an integral part of the planning and design process;

- ensure that there is a voluntary compliance with provincial codes when necessary.

7.1.3 Sustainable and Enduring Development

PWGSC is committed to the principles of sustainable development in all of its operations. The principles of sustainability must be incorporated in all the phases of project delivery, especially in the initial stages when most of the key decisions are taken. The building's design for energy use must be optimized through an integrated design approach with all disciplines and must meet the following performance requirements and those listed throughout this standard.

Ensure design solutions maximize a sustainable approach to building designs as well as improving the social value of supporting more livable communities. The reduction of the environmental footprint in proposing reducing, recycling and reusing as well as creating economic efficiencies in the design. Design solutions must:

- meet LEED Gold for new buildings, alternately 4 Green Globes, and 28% better than National Energy Code of Canada for Buildings. ;
- meet LEED Silver for renovations, alternately 3 Green Globes, and 24% better than National Energy Code of Canada for Buildings;
- utilize passive solar design to maximize the energy performance potential of the building and occupant comfort;
- be tailored to local climate to ensure durability and high performance of building systems;
- for rehabilitations to HVAC, interiors and envelope modifications refer to Appendix D of the National Energy Code of Canada for Buildings for energy efficiency goals;
- have an effective choice of building materials and systems to ensure durability and meet pre-determined durability targets set out for each project; and,
- be consistent with the Federal Sustainable Development Strategy (FSDS).

7.1.4 Creativity, Innovation and Technical Competence

Ensure design solutions demonstrate creativity, innovation and technical competence in their approach to program and context. However, only proven solutions are acceptable. Design solutions must:

- maximize project potential as it relates to program requirements for the building and site;
- be innovative and creative in the problem-solving response to program and site constraints;
- have technical competence in the integration of design, building science and engineering disciplines; and
- propose solutions that provide best value to the Crown over the life cycle of an asset.

7.1.5 Inspiring and Attractive

Ensure design solutions take into consideration the physical expression of the asset and contribute positively to the local context.

- design solutions must: enhance the immediate environment, both for direct users and the broader community; and
- be recognizable as a federal office building, reflecting the image of the Crown's values of long term sustainability.
- integrate visually within the unique context of an area;

- provide clarity and consistency of architectural form and detailing;

7.1.6 Financial Performance based upon Life-Cycle Costing

Ensure design solutions demonstrate the balance between capital construction costs, operational costs, and sustainability. Design solutions must:

- demonstrate best value to the Crown from a life-cycle approach to financial performance of the asset from construction to demolition; and
- be evaluated using life-cycle cost analysis according to industry best practice.

7.1.7 Other Considerations

For all projects, commissioning activities support the general design objectives. Integration of commissioning goals should begin at the earliest stages of project development. In the case of existing buildings interventions must integrate heritage values when they are being redeveloped. Discussions should also commence at the inception of the project.

7.1.7.1 Heritage Resources

In the case of rehabilitations of designated heritage office buildings, the design solutions must:

- respect the heritage values of a designated property in accordance with Treasury Board Policy on Management of Real Property;
- present coherent and well reasoned concepts for renovations of new buildings and rehabilitations of federally designated historic properties by following the *Standards and Guidelines for Historic Properties in Canada*;
- the *Policy for Stewardship of Heritage Properties*; and,
- RPB Procedure for the Stewardship of Federal Heritage Buildings.

7.1.7.2 Commissioning Activities

Commissioning of the base building is a fundamental activity of all professional disciplines. Commissioning of each must be carried out in accordance with PWGSC *Commissioning Policy* and related documents and CSA Z320 *Building Commissioning Standard*. Commissioning shall include:

- preparation of a 'basis of design' which explains the understanding of requirements of the BBS and identifies how they are to be met;
- implementation of a commissioning plan identifying how functional performance requirements will be confirmed;
- setting out commissioning activities that are to be completed over the life-cycle of the project;
- application and integration of heritage conservation specialty knowledge;
- identification of operational requirements, issues and concerns;
- development of commissioning specifications for testing of equipment, systems, subsystems and integrated systems;
- documentation of the concept of operations;
- inspection and testing equipment and systems;
- placing equipment and systems in operation;

- balancing equipment and systems;
- evaluating the performance of systems, building envelope against the design specifications;
- timely transfer of project documentation from the project team to those responsible for operation and maintenance;
- preparation of operating manuals; and,
- training of building operators.

7.2 Site Development

The site's development provides the first impression to Canadians of a federal office building. Real Property Branch is a custodian of real property assets and a provider of general-purpose office accommodation to federal departments, Real Property goals include:

- meeting the custodial requirements of accommodation as per the TB standards
- following the guidelines for designated cultural landscapes in the Standards and Guidelines for the Conservation of Historic Places in Canada; and
- meeting the various site development requirements of LEED, or Green Globes pre-established for the project;
- ensuring that Provincial and Municipal Official Plans, zoning bylaws, urban design guidelines and other priorities are considered for the site development in the delivery of the real property program

7.2.1 Site Specific Analysis

A site specific analysis report must be prepared for each project which illustrates that the above goals have been reviewed and evaluated as part of developing an integrated strategy. The site analysis must demonstrate a clear understanding of the existing site conditions.

7.2.2 Urban Design

PWGSC is committed to working closely with Canada's communities collaboratively in support of local planning priorities while meeting sustainable objectives of the department. The federal government's intent is to support the quality of life of communities with appropriate, sensitive urban design.

The measurement of success will be the degree of compatibility with the physical characteristics of the area and environment surrounding it including neighbouring land uses.

7.2.2.1 Design Objectives

Urban design is important to ensure an appropriate 'fit' of the building or building complex within the urban environment. The building's form and adjacent open space areas must be integrated to ensure a cohesive, sensitive solution. This objective must demonstrate:

- aligning with the urban design guidelines, best practices and approvals requirements of local communities;
- enhancing the quality of life of the community by:
    - linking, where possible, with the public transit system and including bicycle and pedestrian pathways to reduce stress on the existing transportation system;
    - preserving and protecting the ecological features, heritage and cultural values of the community; and
- supporting the livable qualities of the neighbourhood and community by:
    - demonstrating that building massing includes adequate setbacks proportional to existing neighbourhood supporting the integration of the building into the local context;

- providing appropriate pedestrian sidewalk widths to include and support trees, rest areas with benches and other site features to generate a lively pedestrian culture to ensure accessibility for all users;
- illustrating a respect for human scale and use at street level;

- integrating into the existing streetscape by:
  - orienting the front of the building to the main thoroughfare and providing an open space in front of the façade where the main entrance is located;
  - creating an animated and transparent ground floor level along commercial street frontages such as maximizing the use of clear glazing at public entrance areas and lobbies;
  - incorporating elements to aid in the reduction of wind tunnel and wind shearing effects at grade levels around the building;
  - integrating site furniture (benches, waste receptacles, light standards), plantings, bus shelters with the building's design and to assist in improving the functionality of the streetscape and neighbourhood;
  - locating service entrances away from active public streetscapes. If space is limited, design service entrances so they are screened from the street in order to preserve the sense of place and aesthetic appeal of the streetscape. There must be no manoeuvring or backing in from the street;
  - demonstrating the use of the principles of crime prevention through environmental design for the planning of the site, opportunities for passive surveillance and territorial control.

7.2.2.2 Master Planning

Master planning is fundamental for the appropriate organization and development of sites. For federal precincts, campuses, office complexes or an office building, a master planning exercise must be undertaken for a project site area. At a minimum the following elements must be studied:

- site's capacity to be able to accommodate the building or a building complex's functional, operational and experiential components;
- natural and built environment including topography, and climatic conditions;
- surrounding context of the site in relation to;
  - rural, suburban and urban core contexts;
  - neighbourhood and streetscape typologies;
  - heritage designations;
  - servicing
  - emergency access
  - public transit opportunities;
- projected growth and development of the surrounding area;
- on site circulation of employees, operations, functional requirements, public transit links, general public use;
- provincial laws and standards as well as local municipal official plans, technical standards, and bylaws for the site and adjacent land areas and urban fabric; and
- project specific cost and risk and issues for the site's development.

- Master planning for multiple building complexes or a campus, must incorporate open areas which can be either adjacent to the building or at another location as determined by the site master plan.
- Security elements must be integrated with the site and building's design.

7.2.3 Landscape Architecture

The intent of this section is to ensure the provision of integrated design and technical solutions to create liveable and sustainable environments. Provided are design strategies that will encompass varying scales of planning, design and management of sites.

7.2.3.1 Design Objectives

The objective of this section is to establish sound landscape architectural design requirements for federal office buildings. Design goals are to:

- create a well developed site that will support and enhance the building's function and operation;
- enhance the user experience outside the building and on the site;
- enhance the linkages and connections with the adjacent streetscapes and neighbourhoods
- support and enhance sustainable best practices to strengthen the inter-relationship of the landscape and building with the environment through the use of green infrastructure, reducing, recycling and reusing of materials and other sustainable practices and strategies;
- support and enhance the social values by applying universal accessibility best practices;
- ensure low maintenance solutions to create operational efficiencies

7.2.3.2 Site Design

Site design strategies must utilize the environment to reduce operational costs and support an effective functional program for employees and the public by:

- demonstrating how sun radii, wind, topography and vegetation are used to create microclimates to enhance the experience of the site and building for the occupant and visitor experiences;
- illustrating how scale and massing of the building and its infrastructure such as parking structures and circulation systems will not negatively impact adjacent open spaces or streetscapes or critical viewlines;
- demonstrating how the design of the exterior circulation systems and site amenities supports the building's functionality such as selecting appropriate locations for principle building entrances and key destination points that are easily identifiable when approaching the building.
- demonstrating how wayfinding and orientation systems are efficient and effective and assist in preserving the social and aesthetic values of the landscape surrounding the building.

7.2.3.3 Technical Requirements

7.2.3.3.1 Site Areas

Site areas around buildings must encourage interaction with the environment and social interaction of the occupants and support passive recreation. The outdoor space must be:

- designed with appropriate landscaping materials selected to reduce impervious hardscape elements;
- designed using native plants to limit maintenance requirements and promote biodiversity;
- integrated with vegetative elements to create a dynamic landscape throughout the year that takes in consideration the four seasons;
- focused on eliminating use of potable water for irrigation and using where required grey water irrigation systems and plantings which require little to no irrigation;
- planned with trees placed to provide shaded rest areas as well as in achieving reductions in heat and glare on hard surfaces, and general enhancement of pedestrian comfort;
- planned with the intent of integrating planting in and around the building and parking area so that it promotes visual surveillance for safety and security.

7.2.3.3.2 Circulation

Convenience and clarity of the exterior circulation system is a priority and it must be planned to achieve the following objectives:

- demonstration of a clear design strategy for pedestrian, bicycle, vehicular, service delivery, construction, emergency and exterior material handling circulation routes, intersections as well as staging areas, vehicular lay by's or drop-off areas for building occupantsparking, waste and snow storage areas;
- provide space for drop-off zones and waiting areas for pedestrians and vehicles.
- integration with existing walkways, paths, and vehicular circulation networks;
- demonstration of parking areas and circulation routes that maximize sustainable best practices to reduce impacts on the natural environment through best practices for stormwater and heat island reduction

7.2.3.3.3 Vegetation

Vegetation strategies must include:

- conservation and enhancement of existing natural areas and restoration of damaged areas to provide habitat and promote biodiversity;
- reinstatement of trees removed from site on a ratio of 2 new trees for every tree removed

7.2.3.3.4 Site Grading

Grading strategies must demonstrate an integrated approach to the site and building and adjacent land areas. There must be no negative impacts to riparian zones, ecologically sensitive landscapes, existing trees and shrubs that will be remaining, and adjacent land areas not owned by the federal government.

Site grading must:

- demonstrate the reuse of materials through efficient excavation, transporting, placing, and compaction materials excavated within a site;
- demonstrate avoidance of the potential for settlements resulting from compression of the underlying soils;
- include the reduction of need to limit excavations where high water levels and permeable ground conditions occur;
- minimize the need for retaining walls;
- minimize the need for constructing cut slopes; and
- minimize the need for removal of topsoil or other organic soils including fill materials.

7.2.3.3.5 Site Drainage

The site drainage planning must develop a strategy to minimize the volume of stormwater and snow melt runoff going to municipal systems, and, to improve water quality. The approach should if possible be based on the historical conditions of ecosystems in the region.

In all cases, the design of site drainage must minimize the negative impacts of site grading strategies to municipal infrastructure, adjacent landscapes, surface water bodies, and below ground water tables through:

- use of above and below ground, sustainable green infrastructure storm water control systems and site design such as the elimination of curbs on-site;
- a system design incorporating an integrated storm water retention and detention program for a roof to reduce stormwater and where applicable to provide irrigation. A green roof strategy or rainwater harvesting strategy must be clearly demonstrated as to its viability and effectiveness;
- the provision of grey water irrigation to assist vegetation growth on-site if irrigation is required;
- provision of proper drainage to eliminate standing water that is at risk of harbouring mosquitoes or other disease-carrying insects.

For all projects, the following minimum criteria must be respected;

- major systems; site surface drainage must be designed to be capable of addressing a minimum 100 year storm event;
- minor systems; storm sewer collection systems must be designed to address a minimum 1:5 years storm event without surcharge;
- new developments must provide quantity control; limit runoff from minor system for new development sites to a minimum 5 year predevelopment level. Attenuate a 1:100 year storm event and water run-off from site to a minimum of the 1:5 predevelopment flow rate;
- storm drainage systems must rely on gravity flow only

7.2.3.3.6 Soil Erosion

Site planning and design must control and minimize soil erosion, waterway sedimentation, and airborne dust. The site plan and sedimentation control plan for all land related construction activities must conform to erosion and sediment control requirements of provinces and municipalities and:

- minimize erosion effects of construction activities; and,
- mitigate risk of erosion of embankments and sloped areas especially those that could impact riparian zones, waterways and stormwater retention ponds.

7.2.3.3.7 Site Furniture

Design and provision of site furnishings and shaded rest stops are an important aspect of site planning. The durable furnishings must be integrated with building design.

7.2.3.3.8 Site Lighting

Designs must achieve light pollution reduction and where applicable meet regulatory requirements such as LEED. Refer to electrical section for additional standards. Designs must support:

- the reduction of light fixture glare;
- light trespass to adjacent sites;
- balance of providing good visibility, meeting security concerns while respecting the character of a site, streetscape or neighbourhood;
- respect light hierarchies as per master planning and urban design requirements.

7.2.4 Civil Engineering

7.2.4.1 Design Objectives

The design objectives for civil engineering associated with site development for new construction and existing buildings include;

- meeting provincial and municipal requirements found in Official Plans, Zoning Bylaws, technical standards and other design and technical guidelines for the development of sites;
- meeting and integrating project requirements of the utility and services authorities having jurisdiction including installation, access, maintenance and replacement of equipment;
- locating piping for all systems under dedicated service corridors, vehicular circulation routes and be accessible for maintenance all year long;
- addressing trenching to minimize differential frost settlements of the cuts, reduction of settlement effects of trenches and pipes as well as frost protection of the pipes;
- controlling storm water and sanitary sewage to meet discharge standards of the authority having jurisdiction over the receiving outlet;
- sizing sanitary systems to accommodate ‘peak waste flow’ including long term development forecasts as well as allowances for infiltration following municipal guidelines;
- providing sanitary system separate from the storm water system;

7.2.4.2 Water Supply Services

Campus planning must use a loop system fed from more than one source and the entire distribution network to be configured to ensure redundancy of supply. Buildings must also have two feeds to ensure redundancy.

Service connections for individual site and building water supply must meet following design and technical requirements:

- system design must confirm available flow rates from the surrounding system. Flow rate, testing and hydraulic analysis must be completed as part of the design to confirm capacities and pipe sizing;
- flow and pressure requirements for site fire protection demands must be met, including the requirements of NBC, NFPA 24, *Standard for the Installation of Private Fire Service Mains and Their Appurtenances* , and responding fire protection services with the design;
- domestic water demands (peak and average) must be met with the design;
- service lines to buildings are to be grounded as required by Electrical Code of Canada. Use of 3.0 m minimum metallic, continuous ductile iron or copper piping outside the building footprint is the preferred method of grounding;
- provide modular wall seals at water service entries to buildings;
- provide cathodic protection of water main and associated appurtenances based upon soil and ground water conditions and municipal standards.

7.2.4.3 Storm Water Management Services

Storm water management services must be integrated with landscape architectural design requirements for surface water flows. Refer to landscape architecture site drainage section for specific requirements. The gravity based system must have as a minimum:

- pipe flow velocity within a range of 0.6 m/s to 3 m/s, under full flow pipe conditions;
- system design that optimizes on site water detention; and,
- stormwater system components must conform to municipal or provincial regulations and have the following:
    - sumps in maintenance holes and catch basins; and,
    - for maintenance holes with depths exceeding a maximum of 5.0 m, provide safety platforms.

7.2.4.4 Site Grading

Site grading must be integrated with landscape architectural design requirements. Refer to municipal requirements and landscape architecture grading section for detailed requirements.

7.2.4.5 Sanitary Services

On campuses, the sanitary sewer system design for individual buildings must be integrated with overall master planning requirements.

In rural areas, follow requirements of provincial authorities having jurisdiction/municipal requirements for septic systems or onsite sewage treatment. Cesspools are not permitted.

Individual sites and buildings must have the sanitary service system sized to accommodate ‘peak waste flow’ as well as the long term needs of the site. The system design criteria must include:

- cleanouts to be interior to the building, where exterior access required, provide maintenance holes;

- follow municipal requirements as well as local guidelines for leakage allowances. Include these design values for extraneous flow rates in calculating peak sanitary flows;
- pipe velocity flow rates must be confirmed after construction and data submitted as part of commissioning process;
- sizes for piping must follow municipal standards and the following;
    - maintenance holes to be benched;
    - provide external drop pipes at maintenance holes where inlet elevation exceeds 600 mm or in accordance with local authority having jurisdiction; and,
    - for maintenance hole depths exceeding 5.0 m, provide safety platforms within maintenance holes.

7.3 Architecture and Interior Design

7.3.1 Design Objectives

The site, setting, and appearance of a federal building, contributes to the image of the Government of Canada. The base building design for a federal building and its interior public spaces must contribute to the overall architectural value of the building. The main building signage and flagpoles must be integrated into the design of the building.

Federal buildings must have a Load Factor ranging from 1.1 to 1.3 based upon the 2010 BOMA Office Building Standard ANSI/BOMA Z65.1 using Method B. Buildings must meet the National Energy Building Code targets noted and the following technical performance standards with reference to other detailed requirements of the Mechanical and Electrical sections:

- The building envelope must be air tight and must meet air leakage of 1.27 $L/s \cdot m^2$ @ 75 Pa must be met with all five faces. All buildings must have an air leakage testing to confirm that target is met.
- The building must be designed to minimize stack effect and solutions to achieve objectives must be identified.
- The building design service life is to be 50 years minimum following CSA S478, *Guidelines on Durability in Buildings*.

7.3.2 Building Common and Service Areas

7.3.2.1 Entrances

The building must be designed to direct the visitor to a principal entrance of the office building. It must be conveniently located, have a grade level approach based on existing site conditions as well as be clearly articulated on the exterior design of the building. The design must meet the following design and technical requirements:

- have a canopy for weather protection, sized for sheltering and for emphasizing the main entrance;
- have weather protection for secondary and tertiary entrances and these to be clearly articulated on the exterior of the building;
- provide conventional swing doors and vestibule at the principal and secondary entrances;
- exterior overhead door locations require one personnel door;
- incorporate building and way finding signage in compliance with the *Federal Identity Program.* Design to include standard federal signage mounted on a prominent facade and a flagpole mounted on facade or rooftop.
- deploy solutions to inhibit the buildup of dirt and moisture in the lobby;
- deploy solutions to maintain the integrity of the security of the lobby; and
- incorporate appropriate decorative or accent lighting to support the design concepts.

7.3.2.2 Lobbies

The main building lobby must provide a welcoming impression to Canadians visiting the office building and reflect a positive identity for the Federal government. Lobbies must meet the following design and technical requirements:

- be clearly visible from the exterior of the building both day and night;
- locate the elevator lobby and main building lobby such that they are visible from the building entrance vestibules;
- be laid out to allow continuous flow of pedestrian traffic with space large enough to accommodate all employee traffic during peak hours. Interlink ground floor entrance areas from the street and the parking lot areas.
- the circulation requirements must include additional floor area for a visitor and security desk approximately 24 m2 in area as well as surrounding area for security screening;
- accommodate the placement of reception and security control functions to provide visual supervision and physical control of the lobbies, elevator lobbies and escalators;
- be designed to adhere to security requirements (see 7.9);
- utilize durable interior finishes for all areas with high impact resistance for heavy pedestrian traffic was well as can be easily cleaned and maintained (painted GWB is not considered durable); and
- have appropriate decorative or accent lighting to support the design concepts.

7.3.2.3 Building Core and Support Spaces

The core is the central area of the floor plate which includes elevators, exit stairs, washrooms, mechanical and service shafts as well as electrical rooms. The elevator lobby and the main building lobby must be designed as an interconnected reception area.

Planning for building cores must establish distances to perimeter glazing following LEED requirements – the workstations no more than 12 m from window wall. Planning of office floor plates must be flexible to allow subdivision of typical floors into a minimum of two separate tenant areas, not compromising life safety for occupants. There must be acoustic separation of STC 52 of the building core from Tenant Areas. Building support areas and inter-relationships determined in the functional program must be achieved in the design.

7.3.2.3.1 Elevators

All occupied areas of a federal multi-story building must be served by at least one fully automatic passenger elevator. Elevator cab sizes, the class or the service capacity to be determined through an elevator traffic capacity and wait time analysis. Number of elevators to be based on occupant load and meet the following technical requirements:

- office areas to have a minimum capacity established based on the floor plate, anticipated population and the required handling efficiencies to provide efficient service at both peak periods and all other times in accordance with high standards in the elevator industry; and,
- the passenger waiting times below:
    - response in less than 20 seconds to 55% of hall calls;
    - response in less than 30 seconds to 80% of hall calls;
    - response in less than 50 seconds to 90% of hall calls;
    - response in less than 90 seconds to 99% of hall calls;
    - response in less than 180 seconds to 100% of hall calls;
    - cars to be dispatched from main floor when 65% loaded;
    - car and landing doors to open or close completely in five seconds maximum;
    - each car capable of being operated independently.

- passenger elevators, if more than one, must be grouped in banks of at least two for efficiency;
- provide a separate service elevator withClass C-1 loading to serve all floors of the building including the parking levels and all mechanical and elevator penthouses and roof top equipment areas. The capacity of this elevator must be 2268 kg. The lobbies for these elevators must be designed for at least the same load as the elevator capacity. Freight elevators must have a ceiling height of no less than 3.7 m;
- provide a shuttle elevator from the ground floor lobby to below grade parking with fully automatic operation with selective-collective operation. Shuttle elevators must be designed for the environment of the unheated parking garages. Capacity will be established based on anticipated traffic flow;
- if no separate freight or service elevator is provided, one passenger elevator must be designated as a service elevator. For midrise office buildings provide a freight elevator;
- a minimum ceiling height of 3.0 m is required in service and freight elevator cabs, service elevators to be a minimum 1727 mm x 2745 mm x 3000 mm high ;
- all gearless and geared elevators shall be provided with VVF regenerative motor drives;

A non-proprietary elevator control system must be used, and the PWGSC Project Manager must define the extent of control. Destination control systems must be used. Security controls must be installed with override systems to follow functional program.

Passenger elevators finishes must be focal points for the interior design of the building. Finishes for all surfaces must be durable, easily replaced and low maintenance. Door surfaces must be durable, scratch resistant and easily replaced. Inside and outside finishes must be coordinated with adjacent wall surfaces.

All finishes for service elevators must meet the service level requirements for durability, walls and ceilings must be metal. Flooring must be durable, non-slip, easily maintainable, and replaceable.

In passenger elevators, recessed down lights or indirect fixtures must be used. Freight elevators to have recessed ceiling light fixtures.

Emergency power must be provided to one passenger, shuttle, and freight elevator as well a having the transfer of power from one elevator to another in the same group.

All elevators shall be provided with fire fighters emergency operation with the service elevator being the dedicated fire fighters elevator for the building.

Provide conduit for remote video monitoring system for elevators, machine room from the security control room. Integrate with rough-ins required for a remote monitoring system for the elevator controls.

Provide rough-ins for security system interface and control capacity to be provided with elevator controls.

Travel distances from a given office or workstation to an elevator must not exceed 60 m.

The location of stairs and design within buildings must be inviting and encourage their use rather than elevators, to the fullest extent feasible.

7.3.2.3.2 Escalators

Escalators must be installed in a parallel arrangement and must meet the following requirements:

- be heavy duty in design (16 hours per day) with cleated risers and be reversible. The unit should be self contained;
- have an angle of inclination of 30 degrees from horizontal;
- have nominal step width of 800 mm (4,320 passengers/hour) and operate at 0.50 m/s.
- balustrades and other components and finishes must be selected to correspond with Lobby finishes;
- provide technology i.e., soft start semi-conductors, multi-speeds or other opportunities to minimize energy use.

7.3.2.3.3 Stairways (open for convenience)

Open stairways that connect lobby and atrium spaces must use a similar materials palette as the lobby space. Open risers are not to be provided.

7.3.2.3.4 Mechanical, Electrical and Telecommunication Equipment Rooms

Mechanical, Electrical and Telecommunication equipment rooms must be designed with adequate aisle space and clearances around equipment to accommodate maintenance and equipment replacement. These rooms must meet the following criteria:

- Locate mechanical rooms such that heat and sound will not be transmitted to other parts of the building.
- Mechanical spaces must be large enough to allow for a safe working environment and provide adequate area for maintenance service requirements and for future expansion.
- They must have hoists, rails, and fasteners for chains provided to facilitate removal of heavy equipment.
- Provide easy access to roof mounted equipment by elevator cab stop or a large stairway to facilitate maintenance. Do not use temporary ladders, steep stairwells and ship's ladders.
- Main mechanical and electrical equipment rooms (such as mechanical penthouse or basement rooms) must not be less than 3.6 m clear in height from underside of structure.
- Doorways and corridors to the building exterior must be of adequate size to permit replacement of equipment. The path may include knock-out panels, hoists, and provisions for cranes, but must allow equipment replacement.
- Mechanical and electrical rooms must be accessible from non-occupied spaces such as corridors.
- Primary substations (electrical vaults) or rooms containing main secondary switchgear must not be located below garage ramps, washrooms or janitor closets or at an elevation that requires sump pumps for drainage.
- Transformer vault rooms and emergency generator rooms' locations must follow local requirements of the authority having jurisdiction.
- Floor-mounted electrical and mechanical equipment such as switchgears, main building transformers, motor control centers and generators, chillers, boilers, pumps, air-handling units, electric motors, motor starters, tanks, etc., must be set on concrete housekeeping pads, curbs, or saddles at least 100 mm wider on all sides than the equipment they support, and at least 100 mm thick.

- Fuel tanks or storage tanks must have a housekeeping pad that incorporates a raised barrier of adequate volume for spill containment.

7.3.2.3.5 Vertical Shafts

Vertical shafts for running pipes, ducts, and flues must be located adjacent to other building core elements and:

- Shafts must be straight vertical runs for services.
- Shafts must be sized 20% larger in area to accommodate planned expansion of the systems.
- Bus ducts require a raised containment curb edge at floor slab penetrations. Sleeves to continue to 75 mm above floor slab.

7.3.2.3.6 Washrooms

Washrooms must be located adjacent to vertical shafts at the building core. They must be designed with water resistant, easily maintainable, durable finishes on all walls and floors. Mirrors are required above each sink, continuous for sink area.

All washroom partitions must use durable, easily maintainable materials and must be ceiling or wall hung. Separation partitions between urinals must be provided.

Each washroom to have two recessed waste receptacles, in stainless steel, one for paper towels, and one for garbage with bilingual signage to meet requirements of the PaperSave Program managed by PWGSC Crown Assets.

Washroom plumbing fixtures must be of a low-flow specification in all areas except basement areas.

7.3.2.3.7 Change Rooms, Showers, Locker Rooms

Change rooms with lockers must be located as part of washroom areas associated with relevant LEED credit. If provided, the planning of the change rooms must include lockers, and benches. The showers must be separate showers and visually separated from the locker areas. All finishes must be water resistant, easily cleanable and maintainable.

7.3.2.3.8 Custodial Spaces

Custodial spaces must be provided to support the operation and maintenance of the building and include building maintenance storage rooms, stockrooms and maintenance workrooms. Provide as a minimum 20 m2 area in basement, ground floor adjacent to Loading Docks, and rooftop penthouse. Coordinate requirements with the Functional Program.

7.3.2.3.9 Janitor Closets

Janitors' closets must be directly accessed from the office floor corridor and discretely located near the washroom facilities.

7.3.2.3.10 Recycling Centres

Corridor areas must be provided with multi-material waste and recycling recesses. Minimum three containers are typical: one for recyclables, mixed recyclables, and compostables, the

requirements must be confirmed with building management. A minimum of one station per floor or one station per 1000 m² must be provided.

7.3.2.3.11 Waste Management Rooms

Waste management rooms and equipment must be adjacent to loading docks or service entrances and meet the following:

- be sized to accommodate the required functions of central collection, separation, and storage of garbage, recycling and compostable materials;
- have areas sufficient for storage of anticipated waste material volumes generated during three-day building occupancy period of the building;
- have refrigerated areas for compostable materials;
- waste management rooms accommodate all governmental requirements pertaining to waste reduction and waste audit programs.
- facilities that use waste containers picked up by vendors must have at least one internal loading berth for the waste containers.

7.3.2.4 Building Management Spaces

Property Management, Building Systems Technicians and Building Cleaning Operations teams must have offices next to the security control centre. Approximately 15 m^2 must be allocated for this standard office space, refer to building specific functional program.

7.3.2.4.1 Security Control Centre

The security control centre must be located adjacent to the main lobby. Approximately 20 m² must be allocated for this room, which will require rough-in of specialized conduit requirements in slab and in ceiling areas for the workstations. Rough-ins required from the location of the BAS and emergency power system as well as fire alarm annunciator panel.

Planning of the building for a security command centre and inspection station must be considered, if it is not required at time of building design. The security control centre design criteria that are outlined above must be used in conjunction with the Royal Canadian Mounted Police (RCMP) *G1-103 Security Control Space Requirements*.

7.3.2.4.2 Loading Docks, Shipping and Receiving

These areas are to be available to PWGSC at all times. These areas must be convenient to service or freight elevators so that service traffic is segregated from the main passenger elevator lobbies and public corridors. They must be fully inside the building and include staging areas. Other requirements include:

- loading docks must be located for easy access by service vehicles and be separate from the main public entrances to the building;
- trucks and trailers that remain outside of the building must have expandable environmental seals provided to separate interior unloading areas from the exterior;
- dock levellers and one scissor lift must be provided to accommodate the variety of bed heights of service vehicles;
- protect edge of loading docks with edge guards and bumpers; and,

- spot lighting must be provided to illuminate the inside of trailers for the loading/unloading activities.

7.3.2.5 Structured Parking

Parking is to be exterior on-grade parking, interior below-grade, or standalone structured parking. The general management criteria are in *Real Property Branch* *Custodial Parking Policy and Custodial Parking Procedure*. Design and technical requirements include:

- planning of structures and parking spaces must be laid out for maximum efficiency;
- parking stalls must be full sized, do not provide compact vehicle sized parking stalls;
- two-way aisles must have a minimum width of 6.7 m and one-way aisle a minimum of 3.6 m and parking spaces must be a minimum size of 2.6 m wide and 5.2 m long;
- preferential parking spaces to be provided for accessible parking and for electric vehicles with their charging stations;
- accessible parking spaces must be adjacent to access aisles that are part of an accessible route to the building or facility entrance;
- access aisles and entrance platforms to elevator lobbies to use bollards and guardrails to safeguard routes;
- entrances and enclosures of elevator lobbies must be located to be visible from interior of parking facility and have a minimum 50% glazed wall areas;
- structural elements must not intrude upon the required stall dimensions. Columns must not be located within 610 mm of the required aisle except where the aisle has no stalls perpendicular to it. Each stall must have direct access to an aisle;
- maintain the entire length of the entrance and exit ramps protected from snow and ice. Snow and ice must not accumulate on the ramps;
- all vehicular entrances to structured parking to be secured with overhead doors or grilles these must be electric powered and on an emergency power circuit and operated by card-readers or other means of remote control;
- garage openings must be a minimum of 3.6 m wide with minimum height of 2.4 m and must be monitored by video camera. The clear height throughout vehicular accessible areas of a parking structure must not generally be lower than 2.25 m. A headache bar, with signage indicating the clear height, must be provided in front of each opening and mounted slightly lower than the clear height of the parking garage;

Pedestrian walkways must link the exterior structured parking or outdoor parking area with the building entrance. Passive landscape techniques must be used to prevent vehicles from encroaching upon pedestrian walkways. Pedestrian crossings of vehicular circulation lanes must be identified.

7.3.3 Building Envelope

The objective is to have an envelope which provides an effective, low energy consumption, separation between the interior and exterior environments. The use of passive solar principles is required to enhance the health and productivity of occupants.

7.3.3.1 .Exterior Wall Assemblies and Components

The envelope must meet or exceed the requirements established in the CSA S478 *Guideline on Durability in Buildings*.

- walls must have a minimum 50 year full service life and at least 30 years prior to a major rehabilitation;
- windows must have a minimum 25 year full service life and at least 15 years prior to a major rehabilitation of gasket and seal replacements;
- roofs must have as a baseline a minimum 20 year full service life;

Exterior wall design must provide complete control of migration of heat, air and moisture through the building enclosure. The exterior building envelope must be designed in accordance with 'rain-screen' principles, pressure equalized as well as control air leakage and provide continous insulation. Face-sealed envelope systems must not be used. Risk of moisture-related failures must be minimized in the design of an exterior wall and;

- the cladding design shall have the means to evacuate moisture from the wall assembly. Comply with *ASHRAE 160, Criteria for Moisture-Control Design Analysis in Buildings;*
- the window to wall ratios of glazing to opaque wall, must vary with facade orientations to maximize energy efficiencies and must reflect passive solar design best practices, and vision glazing not to exceed a maximum 40% of envelope areas;
- opaque wall assemblies must be a pressure equalized, rain screen design. They must reduce thermal bridging to a minimum, to less than 5% maximum of wall area;
- curtain wall vision glass and spandrels must use high thermal performance thermally broken, metal frames with high-performance glazing units;
- metal and glass cladding systems must meet requirements of the American Architectural Manufacturers Association, Canadian Standards Association (AAMA-CSA) 101-A440 *North American Fenestration Standard for windows, doors and skylights*, maximum air leakage as well as meet the performance class AW40;
- window wall assemblies are not permitted for multi-storey buildings; and,
- provide thermal analysis of window systems based on NFRC 500 Procedure for Determining Fenestration Product Condensation Resistance Values.

Soffits are totally exposed to weather and must therefore be designed to be resistant to migration of heat, air and moisture from the exterior to interior environments. They shall be designed:

- to resist displacement due to wind uplift allow for access to operable equipment;
- air tight and insulated to limit condensation on the enclosure materials; and
- equipment or distribution systems that may be affected by weather must not be located inside soffits.

7.3.3.2 Exterior Sun Control

Passive solar principles and techniques must be used with facade and glazing designs to maximize responsiveness to climatic conditions. The base building envelope should be designed and constructed to passively manage solar heat gain, daylight and glare with the use of passive sun shading devices. The architectural features in the form of a projection from the face of the building must not cause ice accumulations that could represent a risk to the public.

Provision for repair, maintenance, and window cleaning, must be part of the for exterior sun control system design.

7.3.3.3 Glazing

The choice and thickness of glass double or triple glazed windows, the selection of glazing coatings and type of insulating gas in the air spaces must be based on climate, energy conservation, and security requirements.

Minimize use of highly reflective glass that produces mirror images to avoid creating glare in surrounding streets and buildings.

The design of the building must include provisions for cleaning the interior and exterior surfaces of all windows, as per CAN/CSA-Z91, *Safety Code for Window Cleaning Operations*, as amended from time to time.

7.3.3.4 Interior Sun Control

All windows in general office floors must have manually operated fabric roller shades to control the amount of daylight and heat gain in the office space. The type of shade, fabric, and neutral colour must be consistent throughout the building. The light filtering capacity must range from 0% to a maximum 14% openness factor. Openness factors must be selected and located on facades to achieve optimum effectiveness based on building orientation and exposure.

The interior fabric must be resistant to the degradation by temperature variations, and colour fast when in direct sunlight. The fabric must be stain and mould resistant and dimensionally stable. All fabric and hardware must be heavy-duty commercial grade, with a minimum warranty of 5 years.

Provide remote operation controls for coverings on clerestory and atria windows. Ensure that systems and techniques are proposed for servicing for cleaning, maintenance, repair, and replacement.

7.3.3.5 Exterior Doors

Entrance doors must be constructed out of heavy duty materials to withstand continuous high traffic. The exterior side of one leaf of a double door entrance must have a lock guard or astragal to prevent tampering or break in.

Doors used for egress only must not have any operable exterior hardware.

7.3.3.6 Bird Control Devices

Building design strategies must include techniques to manage bird control and reduce opportunities for nesting.

Design facades to meet best practices of *Bird Friendly Development Guidelines and Bird Friendly Development Rating System, www.toronto.ca/lightsout/pdf/development_guidelines.pdf*.

7.3.3.7 Window Washing Equipment

Building design must include suitably engineered systems for window washing equipment. The design applies to buildings of three stories or 12 m and higher, and must conform to technical requirements found in CAN-CSA Z91-02 *Health and Safety Code for Suspended Equipment Operations.*

7.3.3.8 Roofing Systems

Roofing systems and below grade waterproofing systems require assemblies that are highly resistive to physical damage, including impact and water-entrapment resistance. Single-ply systems can only be used where the system is fully adhered to a solid structural surface. General principles that must be met include:

- roofing design including metal flashing and trim, must follow the recommendations of the Canadian Roofing Contractors' Association (CRCA) and provincial roof associations;
- roof membranes to be 2 ply fully adhered membranes. Loos-laid and single ply roof membranes must not be used;
- all inverted roof assemblies including green roofs must incorporate suitable Electric Field Vector Mapping (EFVM) charged wiring systems for non destructive testing for leaks in waterproof membrane;
- slope roofing to drains and avoid ponding on the surface of a membrane;
- exterior surface of the parapet walls and penthouses shall be consistent and integrated with the envelope assembly materials;
- roof insulation must be installed in a minimum of two layers to maximize thermal breaks;
- permanent access via stairs to all roof levels must be provided to facilitate re-occurring inspection and maintenance. The use of ship's ladders is not permitted;
- there must be continuity of the roof waterproof membrane and the wall air barrier;
- noise-emitting roof-mounted equipment must be screened with noise-abating panels;
- roof-mounted equipment must be housed in penthouses or screened by walls;
- roof-mounted equipment must be set back from the roof edge to minimize visibility and allow access for maintenance and repairs;
- critical roof-mounted equipment must be installed to permit roof system replacement or maintenance without disruption of equipment performance;
- pitch pocket details are not acceptable;
- no building element may be supported by the roofing system except walkways.
- exposed waterproof membranes on roofing assemblies shall be protected by walkways along routes to and around rooftop equipment and all public/building user activity;
- roof-mounted devices, such as antennae, lightning rods, flagpoles, roof anchors, etc., must be integrated into the building structure and roof design; and
- all podiums and roof top areas providing access to building occupants and the public must have protected waterproof membranes and insulation and structural assemblies that will withstand structural loading of planned activities. Parapet heights to ensure heights address occupancy requirements.

7.3.3.9 Skylights and Sloped Glazing /Atria

These public area architectural features at the entrance and lobby spaces pose particular challenges for operations and maintenance. They must meet the following requirements:

- skylights design must follow the requirements of AAMA/WDMA Standard 1600/I.S.7-00 *Skylights and Space Enclosures*;
- skylight placement must be calculated to prevent glare or overheating in the building interior;
- skylight and sloping glazing design must also incorporate the pressure equalized rain-screen (PER) principle which is based on the principle of pressure equilibrium.
- condensation gutters and a path for the condensation away from the framing must be incorporated; and
- design strategies must be provided for cleaning of all sloped glazing and skylights, including access and equipment required for both exterior and interior faces.

7.3.4 Thermographic and Air Pressure Testing

The design intent for the exterior building envelope must be verified with thermal and air performance testing. Building enclosure commissioning must be undertaken, by testing and reporting upon air tightness based upon ASHRAE 90.1, *Guideline 0 and 3 Fundamental Enclosure* and requirements of ASTM E2813.

Thermographic inspections must be performed at pressurized and depressurized environmental conditions on the finished construction and before occupancy. Other applicable testing methodologies must be followed to verify the actual construction and specified requirements for integrity of the air, vapour barrier and waterproof membrane assemblies within the building enclosure have been met.

The enclosure air tightness testing on all five faces of the building must be undertaken to confirm air tightness achievements. Testing must follow:

- the air tightness maximum air leakage of 1.27 $L/s \cdot m^2$ @ 75 Pa must be met with all five faces following ASTM E779, ASTM E1827 as noted in ASHRAE 189.1-2009.

7.3.5 Architectural Components

The description of components is intended to address all base building finishes inlcudeing general office areas of the building.

7.3.5.1 Partitions

Partition assemblies have construction and acoustic requirements that must be met as identified by the requirements of the functional program, and the following:

- tolerances for deflection and long-term creep must be designed at the top of a partition walls abutting structure;
- partitions finishes used at the perimeter of a humid space, such as a bathrooms, basement, and limited air control areas, must have moisture, mould, and mildew resistance;
- shower areas must use water-durable and mould-resistant partition materials as the substrate;

- physical security control area walls to include full-height 18 gauge expanded metal mesh as part of the assembly.

7.3.5.2 Interior Doors

Doors to meet the durability standard, the functional program, and must meet the following standards;

- use heavy duty doors and frames, Level 2 per ASTM/SDI 250.4 *Criteria for physical Endurance for steel doors and Hardware Reinforcing*. All doors and frames should be ULC labeled and factory primed and prepared for hardware installation;
- door hardware must meet *Best Grade* requirements of the Canadian General Standards Board (CGSB);
- wood doors to be constructed to WDMA I.S.-1A, Architectural Wood Flush Doors and DHI A115-W, Wood Door Hardware Standards, Hardware Preparation; and,
- doors leading to high traffic areas must be 70% glazed;

7.3.5.3 Acoustic Treatment

Acoustic performance must meet project requirements and the following:

- Sound Transmission Class rated must include careful and extensive sealing of all joints and apertures between components around and passing through the separation, both above and below the partitions. Doors and other opening must use sound attenuation techniques appropriate to the STC;
- ceiling tiles must have a noise reduction (NRC) or (SAA) coefficient minimum of 0.75 and a Ceiling Articulation Class (CAC) minimum 180; and
- reverberation time control in the main lobby areas must not be higher than 0.7 seconds at 500 Hz.
- comply with "Maximum Ambient Noise Levels" table and evaluation standards found in MD 15000 – *Mechanical Environmental Standard for Federal Office Buildings*.

7.3.5.4 Graphics and Signage

Graphics and signage must meet the requirements set by the Federal Identity Program Policy (FIPP). Refer to the *Federal Identity Program Policy* for the application of the Coat of Arms and flag symbol with bilingual titles, and the use of the "Canada" wordmark. For design standards, refer to the *Federal Identity Program Manual* issued by the Treasury Board and the following:

- signs for washrooms, stairwells and emergency exits must comply with the *Federal Identity Program Tactile Sign System and Installation Guide*;
- heritage buildings, signage must be compatible with original signage design, using materials, finishes, colours, typefaces size and scale as a guide for new signage design; and,
- maintenance rooms, mechanical and electrical rooms and equipment and piping to be provided with signage,

7.3.6 Interior Design Components

PWGSC provides finished interior service spaces at the core, and finishes the ceilings, perimeter walls and ceilings of tenant areas as part of the base building. Refer to the functional program for detailed requirements.

7.3.6.1 Carpet Tile

Commercial grade carpet tiles must be specified for all base building areas which will be used for general purpose office space and other functional areas as defined in the functional program. Carpet tile products must comply with the following minimum performance standards:

- tufted loop, multi-colour / textured pattern, minimum 4 fibre colours, with colour selection to take into consideration masking soiling and staining must be specified for optimum performance;
- yarn must be 100% solution dyed nylon or a combination of maximum 30 % yarn dyed, with permanent static control, permanent soil-hiding fibre cross-section with a modification ratio no greater than 2.2 and stain resistance that must be permanent and be able to resist trafficking and numerous hot water extractions without losing its effectiveness;
- carpet fibre must be a minimum pile weight of 570 g/m^2 with sufficient density to ensure long term resistance to matting and crushing;
- water based releasable adhesives are to be used which are best suited for project, environmental or flexibility reasons;
- carpet tile backings must be chosen based on project application and longevity;
- carpet tile must be Carpet and Rug Institute Green Label Plus Certified and contain a minimum of 40% recycled material, uses recovered materials and must be recyclable;
- all existing carpet being removed from buildings must be recycled; and
- during removal of carpet, dust control procedures must be followed using HEPA filters.

7.3.6.2 Other Flooring

Primary public entrance areas to the building, lobbies and elevator lobbies must be finished with hard surfaces, high density, and low porosity materials chosen for their non-slip characteristics, low moisture absorbency, and hydrophobic nature. The high traffic volume of these areas must meet durable building standard to exceed 50 years life-cycle and be easy to maintain. Painted gypsum board is not considered a durable finish.

Secondary and support areas of the building, high-traffic or service areas where acoustics are not a concern and higher-end finishes are not required as defined in the functional program must be finished with resilient flooring. Products must be chosen for their durability, recyclability, low VOC, low embodied energy, and low toxicity.

7.3.6.3 Wall Finishes

Primary public entrance areas to the building, lobbies and elevator lobbies must be finished for full height of walls with materials which exceed 50 year life-cycle standard of durable building standards, have a high density, low moisture absorbency and these hard surfaces are to be chosen for their ease of maintenance.

Wall surfaces in heavy-traffic circulation areas must be treated with materials that are chosen for their impact resistance and low-maintenance character.

Wall surfaces in general purpose office space must be finished in gypsumboard, painted.

7.3.6.4 Material Finishes - Ceilings

There are a variety of options possible with ceiling treatments, for general office spaces, at a minimum suspended acoustic tiles must be used and following requirements met:

- standard office space within heritage buildings must maintain the heritage character of the spaces which would include general volumetrics and characteristics of finish materials;
- new suspended ceilings in standard office space proposed within heritage buildings must maintain full clearance at existing windows; and,
- washrooms must have a full-length cove lighting above the counters or a lighting design which delivers a soft and uniform wall wash.

7.3.6.5 Architectural Woodwork

All wood products must be certified either by the *Forest Stewardship Council Canada* (FSC), *Sustainability Forestry Initiative* (SFI), or CAN/CSA *Sustainable Forest Management System (SFM) Standard*. The following are requirements:

- Built-in furniture and casework provided in the main building lobby must be heavy-duty; other areas must be designed for normal use.

7.4 Structural Engineering

The National Building Code of Canada (NBC) serves as the basis for structural design for office buildings.

7.4.1 Design Objectives

The structural engineering design objective for office buildings is to provide an economical and efficient structure to meet the functional requirements and to fulfill the following additional requirements:

- the limit state design (LSD) method must be used for all structural design following the requirements of the NBC;
- the design for seismic protection must conform to the Real Property Services *Seismic Resistance of PWGSC Buildings* policy;
- use a 50-year design service lifespan per CSA standard CSA S478-95 *Guideline on Durability in Buildings*;
- flexibility to accommodate likely future functional requirements must be identified and integrated into the structural design; and
- the use of rainwater detention on building roofs for stormwater management must be minimized.

7.4.2 Structural Risk Management Statement

A Structural Risk Management (SRM) Statement must be prepared and submitted at each stage of the project. Refer to the PWGSC publication *Doing Business with Real Property Branch (RPB).*

7.4.3 Serviceability

Live-load reductions must not be used for horizontal framing members, transfer girders supporting columns, and columns or walls supporting the top floor or roof.

7.4.4 Floor Loads and Moveable Shelving

Office floor loads must be designed for 3.8 kPa live load and 1.0 kPa partition allowance. New office buildings must have floor plates designed to accommodate loads for moveable filing systems for all bay areas except the first perimeter bay. The load rating for the first bay areas must exceed 4.2 kPa live load.

7.4.5 Parking Structures

New parking structures must be designed in accordance with CSA S413*: Parking Structures*, with a design service life of 70 years.

7.5 Mechanical Engineering

7.5.1 Design Objectives

The mechanical engineering design objectives are to:

- provide a safe and reliable work environment for federal employees;
- meet the requirements in the *Canada Labour Code Part II, Occupational Health and Safety* and its supporting regulations, codes, and standards, and;
- meet the requirements from Treasury Board of Canada Secretariat policies and standards.

Although PWGSC encourages innovative designs, experimental and unproven mechanical systems and equipment must not be used.

7.5.2 HVAC Requirements

HVAC requirements must satisfy MD 15000: *Mechanical Environmental Standard for Federal Office Buildings*, including but not limited to the following:

a) indoor design temperature;
b) relative humidity operating limits;
c) operating temperature range;
d) occupancy heat gain
e) outdoor design temperature;
f) minimum outdoor air ventilation rate;
g) flushing air for new constructions and major renovations;
h) provide outdoor air to flush out the building on a floor-by-floor basis;
i) indoor air contamination control;
j) vibration isolation.
k) acceptable acoustical environment; and
l) for spaces not listed in ***MD 15000,*** section 5.1. *Acceptable Acoustical Environment*, the maximum noise levels must not exceed levels specified by the *National Joint Council on Occupational Health and Safety,* Part VII Noise Control (Levels of Sound). In addition, noise management strategies must be in *compliance with the Government of Canada Workplace 2.0 Fit-up Standards*.

In addition to the requirements in MD 15000: *Mechanical Environmental Standard for Federal Office Buildings*, HVAC requirements must also satisfy the following:

a) lighting and other equipment cooling loads
b) lighting loads must be based on actual design loads for the base building
c) ventilation zone control

Interior control zones must not exceed 180 m² per zone for open office areas, or a maximum of three offices per zone for closed offices. Perimeter zones must extend no more than 4 m from an outside wall along a common exposure, and must not exceed 50 m². Interior zone controls must be designed to accommodate the effects of the following:

- solar heat gain;
- perimeter heating/cooling;
- corner spaces;
- interior spaces; and

- diversity factor for occasionally unoccupied spaces (e.g. meeting rooms).

Consideration must be given for coordinating the ventilation zoning strategy with both the electrical grid and the lighting zone strategies.

7.5.2.1 Building Pressurization

Provide an active means for HVAC systems to maintain the positive pressure relationship of the building, in accordance with ASHRAE 62.1: *Ventilation for Acceptable Indoor Air Quality*.

A negative pressure must be maintained relative to surrounding spaces in areas where exhaust systems are used or an indoor air quality contaminant source is located.

Design space and building pressurization to ensure that the maximum door opening forces do not exceed *National Building Code of Canada* limits.

7.5.3 HVAC Systems

7.5.3.1 General Requirements

HVAC systems serving the conditioned air space of office buildings *must* have separate supply and return air fans contained within the air-handling unit. In addition, building pressurization control dampers are to be located as close to the air-handling unit as possible, and must be motorized and connected to the BAS.

Locate HVAC components such as dampers and coils outside of private offices to minimize disturbances.

In systems where redundancy capacity is not being included, design consideration must be given to multiple-unit arrays of smaller HVAC components instead of a single, large component; in accordance with PWGSC's DP001 *Policy on Emergency Management in Public Works and Government Services Canada (001)* and *Operational Security Standard - Business Continuity Planning (BCP) Program* from Treasury Board Secretariat.

Dampers on mechanical ventilation systems serving transformer rooms and emergency generator rooms require limit switches tied into an alarm for the damper position. The damper position must be interlocked with its ventilation fan.

7.5.3.2 Supply and Exhaust Fans

All fans must bear the Air Movement and Control Association International, Inc. (AMCA) seal, and performance must be based on tests made in accordance with AMCA 210: *Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating*.

Scroll casings must have a plugged drain connection.

7.5.3.3 Air-Handling Systems

Air handling systems must be designed incorporating the best engineering practices from the ASHRAE Handbooks.

Individually finned tube coils must comply with AHRI, the number of rows and fin spacing must be selected for the purpose of effective cleaning. Select dehumidifying coils for no more than

negligible water droplet carryover beyond the drain pan at design conditions. They must also be equipped with mist eliminators designed for low static pressure losses.

Heating and cooling coils must consider:

- coil spacing for effective cleaning;
- coil headers for effective cleaning;
- water droplet carryover downstream from dehumidification coils;
- distance to downstream equipment from dehumidification coils;
- mist eliminators;
- coil slope for drainage; and
- drain pans complete with deep trap seals suitable for the system pressure.

All hot water heating and chilled water cooling coils must be certified by AHRI 410: *Forced-Circulation Air-Cooling and Air-Heating Coils.*

Provide air filters in accordance with MD 15000: *Mechanical Environmental Standard for Federal Office Buildings*.

Air volume control dampers must be utilized for outside air mixing boxes. Mixing boxes must only use high efficiency air blenders.

7.5.4 Humidification and Water Treatment Systems

Humidification designers must coordinate the mechanical HVAC design with envelope design architects to prevent condensation on the interior surfaces, control water vapour migration into the exterior wall assembly, and ensure adequate building pressurization.

Humidification systems must also comply with the requirements of MD 15161: *Control of Legionella in Mechanical Systems.*

7.5.4.1 Humidifiers

Humidification systems must comply with Section 5.12 Humidifiers and Water-Spray Systems of ASHRAE 62.1: *Ventilation for Acceptable Indoor Air Quality.*

A high-level humidity safety switch as well as a flow switch must be integrated with each humidification system and tied into the BAS.

7.5.4.2 Water Treatment Systems

Systems requiring water treatment include the following:

- open and closed hydronic systems including cooling towers;
- potable water;
- boiler feed water;
- spray washers;
- humidification systems;
- grey water systems; and
- decorative water systems (fountains, ponds).

Design water treatment systems for control of microbiological activity including *Legionella* control as well as slime production, dissolved solids precipitation, scaling and corrosion protection in accordance with MD 15161: *Control of Legionella in Mechanical Systems*.

The chemical feed system must have self-contained microprocessor controls capable of communicating with the BAS. The methods used to treat the system's make-up water must follow the guidelines in the ASHRAE *Handbooks*. Manual addition of chemicals is not permitted.

7.5.5 Hydronic Systems

Hydronic systems must follow the guidelines in the ASHRAE Handbooks.

Closed-loop systems must include an expansion tank and a pressure-relief valve. Hydronic systems that use a common return system for both hot water and chilled water shall not be used. Hydronic systems that use a common distribution system to supply both heated and chilled water are acceptable provided that the system is designed to allow a dead band between changeover from one mode to the other of at least 8 °C outdoor air temperature.

Hydronic heat pumps connected to a common heat pump water loop with central devices for heat rejection (e.g. cooling towers) and heat addition (e.g. boilers) must have controls that are capable of providing a heat-pump water supply temperature dead band of at least 11 °C between initiation of heat rejection and heat addition by the central devices (e.g. cooling tower, boiler). Refer to CAN/CSA-B214: *Installation Code for Hydronic Heating Systems* for detailed information on hydronic systems and components.

7.5.5.1 Expansion Tanks

Use only diaphragm-type expansion tanks in hydronic systems that are pre-charged to reduce the tank size. Consider operational and maintenance constraints when selecting a suitable location for the expansion tank.

7.5.5.2 Pipes and Valves

Hydronic system designs must include reverse return piping systems with properly sized two-way control valves to minimize pressure drops. Closed-loop piping system designs must incorporate pressure-balancing controls including expansion tanks and required accessories. Isolation valves must be provided on all equipment and devices, including the following:

- main piping branches;
- heat exchangers (including chiller evaporators and condensers);
- heating and cooling coils;
- terminal units; and
- control valves.

Provide local strainers for all terminal units, heating and cooling coils, and heat exchangers. Isolation and shut-off valves greater than 66 mm Ø must be high-performance butterfly valves, and those below 66 mm Ø must be ball valves. Isolation valves must also be provided for zones off vertical risers and major horizontal branches.

Provide flexible pipe connectors as required to prevent transmission of noise and vibration through piping systems.

The use of grooved pipe connections is not permitted.

7.5.5.3 Hydronic Pumps

Design the hydronic pumping system to meet the following requirements:

- inverter duty-rated pump motors for variable-flow systems;
- best efficiency point (BEP) for the most frequently used flow rate (not the maximum flow rate);
- full flow range pumping capability without any overload conditions;
- maximum 1800 RPM for pump drives;
- chillers with corresponding primary chilled-water pumps and condenser-water pumps;
- sufficient pumping capacity for the stand-by pump(s) to maintain building operation in accordance with the requirements of the business continuity plan;
- sufficient space around each pump for the removal of the bearing unit and impeller without interfering with the operation of any other system;
- mechanical seals and labyrinth seals for all pump rotating assemblies;
- fully independent hydronic pumping systems capable of individual isolation without impacting operations;
- automatic bypass valves for variable primary-only chilled-water systems, to ensure that the minimum flow through the chiller is always maintained; and
- variable-flow pumping systems in accordance with the requirements of ASHRAE 90.1: *Energy Standard for Buildings Except Low-Rise Residential Buildings*.

7.5.5.4 Vents and Drains

System drainage connections must be provided at all low points in the hydronic system, at each heating and cooling coil, and at each terminal unit.

Automatic air vents must only be used in accessible spaces, such as mechanical rooms where maintenance personnel can observe them.

Use manual air vents at terminal units and other less accessible high points, at all localized high points in the system, and at each heating coil.

Where hydronic systems are exposed, coordinate with architectural finishes to ensure maintainability.

7.5.6 Heating Systems

7.5.6.1 Central Heating Plants

New buildings or existing buildings undergoing major renovations must be designed to use low-temperature hot water heating systems. When supplied with central heating and cooling plant (CHCP) steam, buildings must use steam-to-low-temperature–hot-water heat exchangers as part of energy transfer stations (ETS). The building heating system must be designed for supply water of maximum 60 °C and return water of minimum 35 °C.

CHCP steam must not be distributed throughout any building as a heating medium.

For shell-and-tube type heat exchangers, provide accessibility to all components without interfering with the operation of other systems and equipment, including the replacement of the tube bundle. Piping networks must include the following:

- isolating and drain valves;
- piping design that account for thermal stresses;
- piping supports with provisions for thermal movement; and
- non-condensable gas elimination.

Double-wall heat exchangers must be used in domestic hot water heating applications. Plate heat exchangers must be used for waterside economizer applications.

7.5.6.2 Dedicated Boiler Hot Water Heating Systems

Hydronic hot water heating boilers must incorporate lower operating pressure and lower operating temperature for increased operating efficiencies.

Boilers must be located in a dedicated mechanical room with all provisions made for breeching, flue stack, and combustion air complete with an outdoor air intake. The combustion air must be connected directly to the boiler. For high-rise applications, locate boilers in the rooftop penthouse to reduce static pressure on boilers.

Hot water heating systems must be designed for redundancy. Dedicated backup capacity must comply with requirements for business continuity plans in conformance with PWGSC'S DP001: *Policy on Emergency Management in Public Works and Government Services Canada (001)* and *Operational Security Standard - Business Continuity Planning (BCP) Program* from Treasury Board Secretariat.

While designing dedicated how water heating systems, incorporate the following:

- packaged boiler designs;
- factory pre-assembled components and controls;
- modular design (allowing the isolation of any boiler without interfering with the operation of any other boiler);
- separate specifications for control and relief valves to limit pressure and temperature;
- return-water temperature actuated burner controls;
- self-contained microprocessor boiler controls capable of communicating with the BAS;
- minimum boiler efficiencies as per the National Energy Code of Canada for Buildings;
- boiler systems complete with all required auxiliaries, including expansion tanks, heat exchangers, water treatment, and air separators;
- control and piping arrangements that protect the boiler from thermal shock;
- pipe sizing in compliance with ASHRAE 90.1: Energy Standard for Buildings Except Low-Rise Residential Buildings;
- primary heating sources for a building that does not include electric resistance heating and/or electric boilers, except when justified by a life-cycle costing analysis;
- sodium/potassium-free (Na-K-free gas valve actuators;
- breeching, vents, stacks, and chimneys; in compliance with NFPA 54: National Fuel Gas Code and NFPA 211: Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances;

- factory fabricated, field assembled breeching, vents, stacks and chimneys; material types, ratings and distance to adjacent building materials in compliance with NFPA 54: *National Fuel Gas Code* and NFPA 211: *Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances;* and
- heat transfer fluid that is free of ethylene glycol.

7.5.7 Cooling Systems

Cooling systems must be designed in compliance to CSA B52: *Mechanical Refrigeration Code.*

Refrigeration systems, the choice of refrigerant and the leak mitigation measures must comply with ASHRAE 34 *Safety Standard for Refrigeration Systems.*

Domestic cold water must not be used for cooling systems. Only acceptable refrigerants are to be used, in accordance with CSA B52 *Mechanical Refrigeration Code.*

7.5.7.1 Chilled Water Systems

Where central heating and cooling plant (CHCP) systems are available, ensure that the cooling plant controls are integrated with the chillers and cooling towers for overall maximum integrated efficiency.

Chillers must meet CAN/CSA C743: *Performance standard for rating packaged water chillers* for energy efficiency requirements. Chiller performance must be certified by the Air-Conditioning, Heating and Refrigeration Institute (AHRI).

Demonstrate that life-cycle costing (LCC) has been used as a basis for selection or omission of the following:

- variable-frequency drive chillers;
- thermal storage solutions;
- absorption chillers;
- centrifugal chillers with magnetic bearing compressors;
- reciprocating water chillers with open or hermetic compressors;
- rotary screw chillers; and
- scroll chillers.

Chilled water system designs must incorporate the following:

- vibration isolation and seismic control measures;
- flexible piping and conduits;
- common header design for chilled water, with provisions to sequence chillers according to load requirements;
- expansion tanks, heat exchangers, water treatment, and air separators for all auxiliaries;
- recirculation/bypass control valves on chiller condenser piping to maintain the manufacturer's minimum incoming condenser water temperature;
- pressure and temperature gauges, flow and energy-use meters, including adequate illumination, along with isolation valves to allow servicing while in operation;
- microprocessor-based controls capable of communicating with the BAS;
- common header with provisions for the BAS to sequence chillers to match the cooling load;
- chiller operating limit controls;

- chiller safety controls;
- chiller freeze protection controls;
- chiller flow controls;
- control panels with self-diagnostic capability and integral safety controls;
- control panels with displays that include the following:
    - run time;
    - operating parameters including set-points;
    - electrical low-voltage alarm;
    - phase-protection loss alarm;
    - peak demand limiting controls; and
    - input/output coefficient of performance (COP);
- BAS-connected chiller leak detection and remote alarming;
- BAS-connected freeze protection, including hard-wired, low-limit switches for all freeze-prone coils;
- piping connections that include isolating and drain valves on chilled water and condenser water loops;
- minimum flow alarm through the chiller when the chiller is operating;
- piping designs that incorporate provisions for the thermal movement of piping and the reduction of thermal stresses on chiller; and
- air elimination accessories including a purge system that operates without affecting chiller operations.

Dedicated backup capacity must comply with requirements for business continuity plans in conformance with PWGSC's DP001: *Policy on Emergency Management in Public Works and Government Services Canada (001)* and *Operational Security Standard - Business Continuity Planning (BCP) Program* from Treasury Board Secretariat.

Chiller units must be connected to a common header that allows for adequate isolation of individual units without interruption of service to the remaining units.

Cooling systems with a capacity less than 175 kW (50 tons) requires a life-cycle cost analysis for incorporating or omitting cooling towers or evaporative condensers. The chilled water system design must maximize chilled water temperatures and minimize condenser water temperatures to achieve the greatest heat recovery rates and highest efficiencies.

Each chiller must be designed to permit refrigerant recovery during servicing and repair.

Chlorofluorocarbon (CFC) refrigerants are not permitted. For acceptable non-CFC refrigerants, refer to the *Federal Halocarbon Regulations* and the *Ozone-Depleting Substances Regulations* of the *Canadian Environmental Protection Act*.

7.5.7.2 Cooling Towers

Cooling tower designs must incorporate the following:

- wet bulb design temperatures that meet ASHRAE 90.1, Energy Standard for Buildings Except Low-Rise Residential Buildings parameters;
- Legionella abatement strategies, including microprocessor controls capable of communicating with the BAS;
- certified performance values by the Cooling Technology Institute (CTI), STD-201;

- cooling tower fan power requirements that comply with ASHRAE 90.1, *Energy Standard for Buildings Except Low-Rise Residential Buildings*;
- supply piping connected to a manifold to allow for any combination of equipment use;
- equalization piping between cell basins for multiple tower designs complete with isolation valves between cells;
- ladders and platforms for ease of inspection and replacement of components;
- control strategies for the prevention of "dead heading" with variable-speed pumps when the pump is operated in parallel with other pumps;
- clean-outs for sediment removal and flushing from basins;
- de-icing capability for operations in subfreezing climates;
- provisions in subfreezing climates for draining all piping during shut-downs using indoor drain-down basins;
- heat-tracing and thermal insulation for exterior piping subject to freezing;
- manual shut-down capability;
- basin heaters for all-weather waterside economizers;
- heat tracing above and below grade (down to 900 mm) for all condenser water piping operated in subfreezing climates;
- fibreglass, PVC, or stainless steel construction for condenser piping, cooling tower basins, and housings, free of bolted or riveted connections;
- vibration and sound isolation designs in accordance with CTI standards for cooling towers located on building structures;
- cooling tower elevations that maintain the required net positive suction head on condenser water pumps;
- 1200 mm minimum clear space beneath the bottom of the lowest structural member, piping, or sump on all rooftop installations (to allow re-roofing under the tower); and
- BAS-connected temperature and pressure sensors for chilled and condenser water pipes connected to the waterside economizer with automated controls for waterside economizers and sequenced with the operating chillers to match the load requirements;

7.5.8 Plumbing Systems

Plumbing systems include domestic cold water supply (DCWS), domestic hot water supply (DHWS), and domestic hot water recirculation (DHWR) systems, plumbing fixtures, traps, sanitary waste and vent systems, and storm water systems. Design the plumbing systems to meet the *National Plumbing Code of Canada*.

When designing plumbing systems, consideration must be given to the reuse of existing systems by confirming the condition of existing piping prior to re-use. To be fit for re-use, piping systems must satisfy the applicable codes listed in Annex B: References *Mechanical Codes, Standards and Legislation* as well as this Standard.

7.5.8.1 Plumbing Fixtures

All plumbing fixtures must be provided with stated water efficiency ratings and must comply with accessibility requirements as specified in the Treasury Board of Canada Secretariat *Accessibility Standard for Real Property*, CAN/CSA B651: *Accessible Design for the Built Environment*, and the PWGSC *Real Property Branch Accessibility Procedure*.

7.5.8.2 DCWS, DHWS, and DHWR Systems

The DCWS must be designed to prevent the following:

- water hammer;
- cross-contamination;
- surge;
- erosion;
- noise; and
- cavitation.

The DCWS must also be designed to minimize flow-generated noise and vibration.

In addition, the DCWS, the DHWS, and the DHWR must be designed to include the following:

- lead-free materials for all piping and fixtures in accordance with CSA B125.1: *Plumbing Supply Fittings*;
- bacterial and/or chemical treatment of raw water supplies to be used for potable water services. As an additional precaution, drinking fountains and water-bottle filling stations are to be equipped with in-line filters capable of removing lead, to meet Health Canada's *Guidelines for Canadian Drinking Water Quality*;
- a domestic hot water recirculation (DHWR) system when hot water availability exceeds 15 seconds at the furthest fixture from the heating source;
- maximum hot water temperature of 40 °C at showerheads; and
- *Legionella* controls in accordance with MD 15161: *Control of Legionella in Mechanical Systems*.

7.5.8.3 Sanitary Waste and Vent Systems

Provide separate sanitary and storm sewer runs to the property line, even in instances where the municipal sewers combine sanitary and storm sewers. Comply with the waste treatment requirements of the authority having jurisdiction.

Floor drains connected to the municipal sewer system or discharging into the environment must include safeguards for the prevention of discharges of hazardous materials where the incidence of discharges occurring is likely, such as in mechanical rooms and workshops.

Provide floor drains with materials and accessories adapted to the following specific building areas:

- cast iron drains and nickel-bronze strainers for public washrooms and other public areas;
- cast iron drains, stainless steel sediment buckets and stainless steel funnel-type strainers for kitchens and dishwashing areas;
- large-diameter cast iron drains with funnel-type strainers in equipment rooms, with the drains located appropriately to eliminate horizontal runs of drain piping;
- large cast iron or concrete basins for parking garages installed in conjunction with heavy-duty cast iron grates to incorporate sand and oil interceptors; and
- trench drains or roadway inlets for ramps exposed to rainfall.

Provide trap seal primers for all floor drains where drainage is not routinely expected from spillage, cleaning, or rainwater. Provide floor drains with adequate cleanouts and plumbing vents in accordance with plumbing codes.

Only use sewage pumps where gravity drainage is not possible. If sewage pumps are required, only the lower floors of the building must be connected to the sewage pump; fixtures on the upper floors must use gravity flow to provide drainage to the public sewer. Sewage pumps must be non-clog, screenless, grinder-type duplex pumps, with each discharge not less than 100 mm in diameter, complete with alternators and connected to the emergency electrical power grid.

Septic tanks and disposal fields must comply with all the requirements of the authority having jurisdiction.

7.5.8.4 Storm Water Drainage Systems

Piping systems must be in compliance with the National Plumbing Code and sized based upon local rainfall intensity in compliance with the *National Building Code of Canada*.

Roof drains and overflow drains must be cast iron body type with high dome grates designed to provide adequate drainage. When included in the design, controlled flow roof drains must comply with the *National Plumbing Code of Canada*.

Foundation drainage systems with drain tiles collecting into a sump pit with backwater valves, as well as duplex pumping systems must comply with the requirements of the *National Plumbing Code of Canada*.

Elevator shaft sumps must be fitted with sump pumps connected to the emergency power grid. Sump pump pits must be independent from elevator pits.

Storm water lift stations and sump pumps must only be used where gravity drainage to municipal storm sewers is not possible. Storm water lift stations and clear water sump pumps must be non-clog, screenless, duplex pumps, with each discharge complete with alternators and connected to the emergency electrical power grid. Sump pumps must be complete with sealed cover plates, vents, inspection manholes, and access to level controls.

7.5.9 Advanced Metering System

The data management must focus on key performance indicators to be meaningful and useful for the implementation of the energy management system (EnMS) as described in CAN/CSA-ISO 50001: *Energy Management Systems.*

Advanced metering systems must be installed in all new construction and major rehabilitation projects to collect information on the consumption of electricity, gas, water, and other utilities (e.g. steam, chilled water).

The metering system must include meters, communications networks, and data management capabilities. Data from variable frequency drives larger than 3.75 kW must be networked to the advanced metering system.

The advanced metering system must be networked to, or form part of, the building automation system (BAS), if present. It must record data at a frequency no less than hourly (similar trigger points are also acceptable) and store the data in a central repository. The system must be able to

show daily, monthly, and annual totalled readings and provide for combined readings to show total energy consumed for the period.

The system must include energy tracking for the whole building (and selected subsystems) by displaying the actual energy consumption in comparison to a baseline (either estimated or established). This data must be available on demand on the central operator workstation, and must be available in a form that allows for the ability to generate advisories to management when normal tolerances are not being maintained.

The advanced metering must record at a minimum the following information:

- electrical components phase voltages, phase currents, and power consumption (kW) readings for the following:
    - all risers
    - motor control centres;
    - lighting panels;
    - power distribution panels;
    - telecommunication rooms; and
    - emergency loads (on the load side of the transfer switches);
- line voltages, line currents, and power consumption (kW) readings for all feeders to the following:
    - motor loads over 15 kW;
    - all major mechanical equipment such as chillers, air-handling units, and pumps; and
    - all spaces planned to be leased;
- For mechanical components and subsystems:
    - gas and other fuels consumption;
    - domestic water consumption;
    - steam and/or hot water utilization, if provided from the outside sources; and
    - chilled water consumption, if provided from the outside sources with individual water flow or energy-measuring devices provided for chilled water lines serving computer rooms.

The water flow and airflow measuring devices must meet the requirements of ASHRAE 90.1: *Energy Standard for Buildings Except Low-Rise Residential Buildings*.

7.5.9.1 Power Monitoring

In addition to, or as part of the above listed metering, power monitoring must also form part of the advanced metering system. The power monitoring must be installed in the primary switchgear (if present and Crown-owned) as well as the main secondary switchgear and measure, at a minimum, the phase voltage, phase current, power consumption, power factor, and harmonic distortion.

7.5.10 Building Automation Systems

For a high level view of the basic recommendations for an Intelligent Building design for the BAS of a new building or major renovation, consult MD 15250: *Intelligent Buildings*.

The BAS must comply with ASHRAE 135, *A Data Communication Protocol for Building Automation and Control Networks*.

The BAS must utilize direct digital control (DDC) technology with networked distributed processing, and be user-programmable in the field for all required automated functions.

The BAS must have a non-proprietary design to monitor, control, and report on all mechanical, environmental-control, and energy-consuming systems. Open protocols, such as ASHRAE's BACnet, must be used.

Provide visual and audible identification of BAS alarm signals in the security control room during unoccupied periods. However, such alarms must not be integrated with the fire and security systems.

7.5.10.1 Operator Work Stations

The primary operator work station (OWS) must be capable of displaying information from the BAS, as well as from the advanced metering system (as described in section 7.5.9 Advanced Metering System).

If BACnet is used, the main OWS and secondary OWS must be listed by the BACnet Testing Laboratories (BTL) as either BACnet Advanced Operator Workstation (B-AWS) or BACnet Operator Workstation (B-OWS).

7.5.10.2 Master Controller

Standalone, microprocessor-based, fully programmable master control units must include the following features:

- microprocessor (CPU) with memory and hardware sufficient for the installation and for at least a 25% expansion of capability for each controller controlled by the master controller;
- controller power supply that accepts local power and provides all conditioning necessary for reliable, fail-safe operation;
- battery-backed real-time clock accurate to ± 5 seconds/year with 72-hour backup;
- battery-backed RAM with 72-hour backup;
- network interface to other controllers;
- network interface allowing access by operators (including access via OWSs); and
- automatic, complete recovery after a power failure.

All BACnet controllers must be BTL-listed.

7.5.11 Mechanical Systems for Special Spaces

7.5.11.1 Entrance and Lobbies

Positively pressurize the entrance vestibule relative to atmospheric pressure to minimize infiltration. Ensure that exterior door operations are not adversely affected and remain within acceptable limits, in conformance with the *National Building Code of Canada*.

7.5.11.2 Elevator Machine Rooms

Maintain space temperature conditions, as required by equipment specifications, and in accordance with CAN/CSA B44: *Safety Code for Elevators*. Consider the use of secondary chilled water for cooling, and the use of elevator machine room heat exhausting for heating the

remaining building. Ensure that the elevator design minimizes the draw of interior air through the stack effect.

7.5.11.3 Mechanical, Electrical, and Telecommunication Equipment Rooms

All mechanical, electrical, and telecommunication rooms must be maintained with room space conditions, such as ventilation, heating and cooling, as required by MD 15000 *Mechanical Environmental Standard for Federal Office Buildings*.

Install equipment in a manner that servicing of any equipment will not require shut-down of other equipment.

The location of water lines must comply with the requirements of the *Canadian Electrical Code*.

All telecommunications rooms must be ventilated and cooled in accordance with the requirements of the Telecommunications Industry Association (TIA) / Energy Information Administration (EIA) standard TIA/EIA 569: *Telecommunications Pathways and Spaces* and its addenda, and Treasury Board information or technology standard TBITS 6.9: *Canadian Open Systems Application Criteria (COSAC), Telecommunications wiring system in Government-Owned and leased buildings - Implementation Criteria*.

7.5.11.4 Computer Room Cooling and Ventilation

Provide cooling and ventilation of computer room cooling and ventilation in accordance with MD 15000: *Mechanical Environmental Standard for Federal Office Buildings*.

7.5.11.5 Service areas

Mechanical systems for service areas must include the following:

- janitor closets have no HVAC requirements;
- chiller equipment rooms, construct, ventilate, and equip all rooms containing refrigeration units to comply with ASHRAE 15: *Safety Code for Mechanical Refrigeration as well as* **CSA B52**: *Mechanical Refrigeration Code.*
- indoor parking garages must include exhaust systems activated by carbon monoxide detectors. Use energy recovery systems where justified by a life-cycle costing analysis.
- mail rooms must have independent HVAC systems to deal with the potential for chemical/biological contamination.
- UPS battery rooms must be ventilated/exhausted directly to the outdoors at a rate that is in compliance with code requirements and the manufacturer's recommendations. The exhaust system must be connected to the emergency power distribution system. Fans must be explosion-proof. The ductwork must consist of a dedicated, negative pressure system of corrosion-resistant material.
- high-occupancy and highly variable occupancy areas must be provided with demand-controlled ventilation (DCV) systems with CO_2 sensors; provide enthalpy energy recovery and de-humidification systems where justified by a life-cycle costing analysis.

7.5.12 Miscellaneous Requirements

7.5.12.1 Acoustical Insulation

Provide acoustical insulation where required to satisfy the requirements listed in Table 5-1: Maximum Mechanical Noise in MD 15000: *Mechanical Environmental Standard for Federal Office Buildings*.

Acoustic treatment of fan noise must be incorporated at the air-handling unit by using duct silencers on the supply and return ducts. The treatment must not use fibre insulation on the interior surfaces of the ductwork upstream of the air terminal units.

7.5.12.2 Identification of Mechanical Systems

All piping and ductwork systems in new constructions or major renovations must be identified in accordance with the Health Canada manual: *Workplace Hazardous Materials Information System (WHMIS)* manual issued by Health Canada, which represents Canada's national standard for hazard classification and communication.

7.5.12.3 Outdoor acoustical treatments

Air intakes, exhausts, mechanical rooms, cooling towers, air handling units, emergency generators and waste handling equipment shall have noise attenuation provisions, where required to achieve compliance with noise restrictions at the property line.

7.5.13 Mechanical Section Checklist

7.5.13.1 does the design provide an Energy Use Intensity value for the building/renovation?
- electricity
- natural gas
- water

7.5.13.2 is the design based on one of the three "General Method for Determining Acceptable Thermal Conditions in Occupied Spaces", as per ASHRAE Standard 55: Thermal Environmental Conditions for Human Occupancy;

7.5.13.3 Graphic Comfort Zone Method

7.5.13.4 Analytical Comfort Zone Method

7.5.13.5 Elevated Air Speed

7.5.13.6 What is the Expected Fresh Air Rate?

7.5.13.7 Does the water system comply with *Legionella* abatement procedures?

7.5.13.8 What are the points measured by the advanced metering system(s)?

7.6 Fire Protection System

7.6.1 Design Objectives

The design objective of life and safety systems is to ensure the health and safety of federal employees in the event of an emergency. The fire protection system design must meet the following objectives:

- meet all NFPA standards for fire protection systems; and,
- integrate specialized tenant requirements with base building requirements.

7.6.2 Municipal Installations

All sites on or off municipal services must be evaluated and strategies provided to address issues related to health and safety.

Municipal systems must meet the NFPA 1142: *Standard on Water Supplies for Suburban and Rural Fire Fighting* and other appropriate NFPA standards that stipulate water requirements for supplying fire suppression systems. Issues to be addressed include the following:

- evaluation of pressure and flow rates to determine their adequacy;
- evaluation of pressure and/or flow rates based on 10 years of projected deterioration (or increase in demand due to population growth; and
- evaluation of the use of fire pump(s) and/or booster pump(s) feeding from a private tank or reservoir.

7.6.3 Specialized Functions for Base Building and Tenants

Office buildings may have tenants who have requirements related to specialized functions in addition to the base building requirements. These functions must be integrated into the base building system. Furthermore, base buildings include general storage facilities, which must meet the requirements of NFPA 13: *Standard for the Installation of Sprinkler Systems* and NFPA 231: *Standard for General Storage.*

Specialized tenant functions in the functional program may include one or more of the following:

- the storage arrangements and protection of a rack storage facility, which must meet the requirements of NFPA 13: *Standard for the Installation of Sprinkler Systems*, NFPA 231: *Standard for General Storage*, and NFPA 231C: *Standard for Rack Storage of Materials*;
- the storage arrangements and protection of a inflammable and combustible liquid storage area, which must meet the requirements of the *National Fire Code of Canada*, NFPA 30: *Flammable and Combustible Liquids Code*, and the applicable Factory Mutual (FM) Global Property Loss Prevention Data Sheets;
- facilities having high-value or mission-essential electrical equipment, mainframe computers, or network equipment with the potential for high dollar loss and/or business interruption, which must be designed and installed in accordance with NFPA 75: *Standard for the Fire Protection of Information Technology Equipment*; and
- fire protection requirements for cooling towers, which must meet the requirements of NFPA 214: *Standard on Water-Cooling Towers*.

7.6.4 Sprinkler Systems

Sprinkler systems must meet all of the requirements below, which supersede the design requirements of NFPA 13: *Standard for the Installation of Sprinkler Systems*:

- all sprinklers and sprinkler escutcheons installed in any new construction or renovation projects must be listed by a nationally recognized testing facility such as Underwriters Laboratories of Canada;
- all quick response glass bulb sprinklers must be equipped with protective devices to reduce damage prior to installation and be removed after the sprinkler is installed;
- flow control (on-off) sprinklers must not be installed in any new construction or renovation projects;
- all automatic sprinklers installed less than 2 m above floor must be equipped with sprinkler guards to provide protection against accidental damage;
- black steel piping and/or copper tubing must be used for all wet-pipe sprinkler piping;
- chlorinated polyvinyl chloride (CPVC) sprinkler piping must not be used;
- galvanized (internal and external) sprinkler piping must be used for all dry-pipe sprinkler systems;
- steel pipe sizes 50 mm and smaller must be Schedule 40 and must be threaded;
- steel pipe sizes larger than 50 mm must be minimum Schedule 10. Piping less than Schedule 40 must be roll grooved;
- threadable lightwall pipe must not be used;
- piping having a corrosion-resistant ratio less than one must not be used;
- plain-end fittings must not be used;
- automatic sprinklers must be installed in all new construction projects and in all renovation projects. This includes elevator machine rooms, boiler rooms, mechanical equipment rooms, walk-in freezers and cold rooms, essential electronic facilities, electrical closets, telephone closets, emergency generator rooms, uninterruptible power service and battery rooms, electrical switchgear rooms, transformer vaults*, and telephone exchange (PABX) rooms. Provide all electrical equipment with a sprinkler-proof enclosure;

  *Note: Sprinklers can be omitted in the transformer vault if the vault is provided with a 3-hour fire separation. Provide appropriate fire protection devices in the vault as required by the local utility and authority having jurisdiction;

- all sprinkler systems must be wet-pipe sprinkler systems unless installed in areas subject to freezing or as directed by the project-specific program;
- in areas subject to freezing, install either dry-pipe sprinkler systems or dry pendent sprinklers must be installed, heat must be provided in the space, and/or sprinkler piping must be rerouted. Do not use heat tape on sprinkler piping;
- antifreeze sprinkler systems must not be installed in any new construction or renovation projects;
- damage to motors, switchgear, electronic equipment, direct digital control (DDC) and alarm panels, computers, etc., must be minimized by applying spray fireproofing;
- sprinklers installed in electrical rooms and electrical closets must be equipped with sprinkler guards to provide protection against accidental damage;
- integrate sprinkler design selection and locations in historic properties.

7.6.5 Fire Alarm Systems

Fire alarm systems must meet all of the following special requirements, which are in addition to those contained in the above listed codes and standards:

- fire alarm systems must have a non-proprietary, open protocol for interoperability with other building systems;
- fire alarm systems must be monitored by the building automation system in a one-way, read-only manner;
- fire alarm systems must be standalone systems that are able to function independently of other building systems; and
- fire protection conduits must be as per the CEC section 32.

7.6.5.1 Fire Alarm System Special Requirements

The following requirements are in addition to those contained in the above listed codes and standards:

- fire alarm system should be monitored by the Building Automation System in a one way, read-only manner;
- fire alarm system must be a standalone system that is able to function independently of other building systems; and,

7.6.6 Fire Pumps and Accessories

7.6.6.1 Fire Pump Design and Installation

When a fire pump is necessary to supplement water flow and pressure, it must be sized to comply with the appropriate NFPA standards: NFPA 13, NFPA 14, and/or NFPA 20. However, fire pump operations must meet NFPA 20. Fire pumps must be designed for manual and/or automatic shut-down. Manual shut-down of the fire pump must ensure that the pump does not shut down prematurely before controlling the fire. Automatic shut-down is only permitted when activated by a low water level shut-off device.

7.6.6.2 Fire Pump Controller

The fire pump controller must be completely assembled, wired, and tested by the manufacturer before shipment from the factory. The status and condition of all fire pump units must be monitored by and signalled at the fire pump controller, and the status of the fire pump must be monitored by the fire alarm system.

7.6.6.3 Jockey Pump

A jockey pump (or pressure maintenance pump) must be utilized where it is desirable to maintain a uniform or relatively high pressure on the fire protection system. Jockey pumps must be sized to make up the allowable leakage rate within 10 minutes.

7.7 Electrical Engineering

7.7.1 Design Objectives

The electrical engineering design objectives are to provide a safe, reliable, and maintainable electric power system for office buildings. The electric system design must meet the following objectives:

- be sized to meet the anticipated loads of the building;
- be coordinated in terms of interrupting capacity, device and cable ratings, fault levels, and protective relaying;
- allow safe maintenance, minimizing shock and arc flash hazards for maintenance personnel; and,
- support power conservation initiatives.

7.7.2 Design Studies

7.7.2.1 Electrical Load Analysis

An electrical load study must be performed for new office building construction as well as rehabilitation projects where modifications to the electrical distribution system may result in overload conditions. The report must analyze the building loads, including scenarios for normal use, off-hours use (night time and weekends), emergency scenarios, and different seasons.

7.7.2.2 Short Circuit, Device Evaluation and Coordination Study

A short circuit, device evaluation, and coordination study must be performed for new office building construction as well as rehabilitation projects where modifications to the electrical distribution system may result in protective devices not being coordinated, or in equipment being subjected to short circuit currents greater than their ratings. If series rated equipment is used, it must be marked in a clear and conspicuous manner to ensure it is replaced with equipment of the same type and rating.

All electrical equipment panels containing interrupting devices must be labelled with the assembly short circuit current rating. Over-current devices (breakers, fuses, relay, etc.) and overload devices must be coordinated and have settings adjusted as per the coordination study.

7.7.2.3 Arc Flash Study

An arc flash study must be performed for new building construction as well as rehabilitation projects where modifications to the electrical distribution system may result in the need to update existing safety labelling.

The study must be performed in accordance with CSA Z462: *Workplace Electrical Safet*y. Safety labels, also in accordance with CSA Z462, must be applied on all panel boards, motor control centers, switchgear, and major electrical equipment. Labels must comply with the *Official Languages Act,* including bilingual labels prescribed under subsection 35(2) of the Act.

7.7.3 Site Utility

In buildings where low voltage is economically justifiable for the site utility, new building construction projects should have the utility company furnish power at the main utilization voltage (i.e. 600/347 V or 208/120 V).

In the case of larger buildings, or office buildings campuses where it is impractical or uneconomical to use low voltage, high voltage (over 750 V) may be used.

Redundant services should be requested from the utility company if the system supplies over 25,000 m^2 of floors space in a building and a cost benefit analysis finds the redundant connection to be warranted.

7.7.3.1 Substation Ownership and Demarcation Points

PWGSC prefers that substations be utility-owned. However, the project details along with discussions with the local utility company will dictate the ownership of the substation and the placement of the ownership and operational demarcation points. Projects involving large buildings and campus locations may require PWGSC to own substations due to cost benefits, security requirements, operational requirements, or agreement with the local utility.

7.7.3.2 Electrical Service

An underground service must be used to supply office buildings, where conditions allow. The underground service must be installed in a concrete-encased duct bank. Cables must be selected based on all aspects of the cable operation and must comply with the requirements of the local utility.

7.7.3.3 Underground Cable and Conduit

Direct buried cables must not be used. Instead, buried conduits appropriate to the site conditions must be used to facilitate the modification and repair of electrical distribution.

7.7.3.4 Concrete-Encased Duct Banks

Concrete-encased duct banks must be used where many circuits follow the same route, for runs under permanent hard pavements, and where service reliability is paramount, such as at service entrances.

The duct bank installation must comply with the *Canadian Electrical Code*. For new building construction, spare ducts for planned future expansion must be provided. In addition, extra ducts equivalent to a minimum of 25% (of the total ducts) must be provided for unknown future expansion.

Ducts must be routed so as to avoid other underground utilities, foundations, and structures. They must have watertight seals where they enter into buildings, and must slope toward manholes.

7.7.3.5 Electrical Manholes

Manholes must be spaced such that pulling tension on cables will not exceed amounts that may damage the cable integrity. Furthermore, manholes must be provided with the following:

- cable racks;
- sumps;
- hardware for cable pulling (irons, inserts etc.);
- labelling on all cables; and
- grounding.

Manholes must be large enough to have all conductors secured on cable racks and must provide adequate working space around the conductors.

Separate manholes must be provided for:

- low voltage cables (not exceeding 750 V);
- high voltage cables (exceeding 750 V); and
- telecommunications cables.

Electrical handholes may be used for low-voltage feeders (below 750 V), branch circuits, and telecommunications pathways.

7.7.4 Primary Distribution

Primary power distribution systems consist of transformers, cables, switchgear, and associated equipment and operate at high voltage (over 750 V). For projects in which PWGSC-owned primary power distribution systems are being installed, i.e. typically large buildings or campuses, the following design requirements must be met:

- Use an open-loop or primary selective system architecture for redundancy if the system supplies over 25,000 m^2 of floor space and/or if the building contains mission-critical equipment such as data centres.
- Provide a minimum spare capacity of 25% above the design demand load as determined according to the Canadian Electrical Code.

7.7.4.1 Primary Substation

Primary substations must be located so that radio frequency interference will not interfere with telecommunications frame equipment. Oil filled transformers located in underground vaults must not be positioned directly adjacent to or beneath an exit way. No building drainage system may pass through the ceiling of the room containing the primary substation.

7.7.4.1.1 Primary Substation Transformers

PWGSC-owned primary transformers must be installed in compliance with the *Canadian Electrical Code* and the *National Building Code of Canada*. The efficiency of the transformers must meet or exceed the following applicable CSA standards:

- CAN/CSA C802.1: Minimum Efficiency Values for Liquid-Filled Distribution Transformers;
- CAN/CSA C802.2: Minimum Efficiency Values for Dry-Type Transformers; and
- CAN/CSA C802.3: Maximum Losses for Power Transformers.

7.7.4.1.2 Primary Substation Switchgear

PWGSC-owned primary switchgear may be provided with draw-out type circuit breakers of the air, vacuum, or SF6 type, or fused-air interrupter switches and must comply with the following design requirements:

- include energy-reducing maintenance switching or other effective means of reducing arc flash hazard during maintenance activities such as remote operation;
- be built according to CSA C22.2 NO. 31: *Switchgear Assemblies* and meet the requirements of the local utility, including any metering requirement;
- include a mimic bus to show bussing, overcurrent devices and instrumentation; and
- include power monitors and advanced metering as per section 7.5.9 Advanced Metering System.

7.7.5 Secondary Distribution

Secondary power distribution systems consist of transformers, cables, switchgear, switchboards and associated equipment and operate at 600/347 V, 208/120 V, or for small buildings at single phase 240/120 V.

Either spot networks (when available) or double-ended substations (also known as a secondary selective circuit arrangement) must be provided if either of the following applies:

- The building is over 10,000 m^2.
- The building contains mission-critical equipment such as data centres.

Double-ended substations must comply with the following:

- The sum of the estimated demand load of both ends of the substation must not exceed the rating of either transformer.
- The transformers must have provisions for fans to increase their rated capacity.
- The double-ended substations must be equipped with two secondary main breakers and one tie breaker mechanically interlocked for manual operation, with no paralleling.

7.7.5.1 Secondary Switchgear

Secondary switchgear must meet the following design requirements:

- comply with the CSA C22.2 NO. 31: *Switchgear Assemblies* standard;
- have a main service disconnect;
- be front- and rear-accessible;
- include hardware to lock out all breakers and switches;
- only use draw-out type breakers;
- have an enclosure that is sprinkler-proof;
- contain a ground bus throughout;
- have spare space and ampacity of 25% (for new installations);
- contain energy-reducing maintenance switching if arc-flash is a risk for maintenance;
- have the state of each breaker (open/closed) monitored by the building automation system; and
- include advanced metering as per section 7.5.9 *Advanced Metering System*.

7.7.5.2 Distribution Switchboards

Distribution switchboards must meet the following design requirements:

- comply with the CSA C22.2 NO. 244-05: *Switchboards* standard;
- have a main service disconnect;
- have spare space and ampacity of 25% for new installations; and
- contain advanced metering for feeders to panel boards measuring current and totalizing watt-hours as per section 7.5.9 *Advanced Metering System*.

7.7.5.3 Secondary Transformers

Secondary transformers must be installed in compliance with the *Canadian Electrical Code* and the *National Energy Code of Canada for Buildings*. The transformers must conform to the following applicable CSA standards:

- CAN/CSA C802.1: Minimum Efficiency Values for Liquid-Filled Distribution Transformers; and
- CAN/CSA C802.2: Minimum Efficiency Values for Dry-Type Transformers.

Secondary transformers supplying large nonlinear loads must be K-rated or oversized in order to prevent overheating due to harmonics.

7.7.5.4 Motor Control Centres (MCC)

Motor control centres must meet the following design requirements:

- comply with the CSA C22.2 No. 14: *Industrial Control Equipment* standard;
- utilize a control circuit voltage of 24 VDC;
- be provided with metering and power monitoring as per section 7.5.9 *Advanced Metering System;*
- have operator controls as per section 7.7.8.4 Operator Controls; and
- include interlocks to prevent multiple motor loads with high inrush current from starting simultaneously, in order to prevent nuisance tripping of breakers and to avoid placing excessive loads on transformers or the emergency power supply system.

7.7.5.5 Variable-Frequency Drives (VFD)

In cases where motor speed is controlled to various set points, variable-frequency drives (VFD) must be used for all motors greater than 3.7 kW (5 hp). Harmonic distortion generated by VFDs must be mitigated as per section 7.7.5.10 Power Quality. Data from VFDs for motors over 3.7 kW must be networked to the advanced metering system as per section 7.5.9 *Advanced Metering System*.

7.7.5.6 Electrical Motors

Electric motor efficiency must comply with the *National Energy Code of Canada for Buildings* (NECB).

7.7.5.7 Elevator and Escalator Power

Electrical design standards in elevators and escalators must comply with the following codes and standards:

- National Building Code of Canada;
- *Canada Occupational Health and Safety Regulations SOR/86-304, Part VI*;
- CSA B44: Safety Code for Elevators and Escalators; and
- CSA B355: Lifts for Persons with Physical Disabilities.

Elevators must be powered from a breaker or fused disconnect located in the elevator machine room that is equipped with hardware for lockout.

7.7.5.8 Panelboards

Panelboards must comply with the CSA C22.2 No. 29: *Panelboards and Enclosed Panelboards* standard. Separate panelboards must be used for regular power supplying:

- lighting;
- general purpose receptacles and miscellaneous loads;
- telecommunications systems; and
- mechanical loads (heating, ventilation, and air-conditioning).

Panels powered by emergency power may contain mixed loads.

Panelboards must be of the bolt-on, circuit breaker types. Multi-pole breakers must have a single handle. Each circuit must be clearly labelled with a durable a typewritten directory within the panel. All panelboards must be fitted with lock-type doors and door-in-door trim.

Panelboards supplying the main telecommunications room, also known as distributor room C, must be provided with a surge protection device (SPD) with a surge rating of no less than 50 kA per phase (25 kA per mode).

All new panelboards must be provided with minimum 25% spare ampacity and 25% spare overcurrent devices.

7.7.5.9 Secondary Distribution Conductors

Either copper or aluminum conductors may be used in the following equipment:

- motors winding;
- distribution transformer windings;
- bus ducts;
- switchgear bussing; and
- switchboard bussing.

Copper conductors must be used for conductor sizes smaller than 1/0 as well as individual grounding and bonding conductors. Joint compound and approved fittings must be used on aluminum conductor terminations as per the *Canadian Electrical Code*.

7.7.5.10 Power Quality

The building's electrical system must comply with the standards set by the local utility for power-line flicker, total harmonic distortion, and power factor, as well as with the requirements outlined in the following sections.

7.7.5.10.1 Power Factor

The system design must maintain a minimum power factor of 0.9 lagging. Power factor correction equipment should be utilized when required. If utilized, power factor-correcting capacitors must be properly labelled, complete with listed discharge times for servicing.

7.7.5.10.2 Total Harmonic Distortion

Total harmonic distortion must not exceed limits set by the utility or interfere with electronic equipment in the building. If it exceeds these limits or interferes with electronic equipment, the distortion must be mitigated. Suitable mitigation measures include but are not limited to the following:

- varying equipment operating settings;
- selection of equipment that produces lower amounts of harmonics, such as drives with more pulses;
- selection of equipment with built-in mitigation;
- passive filters;
- isolation transformers; and
- active conditioning equipment.

7.7.6 Branch Circuits

All branch circuit wiring must be copper and no smaller than No. 12 AWG.

7.7.6.1 Lighting Branch Circuits

Lighting branch circuits may be 120 V, 347 V or DC distribution. The design of the lighting branch circuits must consider life-cycle costing, including the cost of the conductors, equipment, maintenance, and operation. Circuit loading must not exceed the maximum load specified in the *Canadian Electrical Code*.

7.7.6.2 Receptacle Branch Circuits

Standard receptacles must be duplex, CSA 5-15R, spec grade, unless otherwise required by code. Emergency power receptacles must be red. Isolated grounding receptacles must be orange. The colour of standard receptacles, switches, and faceplates must be coordinated with the architectural colour scheme.

Receptacles for housekeeping must be CSA 5-20R suitable for 15/20 A and must be placed in walls around permanent cores or corridors. The distance between receptacles in corridors must be 15 m or less, and receptacles must be located within 7.5 m from the corridor ends.

Emergency power receptacles must be provided in all electrical closets and in the main mechanical and electrical equipment rooms, when emergency power is available. Each piece of

mechanical equipment located either in the interior or exterior of a building must have access to a receptacle placed no more than 7.5 m away.

Receptacle faceplates must be labelled on the exterior with a typewritten machine-made label indicating the panel and the number of the circuit that feeds the receptacle.

7.7.7 Grounding and Lightning Protection

7.7.7.1 Grounding System

The ground source for the electrical power system must have resistance to ground of less than 5 ohms, as confirmed by the fall-of-potential ground testing method outlined in IEEE Standard 81 *Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System.*

Electrical rooms must be fitted with a bonding bus interconnected with the building's grounding system with a minimum of 25% spare terminals or holes for future bonding.

All low-voltage power distribution systems must be supplemented with a separate bonding conductor.

7.7.7.2 Lightning Protection

Lightning protection requirements must be determined in accordance with the latest edition of the CAN/CSA B72-M87: *Installation Code for Lightning Protection Systems*.

Lightning arrestors must be installed on the transformer primary terminals of the main electrical service (subject to agreement with the local utility if the substation is utility-owned).

Surge protection devices compliant with Underwriters Laboratories standard UL 1449: *Surge Protective Devices* must be installed on the secondary switchgear with a minimum surge current capacity of 240 kA per phase (120 kA per mode, and must be installed on each switchboard with a minimum surge current capacity of 120 kA per phase (60 kA per mode).

7.7.8 Placement of Electrical Systems

7.7.8.1 Electrical Rooms

Electrical rooms must meet the requirements listed in architectural section 7.3.2.3.4 Mechanical, Electrical and Telecommunication Equipment Rooms, and must support the efficient vertical and horizontal distribution of power and control systems.

Electrical closets must be stacked vertically to the greatest extent possible. If an electrical room contains transformers or other heat-generating equipment, adequate cooling and/or ventilation must be provided so that environmental requirements are met as per section 7.5.2 *HVAC Requirements.*

Electrical rooms in new building construction must have adequate sleeves installed for future modifications. At a minimum, two capped 100 mm spare sleeves through the structural floors must be installed. All floor sleeve penetrations must extend 100 mm above the finished floor.

7.7.8.2 Seismic Design

Electrical equipment must to be laterally restrained for seismic load requirement as outlined in section 7.4. Structural Engineering, and the *National Building Code of Canada*.

7.7.8.3 Building Raceways

Raceway systems used in buildings must comply with the *Canadian Electrical Code* and local regulations.

7.7.8.3.1 Vertical Distribution

Risers for regular power and emergency power must be combined with other core elements to form compact groups and to maximize usable floor space. Bus duct risers must have a 100 mm curb around floor penetrations to prevent water from running down the bus duct.

7.7.8.3.2 Horizontal Distribution

Conceal raceways for horizontal electrical distribution systems within the concrete slab, in the ceiling plenum, or in or in a raised floor if one is present. Concrete encased tubing and conduit, electrical metallic tubing, rigid conduit, cable tray or modular wire distribution systems are acceptable.

In office areas, install zone distribution boxes near anticipated loads to service workstations in compliance with circuit loading outlined in the *Government of Canada Workplace 2.0 Fit-up Standards.*

7.7.8.4 Operator Controls

Commanding and signalling devices must comply with the national standard CAN/CSA Z431: *Basic and Safety Principles for Man-Machine Interface, Marking and Identification - Coding Principles for Indicators and Actuators*. The standard applies to both physical operator controls and human-machine interfaces (HMI) that form part of a building automation system.

All wired operator controls (e.g. push buttons, selector switches, and pilot lights) must be extra low voltage (below 30 V).

7.7.8.5 Colour Coding

Motor control and HMI colour coding must comply with CAN/CSA Z431: *Basic and Safety Principles for Man-Machine Interface, Marking and Identification - Coding Principles for Indicators and Actuators***.**

The CAN/CSA Z431 standard allows information to be imparted from three different perspectives:

- the condition of the process;
- the state of the equipment; and
- the safety of persons, property, and/or the environment.

Display colours and shapes for HMIs and operator controls must be from the perspective of the condition of the process or the state of the equipment. From these perspectives, green indicates a normal/operational state.

From the perspective of the safety of persons and property, green indicates a safe condition, and indicating devices must only be applied locally to facilitate service or maintenance (e.g. a green light placed near a door to indicate that it is safe to enter). In addition, indicating devices must include clear labelling to ensure correct interpretation.

7.7.8.6 Operating Controls Labeling and Language Policy

Labelling on operator controls (mechanical indicators) and HMIs must make use of symbols as per CAN/CSA Z431. Any words used on controls or in HMIs must comply with the *Official Languages Act,* including bilingual signage for regions prescribed under subsection 35(2) of the Act.

7.7.9 Emergency Electrical Power Supply

All facilities must have an emergency electrical power system for life safety if required by the *National Building Code of Canada* (NBC) and in accordance with the *Canadian Electrical Code* (CEC).

Self-contained battery units may be used for emergency light fixtures in buildings where an emergency generator is not required for other systems.

7.7.9.1 Emergency Generator System

If required, an emergency generator system must consist of a central engine generator with a separate distribution system with one or more automatic transfer switches (ATS). The emergency generator system must be provided in accordance with the latest version of CSA C282: *Emergency Electrical Power Supply for Buildings*.

In addition to CSA C282, the fuel system must also meet the requirements of the latest version of CSA B139: *Installation Code for Oil-Burning Equipment*. The base building generator fuel day tank must meet the following requirements:

- have a sufficient quantity of fuel to operate the engine for a minimum of 2 hours of running time at full load;
- be within the proximity of the generator; and
- be automatically refilled from a main storage tank with a sufficient capacity to operate the engine for a minimum of 24 hours' running time at full load.

The purpose of the tank requirements is to facilitate safe evacuation in an emergency and to protect government assets.

The emergency distribution system must be designed so that emergency power sources cannot under any condition back-feed energy into the de-energized normal system. A permanent system must be provided to allow safe and fast connection of a portable load bank to test the generator full load.

The emergency system status and alarms must be transmitted to the building automation and fire alarm systems.

7.7.9.2 Emergency Power Loads

As a minimum, emergency electrical power supply must be provided for the following loads (other loads may be added as required):

- Life-safety load:
  - exit lighting
  - emergency lighting
  - fire alarm system
  - fire control centre
  - smoke control systems
  - fire pumps and suppression system
  - high-rise stairway pressurization fans
  - elevators
  - generator auxiliaries (fuel pump, control power etc.)
- Essential building load:
  - Lighting:
    - security perimeter lighting
    - lighting for main electrical room, electrical closets, security rooms, fire control centre, telecommunications rooms, and generator room
  - Mechanical:
    - mechanical control systems
    - sump pumps
    - sewage pumps
    - exhaust fans removing toxic, explosive, or flammable fumes
    - hydronic heating system (if applicable)
  - Telecommunications:
    - telecommunications room emergency receptacles
    - telecommunications rooms back-up power system (UPS)
  - Building controls:
    - building automation system
    - advanced metering system
    - security systems
  - Electrical:
    - emergency power receptacles
  - Miscellaneous:
    - horizontal sliding doors in public spaces
    - other associated equipment designated by code
  - Essential client load:
    - 12 W/m^2 of the gross floor client area

7.7.9.3 Automatic Transfer Switch (ATS)

All automatic transfer switches (ATS) supplied and installed for the base building and/or tenant must be provided in accordance with CSA C282: *Emergency Electrical Power Supply for Buildings* and must have the following features:

- both automatic and manual operation;
- network connection to the building automation system;
- dedicated ATS for:
  - life-safety loads;

- essential buildings loads
- manual bypass isolation switch to permit electrical bypass and isolation of ATS without interrupting the load (to either the normal or emergency power).

7.7.9.4 Uninterruptible Power Supply System

Uninterruptible power supply (UPS) systems generally do not form part of the base building but are tenant-owned and -operated. Tenant requirements for UPS systems must be considered in the base building design.

UPS installations that may adversely affect the power quality in the building must include forms of mitigation such as filtering, isolation transformers, and active filtering.

Rooms containing UPS batteries must have sufficient ventilation in order to prevent the accumulation of any vented hydrogen from reaching hazardous levels as per section □ *ups battery* . Hydrogen detection sensors must be installed in areas where hydrogen is most likely to accumulate, and be networked to the building automation system.

Base building UPS systems (non-client-owned), if required, must meet the following requirements:

- have an input power factor of above 0.8;
- have an output power factor of above 0.8;
- have an efficiency of above 90%;
- include maintenance bypass switch; and
- be interconnected to the building automation system for monitoring status, voltages, and currents.

7.7.10 Lighting

Lighting goals include meeting health, safety, and security requirements as well as meeting the multiple task requirements of the functional program. Default lighting levels for exterior and interior spaces are listed in Table 2 and Table 3 at the end of this section.

7.7.10.1 Lighting Design Requirements

Lighting design must provide appropriate levels of illumination for performing tasks easily and comfortably. Lighting must satisfy both quantity and quality aspects demanded by the work environment, by providing the following:

- visual comfort to promote workers' well-being;
- visual performance to promote high levels of visual task execution; and
- visual safety to permit safe movement within the work environment.

The following requirements must be adhered to in terms of illuminance, luminance ratio, and colour rendering.

7.7.10.1.1 Illuminance and Luminance Ratio

Light levels must comply with the illuminance and luminance ratio requirements outlined in Table 2 and Table 3 at the end of this section. For specific areas not found in these tables, and for applications other than typical office environments, refer to the *Canada Labour Code*, *the National Building Code of Canada (*NBC), and *The Lighting Handbook* published by the

Illuminating Engineering Society (IES). When there are discrepancies between any of the three sources, the *Canada Labour Code* takes precedence.

7.7.10.1.2 Colour Rendering and Temperature

For all lighting, lamps must be selected with a colour rendering index (CRI) not less than 80 and a correlated colour temperature (CCT) less than or equal to 4100°K.

7.7.10.2 Lighting Power Density

Lighting power densities (W/m^2) must comply with the requirements contained in the latest edition of the *National Energy Code of Canada for Buildings* (NECB) or the ASHRAE 90.1*: Energy Standard for Buildings Except Low-Rise Residential Buildings,* whichever is more stringent. This applies to new and existing buildings where the base building lighting system is being physically replaced.

While individual areas may deviate in power loading from the recommended values, the total power budget for lighting for the building or overall space must not be exceeded unless justified by the client's operational requirements. The total power budget for the project must be documented in the investment analysis report (IAR), and a demonstration must be provided showing that implementation of the proposed design will not exceed the budget.

7.7.10.3 Day Lighting

Day lighting (also called daylight harvesting) must be considered for all new construction and major retrofits. The IAR must identify whether day lighting is to be implemented. If implementation is not feasible, the report must include a justification for not implementing day lighting.

Day lighting systems in work areas must utilize dimming rather than simple ON/OFF operation to minimize distraction to workers.

7.7.10.4 Flexibility and Servicing Accessibility

The lighting design must allow easy servicing of the luminaries and replacement of lamps and ballasts. It must also be possible to economically modify the lighting system post occupancy to meet the required lighting levels.

7.7.10.5 General Luminaires Criteria

Luminaires and associated fittings must be of standard commercial design. Designers must use components that are proven (capable of demonstrating the required performance in relevant projects), readily available, technologically current, and user-friendly components that provide convenient operation, ease of maintenance, and energy efficiency. Custom-designed fixtures should only be installed to meet heritage requirements.

Ballasts, when used, must have a sound rating of "A" for all areas occupied by personnel, and must conform to the CSA C654: *Fluorescent Lamp Ballast Efficacy Measurements* standard and local electrical authority requirements. Ensure that all voltage drops are within the manufacturer's specification for the lamps being controlled. Ballasts must be electronic, energy-efficient with a minimum power factor of 0.95, and have a maximum total harmonic distortion (THD) of 10%.

Exit signs must be of the LED type and meet the requirements of the CAN/CSA C860: *Performance of Internally Lighted Exit Signs* standard. Location and symbols must be in accordance with the *National Building Code of Canada*.

LED light sources must have a rated life of 50,000 hours at 70 % lumen maintenance (L70). All other light sources used must have a rated life of at least 24,000 hours at 3 hours per start.

7.7.10.5.1 Specific Lighting Applications

Emergency lighting must be installed and meet the performance requirements of the *National Building Code of Canada* and the *Canada Occupational Health and Safety Regulations* (COHSR) *Part VI*. In addition to these requirements, emergency battery-powered lighting must also be provided in main mechanical and electrical rooms, generator rooms, and automatic transfer switches rooms.

Equipment room light fixtures must be located so that lighting is not obstructed by tall or suspended pieces of equipment.

Lighting fixtures must be provided at all building entrances and exits. Exterior lighting fixtures must be connected to the emergency lighting circuit.

Luminaires in parking areas must be placed so that they maintain the required vehicle clearance.

7.7.10.5.2 Light Pollution Reduction

The exterior lighting design must comply with the light pollution reduction requirements listed in the latest version of the Leadership in Energy and Environmental Design (LEED) building certification program. This requires defining lighting zones as per the Illuminating Engineering Society and International Dark-Sky Association (IES/IDA) *Model Lighting Ordinance (MLO)*, and selecting luminaires with an appropriate luminance, shielding, and orientation so that backlight, uplight, and glare (BUG) are in compliance with LEED requirements.

7.7.10.6 Lighting Controls

7.7.10.6.1 Lighting Controls Requirements

Lighting controls in office spaces must be designed to meet the latest *National Energy Code of Canada for Buildings* (NECB). Lighting control zones must not exceed the maximum requirements of NECB or one 15 A circuit, whichever is smallest.

The selection of manual control, localized automatic control, microprocessor lighting control, networked control, or any combination of the four is a fundamental design choice and is dependent on a number of space factors: frequency of use, available day lighting, normal and extended work hours, and the use of open or closed office plans. The designer must provide descriptions and a rationale for the chosen scheme. A local means of override must be provided in every area to ensure continuing operations when required.

7.7.10.6.2 Microprocessor and Networked Lighting Controls

Lighting control systems must function on an open protocol to avoid vendor lock-in, and must be able to integrate with other systems such as HVAC, building automation, and security systems.

7.7.10.6.3 Lighting Controls for Specific Applications

Building entrance lighting and wall-mounted access security lighting must be controlled by an ON/OFF photocell sensor to activate the lights from dusk to dawn.

All exterior lighting not designated to operate from dusk to dawn must be controlled by a photocell and a time switch, or by the networked lighting control system.

Interior garage lighting should be reduced during off building hours when motion sensors do not detect movement, as an energy saving measure. Security lighting must stay ON at all times.

7.7.10.7 Base Building Light Levels

Base building light levels must meet the more stringent of the minimum levels outlined in the *Canada Labour Code* (CLC), the *National Building Code of Canada*, and those provided in the tables at the end of this section. If specific areas are not found in the tables, then refer to the IES publication *The Lighting Handbook*, latest edition.

7.7.10.7.1 Illumination Levels for General Office Spaces

General office spaces must be provided with base building lighting as outlined in Table 1.

Table 1: Nominal lighting in general office spaces

Nominal Average Illumination	500 lux
Maximum Uniformity Ratio (average : minimum) measured over task area	1.5:1
Maximum Uniformity Ratio (maximum : minimum) measured over the entire room	5:1

This lighting level complies with CLC requirements for minimum lighting levels for most desk work, as well as the maximum lighting levels for visual display terminal (VDT) work. This allows for maximum flexibility for fit-up workstation arrangement while minimizing the need for client departments to provide task lighting.

7.7.10.7.2 Illumination Levels for Interior Spaces

Light levels for spaces other than general office spaces are listed in Table 2.

7.7.10.7.3 Interior Lighting Calculation Parameters

Typical default parameters to be used in interior lighting calculations are as follows:

- luminaire ambient temperature: 1.0
- voltage to luminaire (electronic ballast): 1.0
- ballast factor: 0.9, manufacturer's data takes precedence
- burnouts: 1.0
- lamp lumen depreciation: 0.9, manufacturer's data takes precedence
- luminaire dirt depreciation: 0.9 for office spaces
- light reflectance values (ceiling, walls, and floor respectively, assuming light colours): 90-60-20

Table 2: Base Building Interior Illumination Levels (Other Than General Office Space)

Location	Minimum Average Illumination (lx)[a]	Maximum Uniformity Ratio (avg : min)[b]
Meeting rooms, boardrooms, conference rooms, file storage areas, training rooms, reception areas	300	1.5:1
Library, general lighting	300	2:1
Common areas (public spaces, lounges, lobbies, atriums, washrooms, elevator lobbies)	150	2:1
Food preparation areas	500	1.5:1
Lunchrooms and cafeterias	150	3:1
Electrical and mechanical rooms	200	3:1
Telecommunications rooms	500	3:1
Frequently used corridors, and stairways, and elevators	100	2:1
Infrequently used corridors and stairways	50	2:1

Notes:

[a] Illumination levels for interior office spaces are expressed as the minimum acceptable values of average maintained horizontal illuminance level (lx) over the working plane at each workstation or at floor level for support spaces (based on carpeted areas).

To ensure a uniform approach and yield consistent results, lighting levels measurement must be made in accordance with the document *Measurement of Lighting Levels in the Workplace – Canada Occupational Health and Safety Regulations, Part VI, 928-1-IPG-039*.

[b] The uniformity ratio is given at a task plane height over an entire room or large area except for food preparation areas and meeting rooms where it is over the task area or desk.

7.7.10.7.4 Illumination Levels for Exterior Spaces

Base building exterior light levels must meet the more stringent of the minimum levels outlined in the *Canada Labour Code* and those provided in the exterior lighting level table below. Lighting levels must also meet security requirements as determined by performing a threat and risk assessment as per *the Policy on Government Security* published by the Treasury Board Secretariat and RCMP guidelines as outlined in the security section of this document.

Table 3: Exterior Illumination Levels

Location	Minimum Average Illumination (lx)[a]	Maximum Uniformity Ratio (avg : min)	Maximum Uniformity Ratio (max : min)
Grounds			10:1
Pedestrian walkways	10	4:1	
Pedestrian walkways and vehicular intersection	30	3:1	
Vehicular traffic	10	4:1	
Vehicular intersections	30	3:1	
Building Entrances and Exits			
Frequently used building entrances and exits	100	2:1	
Infrequently used building entrances and exits	50	2:1	
Open Parking			
Vehicular traffic	10	4:1	
Vehicular intersections	30	3:1	
Vehicular parking	10	4:1	
Pedestrian walkways	10	4:1	
Covered Parking			
General parking and pedestrian areas	50	4:1	
Ramps and corners during daytime	100	4:1	
Ramps and corners during nightime	50	4:1	
Entrance areas[b] during daytime	500	4:1	
Entrance areas[b] during nighttime	50	4:1	

Notes:

[a] Illumination levels for exterior commercial office building spaces are expressed as the minimum acceptable values of average maintained horizontal illuminance levels (lx) over usable area at pavement level.

To ensure a uniform approach and yield consistent results, lighting levels measurement must be made in accordance with the document *Measurement of Lighting Levels in the Workplace – Canada Occupational Health and Safety Regulations, part VI, 928-1-IPG-039*.

[b] The entrance area is defined as the portal or physical entrance to the covered portion of the parking structure and 15 m beyond the edge of the covering into the structure.

7.8 Telecommunications Systems

7.8.1 Design Objectives

Telecommunication systems must support the functional requirements of building management and tenant operations within the building. Systems must meet or exceed the requirements of the latest edition of the codes and standards listed in Annex B.

7.8.2 Telecommunication Spaces

Telecommunication spaces must meet the following requirements:

- be stacked vertically to the greatest extent possible;
- be serviced from electrical panels supplying only telecommunication systems;
- have conditions maintained as per 7.5.11.3 Mechanical, Electrical, and Telecommunication Equipment Rooms;
- be located in dry spaces not subject to flooding from natural sources or building water sources such as washrooms or janitor closets; and
- include required architectural features outlined in Telecommunications Industry Association (TIA) standard TIA 569L *Telecommunications Pathways and Spaces,* such as backboards, ceiling heights, door sizes, etc.

7.8.2.1 Telecommunication Entrance Facility

The entrance facility must be within a dedicated enclosed room. However, the room may also serve as a service provider space or access provider (PWGSC or contractor) space if the access provider equipment is kept secure with a locked barrier such as a wire mesh to prevent unauthorized access.

The entrance facility must be powered by at least two dedicated 20A, 120 V duplex receptacles on emergency power, if an emergency power system is available.

7.8.2.2 Telecommunication/Distributor Room

Telecommunication rooms, also referred to as distributor rooms, must be dedicated and not contain electrical equipment for power distribution, other than panels supplying the room or related equipment. A minimum of one telecommunication room must be provided per building floor, with additional distributor rooms as required should be provided in accordance with *ANSI/TIA 569.*

Each room must contain at least two dedicated 20A, 120 V duplex receptacles on emergency power if an emergency power system is available, and must provide convenience receptacles on the perimeter of the room every 1.8 meters.

7.8.3 Telecommunication Raceway System

Backbone and horizontal telecommunications raceways must meet the requirements of ANSI/TIA-569: Telecommunications Pathways and Spaces and be installed with sufficient separation distance from power raceways to mitigate the effects of electromagnetic interference (EMI) as per ANSI/TIA-569.

7.8.4 Service Entrance Pathway

Service entrance pathways must meet the requirements of ANSI/TIA-758: *Customer-Owned Outside Plant Telecommunications Infrastructure Standard*.

7.8.5 Telecommunication Grounding and Bonding System

Telecommunication equipment must have a dedicated grounding and bonding system as per *ANSI/TIA-607: Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises* (and addenda). The system must be bonded to the building grounding system.

The telecommunication room must be fitted with a copper bonding bus connections interconnected with the building's grounding system with a minimum 25% spare capacity for future bonding. Telecommunication grounding and bonding conductors must be copper.

7.9 Security

The security requirements of the Base Building Standard are aligned with the Treasury Board of Canada Secretariat *Policy on Government Security*. The intent is to support the objectives of safeguarding employees and assets and assuring the continued delivery of services.

Office buildings may either be occupied solely by PWGSC employees or have multiple federal government tenants. Leased buildings may have both public servants and private sector tenants. Both must address the challenges associated with providing for the security of operational zones.

A Threat and Risk Assessment is not carried out for the base building under normal conditions. The need for a Threat and Risk Assessment is determined by the tenants. Furthermore, the tenants are responsible for funding additional building-specific security.

7.9.1 Design Objectives

The security design objective is to identify the minimum physical security required for the base building to reasonably protect the asset.

7.9.2 Site and Building Security Requirements

Physical security must generally be divided into three zones of protection, each with its own requirements:

- **perimeter security** (site design, parking, and outdoor amenities);
- **entry point security** (access control and monitoring, building envelope, etc.); and
- **interior security** (zoning, building systems, etc.).

Base building designs must include provision for mechanical and electrical rough-ins associated with security equipment as well as spatial enclosures and security devices associated with the simple monitoring and protection of the following:

- the perimeter of the building;
- activities in the main lobby;
- access to elevator lobbies, public areas on typical office floors, and tenant spaces; and
- activities in the loading dock and parking garage.

7.9.3 Perimeter Security

Control of the site perimeter must be addressed through integrated, low-key passive security measures. Follow the guidelines for passive security techniques in the *Crime Prevention Through Environmental Design* (CPTED) approach. http://www.rcmp-grc.gc.ca/pubs/ccaps-spcca/safecomm-seccollect-eng.htm.

Site development must integrate planting in and around building nd prking area o promote visual surveillance for safety and security. Site design and lighting must provide a balance good visibility, meeting security concerns while respecting the character of a site, streetscape or neighborhood.

7.9.4 Entry Point Security

Building Entrances which provide Common Area access to the public and employees must be secured at grade level. Requirements include the following:

- all perimeter doors and access to the parking garage and other types of entry points must be equipped with high-quality commercial locks to meet ANSI/ BHMA A156 Series standards, specifically Grade 1 heavy-duty mortise locks, in solid stainless steel or bronze, and including weatherstripping with self-closers. Entrances identified as part of the accessible path of travel must be equipped with automated door operators;
- frames and doors for perimeter doors and other types of entry points must meet the following requirements:
    - For metal doors, the door must be made of Level 4 (1.7 mm) galvanized metal, and the frame must be made of Level 4 (1.7 mm) welded hollow metal and be galvanized and filled solid with grout. The door and frame must meet the requirements of ANSI A250.4: *Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frame Anchors and Hardware Reinforcings*. The door and frame must also be prepared for the installation of a mortice lockset as well as electronically controlled access, and must have high-quality ball-bearing hinges with secured pins;
    - For aluminum doors, the construction must be of 3 mm extruded aluminum with a Class 1 anodic or fluoropolymer paint finish, and must meet the requirements of AAMA 101/I.S.2/A440: *NAFS - North American Fenestration Standard/Specification for Windows, Doors, and Skylights*. Aluminum doors must also be prepared for lockset installation and have offset pivot hinges that meet the ANSI/BHMA A156 Series Grade 1 standard;
- the building must be equipped with a controlled keying system;
- the building must be provided with roughed-in steel conduit for future exterior and interior video cameras and intercoms at all exterior entrances. The systems and equipment must be integrated with the building security system. The conduits must run from entrance points to the security/reception desk area and the building security command centre;
- the building must be provided with rough-in steel conduit for an intercom system at all entry points;
- the building must have security measures in place at all service and utility entrance and exit points such as those related to air intakes, mechanical ducts, roof hatches, and water supply lines. Provide roughed-in steel conduits for all security systems routed back to the security/reception desk area and the building security control room.

7.9.5 Interior Security

Operational zones must be separated from public zones by a secure enclosure with secure access points.

The building is assumed to be locked after regular work hours. Access must be controlled by either a key system or card system.

7.9.5.1 Entry Lobbies and Lobby Areas

The building must be equipped with security systems to ensure secure access to the entry lobby and lobby areas, including the following:

- intercom and rough-in conduits for card access at exterior entries;
- keyed locks to control access, provide rough-in conduits for card access; and
- rough-in conduits for digital closed-circuit surveillance systems at exterior entries and in vestibules and lobbies.

PWGSC lobby design accommodates the client requirements for a reception or security desk in the main lobby and a separate, adjacent security command centre.

- security desks are around 24 m2 not including attendant badging areas;
- security command centre area is approximately 20 m2. It is room directly adjacent to the main lobby;
- rough-in for steel conduit to meet requirements for services to be located in the ceiling and floor slabs are to be provided for workstations in both areas;
- rough-in for steel conduit to meet requirements for security measures used to separate main lobby from the elevator lobbies;
- rough-ins for steel conduit must be provided for the BAS, panic alarm system and for the secondary link to the fire alarm annunciator panel. Refer to RCMP G1-103 Security Control Space Requirements.

Rough-in of conduit for the monitoring and control equipment as well as the emergency or standby power needed for the systems are required. Detailed requirements are identified in the functional program and include the following systems:

- intercoms;
- card readers or keyed locks to control access to operational areas; and,
- digital closed-circuit surveillance systems at exterior entries and in interior public areas and secured areas.

Provide emergency or standby power system for a minimum of 48 hours of continuous duration for security systems such as electronic door locks, digital closed-circuit surveillance systems, and alarms.

Elevator lobbies on office floors are considered to be public zones (common areas) and fall under base building surveillance requirements. These areas must have rough-in conduiting installed for video surveillance.

7.9.5.2 Elevator Control

There are no security-related requirements for base building elevator controls. Provision of rough-in conduits are needed for card access controls. Elevator controls must be able to accept security control systems, refer to elevator section for requirements .

7.9.5.3 Washroom Control

Base building washrooms in public areas must have conduit roughed-in for video surveillance outside the entrances.

7.9.5.4 Loading Dock and Shipping and Receiving Area

PWGSC must have access to loading dock and shipping and receiving areas, and the following must be provided in these areas;

- door locks and conduit for card readers to control access;
- rough-in conduits for digital closed-circuit surveillance systems; and
- rough-in conduits for intercom systems.

7.9.5.5 Building Parking Level Security Control

- PWGSC will have access to underground parking areas managed by others. The following must be provided at access points:
- rough-in conduits for card readers to control access;
  - rough-in conduits for digital closed-circuit surveillance cameras at the sides of entrances and exits;
  - rough-in conduits for panic alarm system and
  - rough-in conduits for intercom systems.

Provide door locks for amenities such as bicycle storage, washrooms, and showers which will not be controlled by PWGSC.

Roof hatch access, provided with locking, must be located in a common area that is within a secure zone, not in a tenant-occupied area.

8 Annual Regional Reporting

Annual Reporting is required is required to ensure compliance to this standard. The standard will be reviewed and updated in compliance with Real Property Branch requirements for the typical life-cycle of a policy instrument. This is usually 5 years. The appendices will be reviewed and updated as necessary on a yearly basis.

9 Definitions and Abbreviations

Refer to Annex A

10 Enquiries

Enquiries about this standard should be directed to Real Property Branch, Public Works and Government Services Canada.

Annex A Definitions and Abbreviations

A1 Definitions

Advanced Metering System	A system that collects time stamped data from meters via a communications network. The system provides useful data for energy use management, procurement and operations.
Advanced Meters	Advanced meters have the capability to measure and record data at least hourly, and can relay the information to an advanced metering system.
BACnet or BACnet Standard	A data communications protocol for building automation and control networks that allows devices from different vendors to interoperate, or work together, on the same network. It is an ISO global standard and was developed by the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE). BACnet communication requirements are defined by the *ANSI/ASHRAE 135* standard and all current addenda and annexes.
Building Automation System	A modern building control system that optimizes the start-up and performance of building system. It controls mechanical systems, including heating, ventilation, and air-conditioning (HVAC); energy monitoring; lighting; alarm; security; and other building systems. A BAS greatly increases the interaction between the subsystems of a building, improves occupant comfort, lowers energy use, and allows off-site building control.
Commissioning	A process of ensuring that systems are installed, functionally tested, and capable of being operated and maintained to perform in conformity with design intent. Control system commissioning requires a point-to-point check and detailed documentation of each parameter. Commissioning includes a complete functional test of the sequence of operation for each piece of equipment.
Duct Bank	Two or more conduits (ducts) routed together.
Extra Low Voltage	Voltage below 30 V
Handhole	A below grade enclosure, which personnel reach into but not enter used for operating, installing and maintaining electrical cables.
High Voltage	Voltage above 750 V
Low Voltage	Voltage between 30 V and 750 V
Major Rehabilitation	Substantial changes to a building, involving building envelope, major systems and structural

Main Lobby	Part of the Building Service Areas**,** that portion of a building that provides services that enables occupants to work in the building. It includes the main lobby typically the primary entrance to a building.
Manhole	A below grade enclosure which personnel may enter, used for operating, installing and maintaining electrical cables.
Base Building	The base building is the building shell, and structure, including finished floors, exterior walls, interior core and demising walls, finished ceiling complete with lighting, and other building systems consistent with the designated function and planned general use of a building. In office accommodation, base building includes window coverings and primary identification signage.
Primary Distribution	Primary power distribution systems consist of transformers, cables, switchgear and associated equipment and operates at high voltage (over 750 V). It is used to distribute power in large buildings or campus locations.
Secondary Distribution	Secondary power distribution systems consists of transformers, cables, switchgear and associated equipment and operates at 600/347, 208/120V or for small building at single phase 240/120V.

A2 Acronyms and Abbreviations

AABC	Associated Air Balance Council
ADM	Assistant Deputy Minister
ANSI	American National Standards Institute
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
ATS	Automatic Transfer Switch
BAS	Building Automation System
BOMA	Building Owners and Managers Association
BEP	Best Efficiency Point
BUG	Backlight, Uplight, and Glare
CEC	Canadian Electrical Code
COE	Centre of Expertise
COHSR	Canada Occupational Health and Safety Regulations
CRI	Colour Rendering Index
CRN	Canadian Registry Number
CCT	Correlated Colour Temperature
CSA	Canadian Standards Association
DALI	Digital Addressable Lighting Interface
DCWS	Domestic Cold Water Supply
DDC	Direct Digital Control
DHWS	Domestic Hot Water Supply
FIPP	Federal Identity Program Policy
FSDS	Federal Sustainability Development Strategy

HMI	Human Machine Interface
HVAC	Heating, Ventilation, and Air-Conditioning
IAR	Investment Analysis Report
IAQ	Indoor Air Quality
IEEE	Institute of Electrical and Electronics Engineers
IESNA	Illuminating Engineering Society of North America
EnMS	Energy Management System
FAR	Floor-Area Ratio
LCC	Life-Cycle Costing
LED	Light Emitting Diodes
NBC	National Building Code of Canada
NEBB	National Environmental Balance Bureau
NECB	National Energy Code of Canada for Buildings
NFPA	National Fire Protection Association
OPC	Open Protocol Connectivity
OWS	Operator Work Station
PWGSC	Public Works and Government Services Canada
RPB	Real Property Branch
STC	Sound Transmission Class
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association
TAB	Testing Adjusting Balancing
THD	Total Harmonic Distortion
ULC	Underwriters Laboratories of Canada
UPS	Uninterrupted Power Supplies
VFD	Variable Frequency Drives

VOC	Volatile Organic Compounds
WHIMIS	Workplace Hazardous Materials Information System

Annex B References

General, Codes Standards and Legislation

- CAN/CSA B651: Accessible Design for the Built Environment
- CAN/CSA C282: Emergency Electrical Power Supply for Buildings
- CAN/CSA Z431: Basic and safety principles for man-machine interface, marking and identification – Coding principles for indicators and actuators
- *Canada Labour Code, Part II Occupational Health and Safety*
- *Canada Occupational Health and Safety Regulations Canadian Environmental Assessment Act*
- *Canadian Environmental Protection Act*
- CSA B355: Lifts for Persons with Physical Disabilities
- CSA B44: Safety Code for Elevators and Escalators
- *Government of Canada Workplace 2.0 Fit-up Standards*
- Municipal/Local Utility Regulations
- National Building Code of Canada and supplements
- National Energy Code of Canada for Buildings
- National Fire Code of Canada
- National Plumbing Code of Canada
- *Official Languages Act*
- Regulations for Construction Projects
- *Treasury Board Accessibility Standard for Real Property*
- *Treasury Board Fire Protection Standard*

Architectural, Codes Standards and Legislation

- Skylights and Space Enclosures, AAMA/WDMA Standard 1600/I.S.7-00
- *Standards and Guidelines for Historic Properties in Canada*

Window Washing Standards

- ASME A120.1 Safety Requirements for Powered Platforms and Traveling Ladders and Gantries for Building Maintenance,
- CAN/CSA Z91-2002 most recent revision: : Health and Safety Code for Suspended Equipment Operations,
- ANSI A39.1: Safety Requirements for Window Cleaning
- ANSI/IWCA I-14.1: Window Cleaning Safety Standard.

National Building Code of Canada.

Structural Codes, Standards and Legislation

CAN/CSA S413: Parking Structures

CAN/CSA S832: Standard for Seismic Risk Reduction of Operational and Functional Components (OFC)

PWGSC Doing Business with Real Property Branch (RPB)

Real Property Services Policy *Seismic Resistance of PWGSC Buildings*

S478-95 Guideline on Durability in Buildings.

Parks Canada's *Standards and Guidelines for the Conservation of Historic Places in Canada*

Civil Codes, Standards and Legislation

- Site services follow Provincial and Municipal Standards.

Mechanical Codes, Standards and Legislation

- Air Movement and Control Association (AMCA) Standard 210: Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating
- Air-Conditioning, Heating, and Refrigeration Institute (AHRI) Standard 880: Performance Rating of Air Terminals
- American Society of Mechanical Engineers (ASME) Code for Unfired Pressure Vessels
- ASHRAE Guideline 4: Preparation of Operating and Maintenance Documentation for Building Systems
- ASHRAE handbooks (Handbook—HVAC Systems and Equipment, Handbook—HVAC Applications, Handbook—Refrigeration, Handbook—Fundamentals)
- ASHRAE Standard 100: Energy Conservation in Existing Buildings
- ASHRAE Standard 105: Standard Method of Measuring, Expressing, and Comparing Building Energy Performance
- ASHRAE Standard 111: Measurement, Testing, Adjusting and Balancing of Building HVAC Systems
- ASHRAE Standard 114: Energy Management Control Systems Instrumentation
- ASHRAE Standard 135: BACnet – A Data Communication Protocol for Building Automation and Control Networks
- ASHRAE Standard 15: Safety Standard for Refrigeration Systems
- ASHRAE Standard 180: Practice for Inspection and Maintenance of Commercial Buildings HVAC Systems
- ASHRAE Standard 52.2: Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size
- ASHRAE Standard 55: Thermal Environmental Conditions for Human Occupancy
- ASHRAE Standard 62.1: Ventilation for Acceptable Indoor Air Quality
- ASHRAE Standard 90.1: Energy Standard for Buildings Except Low-Rise Residential Buildings
- Associated Air Balance Council (AABC) National Standards for Total System Balance
- CAN/CSA B139: Installation Code for Oil-Burning Equipment
- CAN/CSA B149.1: Natural Gas and Propane Installation Code
- CAN/CSA B149.2: Propane Storage and Handling Code
- CAN/CSA B52: Mechanical Refrigeration Code
- CAN/CSA B64: Backflow Preventers and Vacuum Breakers
- CAN/CSA Z204 Guideline for Managing Indoor Air Quality in Office Buildings
- Federal Halocarbon Regulations
- MD 15000 – Mechanical Environmental Standard for Federal Office Buildings
- MD 15161 – Control of Legionella in Mechanical Systems

- National Fire Protection Association (NFPA) 13: Standard for the Installation of Sprinkler Systems
- National Joint Council Occupational Health and Safety Directive
- NFPA 14: Standard for the Installation of Standpipe and Hose Systems
- NFPA 20: Standard for the Installation of Stationary Fire Pumps for Fire Protection
- NFPA 211: Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances
- NFPA 214: Standard on Water-Cooling Towers
- NFPA 231: Standard for General Storage
- NFPA 231C: Standard for Rack Storage of Materials
- NFPA 30: Flammable and Combustible Liquids Code
- NFPA 54: National Fuel Gas Code
- NFPA 75: Standard for the Fire Protection of Information Technology Equipment
- NFPA 96: Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations
- Ozone-Depleting Substances Regulation, Canadian Environmental Protection Act
- Sheet Metal and Air Conditioning Contractors' National Association (SMACNA) HVAC Air Duct Leakage Test Manual
- Standards Association (ANSI) Z223.1: National Fuel Gas Code
- Telecommunications Industry Association (TIA)/Electronics Industries Alliance (EIA)-569: Telecommunications Pathways and Spaces;
- CSA standards for commissioning

Electrical Codes, Standards and Legislation

- CAN/CSA C654: Fluorescent Lamp Ballast Efficacy Measurements
- CAN/CSA C802.1: Minimum efficiency values for liquid-filled distribution transformers
- CAN/CSA C802.2: Minimum efficiency values for dry-type transformers
- CAN/CSA C802.3: Maximum Losses for Power Transformers
- CAN/CSA B72-M87: Installation Code for Lightning Protection Systems
- CAN/CSA C860: Performance of Internally Lighted Exit Signs
- CAN/ULC S524: Installation of Fire Alarm Systems
- CAN/ULC S536: Inspection and Testing of Fire Alarm Systems
- CAN/ULC S537: Verification of Fire Alarm Systems
- CSA C22.1: Canadian Electrical Code, Part I
- CSA C22.2: Canadian Electrical Code, Part II
- CSA C22.3: Canadian Electrical Code, Part III
- CSA Z462: Workplace Electrical Safety
- *Measurement of Lighting Levels in the Workplace – Canada Occupational Health and Safety Regulations*
- Provincial Electrical Codes and Regulations
- UL 1449: Surge Protective Devices
- IEEE Standard 81: Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System

Telecommunication Codes, Standards and Legislation

- ANSI/TIA-568.1: Commercial Building Telecommunications Cabling Standard (and addenda)
- ANSI/TIA-569:Telecommunications Pathways and Spaces (and addenda)
- ANSI/TIA-606: Administration Standard for Commercial Telecommunications Infrastructure (and addenda)
- ANSI/TIA-607: Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises (and addenda)
- ANSI/TIA-758: Customer-owned Outside Plant Telecommunications Infrastructure Standard

Security Codes Standards and Legislation

- Treasury Board Secretariat:
    - *Policy on Government Security*
    - *Operational Security Standard on Physical Security*
    - Operational Security Standard - Readiness Levels for Federal Government Facilities
    - Security Organization and Administration Standard
    - Security and Contracting Management Standard
    - Standard for Fire Safety Planning and Fire Emergency Organization
- Royal Canadian Mounted Police:
- Harmonized Threat and Risk Assessment Methodology
- Guide to the Preparation of Physical Security Briefs
- G1-103 Security Control Space Requirements
- G1-028 - Security Use of Mobile Shelving
- PWGSC Departmental Security Program
- PWGSC Policy of Funding Physical Security
- PWGSC Corporate Security Program

Annex C Non-Compliance Process

General Intent

The intent of the Base Building Standard is to set out the Government of Canada Standards for Office Buildings. The Base Building Standard is the core document which is a companion document to Workplace 2.0 which is the Government of Canada Standard for office space fit-up.

Both these documents have an non-compliance process which accommodates the non-standard situations of existing crown owned office buildings and leased office spaces across Canada. It also allows for the complexity of office space fit-ups within heritage office buildings.

Submission Process

There is a process with submissions explaining the reasons for the exemptions requested. To aid the Evaluation Committee the attached format is requested. The details should include drawings, photographs or other graphic materials as well as the analysis to aid in the deliberations of the committee.

Submittal Forms

Depending upon the non-compliance required, there are several templates available. A general form for issues running across all disciplines is the compliance checklist found in Annex E.

FORM 1: General Business Case Template

1. **Typical Cover Page**
   [Name of department or agency]

   Business case

   For

   [Project-specific non-compliant base building requirements or program-specific requirements]

   [Title]

   Submitted by:

   [Name, title, section and branch]

   Submitted to:

   Assistant Deputy Minister, Real Property Branch,

   Public Works and Government Services Canada

   Date: [day/month/year]

Business Case General Instructions:
It is important that the business case be clear, concise and complete. Include only relevant information and avoid duplication. A maximum of 3 pages per item being requested, not including appendices, should be sufficient for most submissions.

Outline Table of Contents

Purpose

Provide a brief statement on the purpose of the business case (i.e., the non-compliant item(s) or national special purpose space for which approval is being requested).

Background or Context

Provide background information as it relates to the request. Normally, this section requires two to three paragraphs only and may include, for example:

- Mandate of the department or agency and/or the specific group or program to which the request applies;
- Existing building conditions that create the considerations for a variance, for example project costs, heritage values;

Request(s) for Non-compliant Fit-up

For each non-compliant fit-up item being requested, provide the following information.

- The non-compliant item, and
- The Issue: Describe the main issue(s) or problem(s) driving the request and any impact(s) on the department's or agency's operations.

Options Analysis:

Provide an analysis of all options considered for addressing the issue(s). (NB: The Base Building Standards must be considered as one of the options.) For each option, include the following:

- 1. Brief description of the option
- 2. The impact on cost in terms of construction and ongoing operation and maintenance. Short term and where appropriate long term impacts considered. Details are to be provided in the Appendix to the document as required;
- 3. Benefits and risks in relation to, for example;
- .1 Operational requirements and/or program delivery;
- .2 Government objectives and priorities;
- .3 Security;
- .4 Health and Safety;
- .5 Sustainability;
- .6 Project Delivery and Schedules, and,
- .7 Other issues.

-

Recommendation and Justification:
Provide a clear statement of the solution being recommended for approval and the basis for the justification.

- When the recommendation is based on legislation, Treasury Board policies or approvals, reports or studies; the justification must include specific reference to the relevant text within the document. Anticipated cost savings must be provided.
- When the recommendation is based on security, the justification must include:
    - Reference to text within a third-party (RCMP?)Threat and Risk Assessment,
    - Security Design Brief or Security Site Brief that specifically supports the request.
    - If these documents are not available, they must be developed before the business case is submitted.

Funding
Include the following statement(s) to confirm the department's or agency's accountability for associated costs:

- For non-compliant base building requests: "[client department or agency] is responsible for the cost of all items associated with this non-compliance request that exceed the approved base line costs."
-

Approvals and Governance

The Base Building Standards for Office Buildings are supported by PWGSC Real Proberty Branch. It is the responsibility of all PWGSC employees to work with the standards.
Non-Compliance

Non-compliance requests are anticipated for existing buildings and requests are subject to an approval process.

Common Sense and Best Value\The BBS are the baseline for identification of non-compliance; however the project team should exercise sound judgement and common sense. Benefits to the taxpayers will take precedence over the interests of specific SME in the assessment of compliance and solutions.

Approval Committee

Each region is responsible to set up an approval committee to review non-compliance submissions to review the merit of each request and approve or deny the submissions.

Appendix

- Include as an appendix, the completed *Base Building Standards Compliance Monitoring Form* and/or detailed summary of variances requested and rationale based on existing systems or other key factors.

Annex D Scorecards LEED and Green Globes

Note: LEED and Green Globes scorecards are separate documents to be developed later.