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Bid Fax: (819) 997-9776

LETTER OF INTEREST
LETTRE D'INTÉRÊT

Title - Sujet Architectural and Engineering Servi	
Solicitation No. - N° de l'invitation EP021-190572/A	**Date** 2018-11-21
Client Reference No. - N° de référence du client 20190572	**GETS Ref. No. - N° de réf. de SEAG** PW-$$FE-178-75864
File No. - N° de dossier fe178.EP021-190572	**CCC No./N° CCC - FMS No./N° VME**
Solicitation Closes - L'invitation prend fin **at - à 02:00 PM** **on - le 2018-12-12**	**Time Zone** **Fuseau horaire** Eastern Standard Time EST
F.O.B. - F.A.B. **Plant-Usine:** ☐ **Destination:** ☐ **Other-Autre:** ☐	
Address Enquiries to: - Adresser toutes questions à: Matende, Robinah	**Buyer Id - Id de l'acheteur** fe178
Telephone No. - N° de téléphone (613) 296-7948 ( )	**FAX No. - N° de FAX** ( ) -
Destination - of Goods, Services, and Construction: **Destination - des biens, services et construction:** SEE HEREIN	

Comments - Commentaires

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Consultant Services Division/Division des services d'experts-conseils
L'Esplanade Laurier
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140 O'Connor Street
Ottawa
Ontario
K1A 0S5

Canada

REQUEST FOR INFORMATION

REPEATABLE DESIGN AND ARCHITECTURAL & ENGINNERING SERVICES FOR SCIENCE FACILITIES

1. PURPOSE OF THIS REQUEST FOR INFORMATION

The intent of this Request for Information is to notify industry of an upcoming opportunity and to solicit feedback on the draft Request for Proposal (RFP) and other aspects of the requirement detailed herein.

The information collected through responses to the questions in Annex A will serve to identify:

- The level of interest of A&E consulting firms in providing the services set out in the draft Terms of Reference provided under the conditions described; and
- Opportunities for improving the prospective RFP based on industry experience in designing laboratory facilities.

A comprehensive draft RFP will be provided for comment during the RFI period. At this time, the Draft Terms of Reference and Submission Requirements and Evaluation (SRE) are provided. The remainder of the draft RFP content will be released at a later date to be determined, including:

- Supplementary Instructions to Proponents,
- Terms, Conditions and Clauses, and
- Other appendices.

2. SCOPE OF SERVICES

The Government of Canada is developing an enterprise portfolio approach for its Science Facilities, referred to as the Federal Science and Technology Infrastructure Initiative (FSTII). In support of this, Public Services and Procurement Canada (PSPC) requires provision of Architectural and Engineering (A&E) services by a Consultant recognized for excellence in meeting science facility planning and design needs, with access to world-class resources and best practices from around the globe. The Consultant will report to a Departmental Representative (DR) from the FSTII Branch.

PSPC intends to retain the Consultant to support the attainment of FSTII's strategic real property objectives through delivery of the services set out in the attached Terms of Reference (TOR). The Consultant will be required to provide services (within a multi-departmental, multi-organizational, and multi-project planning environment, working in collaboration with PSPC), on an 'as and when requested basis', through Task Authorizations. The work will be based on three streams of activity:

Stream 1: Repeatable Design Framework Services (RS 1),

Services to develop a comprehensive Catalogue and Planning Toolset, based on Science Facility Reference Designs and lab typologies, incorporating comprehensive content based on approved lab design standards and guidelines;

Stream 2: Architecture and Engineering Services (RS 2):

A&E planning and design services, including functional programming, development of schematic designs, and planning and costing services to support science facility project analysis and funding decision-making; and

Stream 3: Design Control Authority Services (RS 3).

Design Control Authority (DCA) services, to assist in ensuring fidelity to the Repeatable Design Framework, and utilizing templated lab designs and typologies contained in the Catalogue in the delivery of specific science facility projects; and Services to transfer the DCA capabilities to the DR, including the Repeatable Design Framework and associated information and data.

Services will be required for an initial period of five (5) years commencing on Contract Award and for three (3) irrevocable optional periods of two (2) years each to extend the contract.

There is a security requirement associated with this requirement. Please refer to the draft RFP for more details.

3. BACKGROUND INFORMATION

Currently, the Federal government operates over two million square meters of laboratory (lab) and science-related assets in approximately 1,450 facilities at 175 sites across Canada. There are more than 125 Science and Technology labs in the National Capital Area (NCA), with facilities at multiple sites in both urban and isolated locations. Within this context, FSTII emerged as a joint initiative led by the Minister of Science and the Minister of PSPC, together with leaders from Federal Science-Based Departments and Agencies and other Federal Science Partners, to meet evolving science infrastructure needs on an enterprise-wide basis.

FSTII proposes the consolidation and modernization of Federal science facilities over a 25- to 40-year period, through a series of incremental plans that will serve to increase science collaboration, provide flexible and extensible building envelopes, and internal workspaces that reduce overall operating costs and improve operating efficiency. FSTII is directed at putting in place an infrastructure platform that can support innovation, collaboration, and open science, with FSTII investments aligned according to the following guiding principles:

- *Modern, Iconic Design,* including the degree to which the design is: likely to attract and retain the next generation of scientists; unique or groundbreaking; likely to set a new standards for labs and campus design; likely to stand up over time; and resonates with,

and is likely to leave an impression on people.

- *Scientific Innovation* - science infrastructure will be designed to enhance the delivery of scientific programs, and promote economic growth and public good.
- *Collaboration* - facility designs will include collaborative spaces and IT-enabled connectivity to maximize program effectiveness.
- *Functionality and Modernization* - facilities will be world-class and designed to comply with leading edge, functional, flexible, collaborative and IT-enabled standards.
- *Environmental Sustainability* - facilities will incorporate innovative technology to meet environmental sustainability goals.
- *Universal Accessibility* - science infrastructure, including sites, buildings, and relevant facilities and amenities will be designed so that they can be approached, entered, and used by all people, including those with physical, sensory or cognitive disabilities. Further to the tabling of Bill C-81, Canada is committed to promoting and protecting the rights of persons with disabilities and enabling their full participation in society. Ratification of the United Nations Convention on the Rights of Persons with Disabilities in 2006 underscores the Government of Canada's strong commitment to this goal. The May 2017 report Accessible Canada: Creating new federal accessibility legislation, highlights the fundamental principle of "an inclusive society where all Canadians have an equal opportunity to succeed, and are equal participants."
- *Optimization of Economic and Enterprise Value* - facilities will be designed and managed to generate overall economic and public benefits. Federal science infrastructure, including both facilities and Information Management and Information Technology (IM/IT) capabilities, has steadily deteriorated to the extent that roughly 36% of facilities are in poor or critical condition. The investment in IM/IT capabilities has not kept pace with growth in the use of analytics and computational power as primary scientific tools. As a result, Federal science infrastructure is not serving as an effective platform for evidence-based policy decision-making and science.

The FSTII vision involves renewing Federal science infrastructure as cost-effectively as possible and maximizing its overall effectiveness, sustainability and utility for Canadian Federal scientists and their collaboration partners. Modern, effective facilities are required to support Federal scientists in fulfilling their mandates and objectives.

Achieving FSTII objectives requires that real property be systematically defined and, wherever possible, repeatable designs leveraged utilizing strategic tools and A&E services designed to systemize the implementation process as far as possible without compromising innovation and creativity. Scientists, working together with the Consultant's lab design experts, will define their science program needs utilizing a Catalogue that provides a compendium of lab standards and design guidelines.

Science facility design requirements will be systematically defined based on Catalogue content in the form of outline technical specifications and guidelines for science facilities and installed equipment. The Catalogue will be used throughout the design process, establishing quality expectations for many aspects of the construction, base building systems, templated

lab room typology designs, materials, and procedures to build and commission new facilities.

The Catalogue is intended to be utilized by the Consultant to assist in defining functional programs at the individual science program level, while supporting the progressive standardization of planning criteria to minimize downstream errors in interpretation and delivery, and to improve quality, reduce risk, accelerate requirements definition and ensure predictable outcomes.

4. NOTE TO POTENTIAL RESPONDENTS

The publication of this RFI must not be construed as a commitment on Canada's part to issue a subsequent 'Request for Proposal' and no Contract or other form of commitment will be entered into with any suppliers based on responses to this RFI. Canada will not be bound by anything stated herein. As a result, potential suppliers of any good or services described in this RFI should not reserve stock or facilities, nor allocate resources, as a result of any information contained in this RFI. Participation in this RFI is encouraged, but is not mandatory.

There will be no short-listing of potential firms for the purposes of undertaking any future work as a result of this RFI. Similarly, participation in this RFI is not a condition or prerequisite for the participation in any potential subsequent solicitations. The responses from industry will enable Canada to evaluate the strategy to be taken, if any, in regards to issuing a solicitation for the required goods and services.

Any information submitted to PSPC in response to this RFI may be used in the further development of a Request for Proposal. Potential suppliers will not be bound by any aspect of their response to this RFI. All responses to this RFI will be held by PSPC on a confidential basis (subject to applicable legislation), and remain the property of PSPC once they have been received.

Provision of responses to this RFI will not preclude the supplier from responding to future solicitations for design services.

5. RESPONSE COSTS

Respondents will not be reimbursed for any costs incurred by participating in this RFI.

6. TREATMENT OF RESPONSES

(a). Use of Responses: Responses will not be evaluated. However, the responses received may be used by Canada to develop or modify procurement strategies or documents for a new solicitation, if a decision is taken to pursue such a course of action.

(b). Review Team: A review team composed of representatives of Canada will review the responses. Canada reserves the right to engage any private sector or Government resources that it considers necessary to review any response. Not all members of the review team will necessarily review all responses.

(c). Confidentiality: Respondents are encouraged to identify, in the information they share with Canada, any information that they feel is proprietary, third-party or personal. Canada will handle the information in accordance with the Access to Information Act and the Privacy Act.

(d). Follow-up Activity: Canada may, at its discretion, require clarification, in writing, of responses to this RFI.

7. INDUSTRY INFORMATION SESSION

During the period of this RFI, there will be an information session, hosted via WEBEX, on **December 6, 2018 at 14:00 pm EST**. This will be an opportunity for Canada to explain the requirement and answer respondents' questions. Respondents may use this session to better understand the requirements.

Proponents are requested to communicate with the Contracting Authority no later than **Thursday, November 30, 2018** to confirm attendance and provide the name(s) of the person(s) who will attend. Proponents who do not attend will not be given an alternative session but they will not be precluded from submitting a response.

8. CLOSING DATE

Responses to this RFI will be accepted until **02:00 PM on December 12, 2018**. Feedback to the RFI is to be submitted electronically (by email) to the Contracting Authority. The information received after that date will be considered only to the extent reasonable, in the sole opinion of Canada, given the progress of the Work at the time of the receipt of the said information.

9. ENQUIRIES

Because this is not a bid solicitation, Canada will not necessarily respond to enquires in writing or by circulating answers to all potential suppliers. However, respondents with questions regarding this RFI may direct their enquiries to:

Contracting Authority:
Robinah Matende
Acquisitions Branch
Public Services and Procurement Canada

Government of Canada
E-mail Address: robinah.matende@tpsgc-pwgsc.gc.ca
Telephone: 613-296-7948

10. FORMAT OF RESPONSES

The respondents should review section 3 *"Background Information"* and the draft RFP before providing responses to questions included under **Annex A** below.

Documents may be submitted in either official language of Canada.

ANNEX A

QUESTIONS FOR INDUSTRY

General

1. Are the requirements as stated in the attached draft RFP clear? If not, what would you need to be able to assess the picture more fully?

2. Would you be likely to bid on any resultant RFP for this requirement? If not, please explain.

3. Would you be pursuing a Joint Venture in order to respond to the RFP?

4. In addition to your replies above, are there any concerns, comments and advice you may offer for consideration?

Terms of Reference (TOR):

5. Are there any opportunities for improving the draft TOR in terms of the clarity and sufficiency of the project information provided and the general understandability of the requirement?

6. Based on your experience with other lab design efforts, are there any opportunities for improving the service delivery strategy? If yes, then:
    - Identify any opportunities for improving the services sought in Stream 1: Repeatable Design Framework Services (RS 1),
    - Identify any opportunities for improving the services sought in Stream 2: Architecture and Engineering Services (RS 2), and
    - Identify any opportunities for improving the services sought in Stream 3: Design Control Authority Services (RS 3).

7. Please indicate what you would consider to be a reasonable timeframe to ramp up to provide a Repeatable Design Framework.

Evaluation Criteria (Submission Requirements and Evaluation (SRE))

8. Can you identify any opportunities for improving the draft SRE in terms of its clarity and general understandability?

9. Please indicate whether your firm has the interest and capabilities to provide the services described.

DRAFT

REQUEST FOR PROPOSAL (RFP)

TABLE OF CONTENTS

The following is intended to clarify the general structure of the whole document.

TERMS OF REFERENCE

REQUEST FOR PROPOSAL – REPEATABLE DESIGN AND ARCHITECTURAL & ENGINEERING SERVICES FOR SCIENCE FACILITIES

Solicitation No- N de l'invitation Amd.No- No de la modif Buyer ID – Id de l'acheteur

ANNEX A

TERMS OF REFERENCE

PART 1 PROJECT DESCRIPTION (PD)

PART 2 CONSULTANT REQUIREMENTS (CR)

PART 3 PROJECT ADMINISTRATION (PA)

PART 4 REQUIRED SERVICES (RS)

PART 1 - PROJECT DESCRIPTION (PD)

Intent

Canada is developing an enterprise portfolio approach for its Science Facilities, referred to as the Federal Science and Technology Infrastructure Initiative (FSTII). In support of this, PSPC requires the provision of Architecture and Engineering (A&E) services by a Consultant recognized for excellence in meeting science facility planning and design needs, with access to world-class resources and best practices from around the globe. The Consultant will report to a Departmental Representative (DR) from the FSTII Branch.

PD 1.1 PROJECT MANDATE

Public Services and Procurement Canada (PSPC) intends to retain the Consultant to support the attainment of FSTII's strategic real property objectives through delivery of the services set out in these Terms of Reference (TOR). In accordance with Task Authorizations (TAs), the Consultant will be required to provide services as set out in the Scope of Work based on three streams of activity:

- Stream 1: Repeatable Design Framework Services (RS 1),
- Stream 2: Architecture and Engineering Services (RS 2), and
- Stream 3: Design Control Authority Services (RS 3).

The FSTII vision involves renewing Federal science infrastructure as cost-effectively as possible, and maximizing its overall effectiveness, sustainability and utility for Canadian Federal scientists and their collaboration partners. Modern, effective facilities are required to support Federal scientists in fulfilling their mandates and objectives.

Achieving FSTII objectives requires that real property be systematically defined and wherever possible, repeatable designs leveraged utilizing strategic tools and A&E services designed to systemize the implementation process as far as possible without compromising innovation and creativity. Scientists, working together with the Consultant's lab design experts, will define their science program needs utilizing a Catalogue that provides a compendium of lab standards and design guidelines.

Science facility design requirements will be systematically defined based on Catalogue content in the form of outline technical specifications and guidelines for science facilities and installed equipment. The Catalogue will be used throughout the design process, establishing quality expectations for many aspects of the construction, base building systems, templated lab room typology designs, materials, and procedures to build and commission new facilities.

The Catalogue is intended to be utilized by the Consultant to assist in defining functional programs at the individual science program level, while supporting the progressive standardization of planning criteria to minimize downstream errors in interpretation and delivery, and to improve quality, reduce risk, accelerate requirements definition and ensure predictable outcomes. The Catalogue is anticipated to consist of lab guidelines, design

standards and associated data, including templated lab room typologies, base building and other content presented in two ways:

1. A published document in PDF format.
2. An electronic version, noting that PWGSC is committed to using non-proprietary or "OpenBIM" standards. As such, the Consultant is not required to use any specific proprietary software format. For the sake of legacy information quality, the Consultant shall use software compliant with the international standards of interoperability for BIM (IFC) in all cases where models are submitted.

Where used, BIM shall not replace the submission requirements outlined by this document and as further specified in the Doing Business with PWGSC reference.

Consistent application of the Catalogue will enable governance authorities to scrutinize needs at the science program level and, based on common functional definitions, permit further consolidation where common lab components can be feasibly and safely shared across programs.

Base building prototype designs should show generic or 'idealized' layouts that help capture key accessibility, security, circulation, public space, and servicing concepts. The intent is to capture best practices in the form of repeatable, optimized designs.

The Lab Standards and Design Guidelines will assist designers and other users to:

- readily and clearly communicate their requirements to the design team;
- establish specific lab design and quality expectations;
- support multiple project delivery approaches, from standard Design-Bid-Build contracts to various forms of Public Private Partnership (P3) arrangements;
- ensure consistent delivery across Canada's Federal lab portfolio;
- increase the accuracy and speed of development of lab design and construction documentation;
- provide a mechanism for capturing best practices in lab design and construction, and for fostering continual improvement, improving quality, and reducing errors, omissions and cost over-runs;
- improve the co-ordination of infrastructure and equipment procurement programs;
- reduce lifecycle cost; and
- reduce environmental impacts over the total asset lifecycle.

PD 1.1.1 Background

FSTII will involve innovative approaches to renew aging science infrastructure for delivery of science programs (i.e. buildings, equipment, and Information Management/ Information Technology (IM/IT)). FSTII aims to support evidence-based policy and enable cost-effective and sustainable scientific program delivery.

PSPC is working closely with Federal Science Partners, including Federal Departments and Agencies, technology champions and Shared Services Canada, to develop state-of-the-art science infrastructure solutions that meet today's science program needs and can be quickly adapted and expanded to support future programs and priorities.

Collaboration and infrastructure flexibility are key FSTII objectives, enabling both physical and virtual collaboration, while supporting the delivery of multiple concurrent science programs.

Currently, the Federal government operates over two million square meters of laboratory (lab) and science-related assets in approximately 1,450 facilities at 175 sites across Canada. There are more than 125 Science and Technology labs in the National Capital Area (NCA), with facilities at multiple sites in both urban and isolated locations.

Within this context, FSTII emerged as a joint initiative led by the Minister of Science and the Minister of PSPC, together with leaders from Federal Science-Based Departments and Agencies and other Federal Science Partners, to meet evolving science infrastructure needs on an enterprise-wide basis.

FSTII proposes the consolidation and modernization of Federal science facilities over a 25- to 40-year period, through a series of incremental plans that will serve to increase science collaboration, provide flexible and extensible building envelopes, and internal workspaces that reduce overall operating costs and improve operating efficiency.

FSTII is directed at putting in place an infrastructure platform that can support innovation, collaboration, and open science, with FSTII investments aligned according to the following guiding principles:

- *Scientific Innovation* - science infrastructure will be designed to enhance the delivery of scientific programs, and promote economic growth and public good.
- *Collaboration* - facility designs will include collaborative spaces and IT-enabled connectivity to maximize program effectiveness.
- *Functionality and Modernization* - facilities will be world-class and designed to comply with leading edge, functional, flexible, collaborative and IT-enabled standards.
- *Environmental Sustainability* - facilities will incorporate innovative technology to meet environmental sustainability goals.
- *Universal Accessibility* - science infrastructure, including sites, buildings, and relevant facilities and amenities will be designed so that they can be approached, entered, and used by all people, including those with physical, sensory or cognitive disabilities. Further to the tabling of Bill C-81, Canada is committed to promoting and protecting the rights of persons with disabilities and enabling their full participation in society. Ratification of the United Nations Convention on the Rights of Persons with Disabilities in 2006 underscores the Government of Canada's strong commitment to this goal. The May 2017 report Accessible Canada: Creating new federal accessibility legislation, highlights the fundamental principle of "an inclusive society where all Canadians have an equal

opportunity to succeed, and are equal participants."

- *Optimization of Economic and Enterprise Value* - facilities will be designed and managed to generate overall economic and public benefits. Federal science infrastructure, including both facilities and Information Management and Information Technology (IM/IT) capabilities, has steadily deteriorated to the extent that roughly 36% of facilities are in poor or critical condition. The investment in IM/IT capabilities has not kept pace with growth in the use of analytics and computational power as primary scientific tools. As a result, Federal science infrastructure is not serving as an effective platform for evidence-based policy decision-making and science.

PD 1.1.2 FSTII Science Facility Project Information

FSTII is a phased program of projects. Attachment 1, entitled *FSTII Overview - Phase I Planned Science Facilities: High-Level Statement of Requirements*, provides an overview of FSTII, and science facility projects to be delivered under Phase1 of FSTII. Attachment 1 describes high-level requirements pertaining to science facilities, including:

- Lab typologies,
- Public-private collaboration,
- Modularity and expansion imperative,
- IM/IT collaboration, and
- Attraction and retention of talent.

PSPC is moving forward with the development of comprehensive strategies for the complete remediation of the current science footprint, based on real property portfolio planning and enterprise consolidation and transformation principles for IM/IT.

PSPC will provide for the acquisition of new Federal science facilities or the renewal of existing ones to meet science needs, complemented by Community Plans that identify specific science facility projects across Canada.

PD 1.1.3 Objectives

FSTII is being implemented through a dedicated Departmental Representative (DR), supported by PSPC subject matter specialists within the FSTII Branch, supported by representatives from science partner departments and agencies, to plan, direct, monitor and manage the consolidation and modernization of Federal science facilities.

On behalf of Federal Science Partners, the Consultant will support the DR in:

a) ensuring that new or modified Federal science facilities will provide best value over their lifecycle;

b) applying the Repeatable Design Framework to support the delivery of world-class, quality, modern science facilities whose designs are:

- flexible, adaptable, scalable, expandable and sustainable; and
- continually improving, with respect to their quality and safety, predictability of cost and schedule, and reduced risk, through consistently applied lab standards and design guidelines.

Design Principles

The following design principles have been established for construction of new or modified facilities and are applicable to each science facility project.

Flexibility and Adaptability – designed-in flexibility and adaptability, to enable a science

facility and its constituent labs to accommodate evolution of research and functional needs and technologies involved in scientific procedures over the life of the facility, with minimal disruption to ongoing programs. The following planning concepts will be applied to assist in meeting these requirements.

- *Repeatable/ Generic Design* – optimum use should be made of generic lab typology designs in primary lab areas that do not require customization. The goal is to maximize interchangeability of uses and to minimize the need for renovations when changes in function occur. A generic approach should also be applied to typical support space, administrative areas and other repetitive design elements.
- *Modularity* – a lab planning module should be employed in the organization of a science facility to maximize efficiency of space use, economize construction cost, and standardize location of partitions, furnishings and utilities.
- *Flexibility of Lab Furnishings* – where practical, lab furnishings should be flexible and/or movable, to enable reconfiguration without major renovation. Modular systems should be utilized to promote interchangeability of components or substitution of equipment for bench elements. Benches should be capable of being raised or lowered (i.e. high bench, low bench) for accessibility and to meet changing needs. Movable bench tops should be lockable in place for stability. Above the bench, a modular, adjustable system of shelving or enclosed cabinets should be used for interchangeable storage elements. Utility services should be delivered to benches via overhead service carriers, service connections, or umbilicals to accommodate change.
- *Reconfigurable Utility Systems* – lab areas should be reconfigurable without requiring major alterations to utility systems. Modular distribution modes should be provided that allow individual areas to be shut-down for alteration or repair without disruption to adjacent areas. Means to track utility consumption by module should be provided. Utilities in a biosafety level 3 (BSL-3) lab, ARF, and other sensitive areas should allow for complete access to components requiring servicing and maintenance, without entering these areas.
- *Expandability* – building systems should be readily expandable, consistent with the master plan for the facility and site. The degree of expandability should be determined early in the design process. Provisions should be made for future utility service expansion, both vertically and horizontally, to accommodate increased demands. Reserve capacity should be designed into building utilities, such as vertical shafts, to accommodate future growth and change. Spare capacity should be designed into building systems to provide flexibility to add equipment and instrumentation as required.
- *Scalability* – an important aim in designing for repeatability is to provide flexibility to scale designs to fit different laboratories' size requirements. There might be a requirement to have "small" (e.g. up to 5,000 square meters), "medium" (between 5,000 and 30,000 square meters), and "large" (e.g. greater than 30,000 square meters) versions of each type of science facility design, or alternative categories that would effectively support

design scalability. Having ranges of sizes implies the potential for some over-design for sizes at the lower end of any range. Size ranges must provide an optimized balance between minimizing additional costs per facility while rationalizing the number of designs.

Sustainability – Lab Standards and Guidelines must be such that they support the targeting of Net-Zero-Carbon Ready Buildings during design stages and include comprehensive consideration of sustainability attributes, including: environmental factors such as reduction of energy, water, and waste; affordability over the complete facility lifecycle; and

Universal Accessibility – science infrastructure, including sites, buildings, and relevant facilities and amenities that can be approached, entered, and used by all people, including those with physical, sensory or cognitive disabilities.

PD 1.1.4 Scope of Work

The Consultant will be required to provide a range of planning and design services, including:

- Services to develop comprehensive Catalogue and Planning Toolset, based on Science Facility Reference Designs and lab typologies, incorporating comprehensive content based on approved lab design standards and guidelines;
- A&E planning and design services, including functional programming, development of schematic designs, and planning and costing services to support science facility project analysis and funding decision-making;
- Design Control Authority (DCA) services, to assist in ensuring fidelity to the Repeatable Design Framework, and utilizing templated lab designs and typologies contained in the Catalogue in the delivery of specific science facility projects; and
- Services to transfer the DCA capabilities to the DR, including the Repeatable Design Framework and associated information and data.

The Consultant will be required to provide services within a multi-departmental, multi-organizational, and multi-project planning environment, working in collaboration with PSPC. The Work will involve extensive consultation with PSPC real property authorities and Federal science program owners, referred to as Science Partners.

The Consultant will be required to deliver services that provide best value to Canada, based on optimal use of allocated labour, financial and other resources, and:

- provide services in accordance with this TOR, and as required by TAs.
- collaborate with Science Partner representatives, working together with mutual respect and trust.
- participate in regular meetings to develop and implement a common vision and shared values that will govern the relationship.
- establish and maintain close business and operational relationships with the DR, and as requested, with other stakeholders.

- establish and maintain a co-operative and professional approach when liaising with Science Partner representatives, ensuring a high level of client satisfaction.
- plan and schedule Work in consultation with Science Partner representatives to minimize disruption to operations or programs.
- manage the quality of products and services and continually evaluate and propose new industry processes and innovations to improve the efficiency and effectiveness of services, and improving the Repeatable Design Framework and Catalogue accordingly.
- apply processes and systems that promote efficient sharing of information and knowledge across the Consultant Team, with PSPC and the DR and with Science Partner Representative organizations.

PD 1.2 MANAGEMENT OF SERVICES

PD 1.2.1 Organization and Operations

The DR, supported by FSTII subject matter specialists, is the lead authority for the services set out in the TOR and fulfilling the FSTII mandate.

Reporting to the DR and working in collaboration with others, the Consultant will be required to:

- employ best practices for scope management, design, estimation, scheduling, controlling and managing quality, and contract administration, throughout the Contract term.
- permit rigorous quality reviews and audits by Canada, correcting identified deficiencies and responding to issues in a timely manner.
- apply a continual risk management program in the delivery of services set out in the TOR.
- ensure the Consultant Team shares information effectively and works in the spirit of collaboration with the DR, other PSPC representatives, Science Partners and other parties engaged by Canada.
- maintain full and open communication among the members of the Consultant Team throughout the life of the Contract.

PD 1.2.2 Planning and Mobilization

In collaboration with the DR, submit a Work Plan and periodic updates in accordance with the CDRL. Describe task activities, organizational structure, and implementation timeframes for the scope of Work included in TAs, including:

a) Task Activity Network for the planning and implementation of individual Scope of Work deliverables;

b) Consultant Team Structure (Core Team, Consultant Resources, and Specialty Consultant Team Resources) covering the required Consultant Responsibilities set out in Part 2, CR 2.2, and the Project Manager, as single point of contact for the Work, no later than 10

calendar days following Contract Award;

c) description of appropriate measures to manage Contract relationships with PSPC at the Consultant's corporate and working levels, ensuring an effective corporate management relationship with PSPC.

d) appointment of the Project Manager, as the single point of contact to manage the relationship with the DR, with the required authority to commit the Consultant.

e) participation in executive meetings including PSPC, Science Partner representatives and Consultant executives, as requested.

f) organization and participation in monthly operations and routine update meetings, as requested.

g) required capabilities to host and operate virtual collaborative meetings.

h) incorporation of ideas and sharing of experience gained in working with the Consultant's other clients.

i) organization and participation in meetings and other forums aimed at fostering collaboration, and participation in other meetings and committees with the DR, PSPC and other stakeholders, as requested.

j) input to strategic decisions and direction to promote the Consultant's sense of ownership and accountability in the Work.

k) advice and support to the DR in coordinating and aligning work undertaken by others, for example in strategic and portfolio planning.

l) flexibility and responsiveness in adjusting to changing DR priorities and requirements.

m) ensuring effective engagement and collaboration with designated PSPC representatives in monitoring stakeholder satisfaction and developing joint communication strategies, as requested.

Submit annual Work Plans by 15 February covering Work for the coming Government Fiscal Year (1 April to 31 March). Present the plan to the DR, respond to questions and adjust accordingly to obtain its acceptance and to support finalization of TAs.

Submit a Mobilization Plan in accordance with the CDRL, for acceptance by the DR, covering the requirements of the first four months of the Contract, or as mutually agreed, indicating:

a) key contacts, and
b) the associated schedule and milestones.

Provide the Core Team including the resources indicated in Part 2 of the TOR: Consultant Requirements (CR).

No later than 30 calendar days following Contract Award:

a) Submit an Initial Labour Resource Plan and Travel Plan;
b) Undertake the Work to obtain required security clearances for team members;
c) Assign Key Discipline and Core Team resources once security clearances have been obtained; and
d) Mobilize the Consulting Team in accordance with the accepted Mobilization Plan.

PD 1.3 DEFINITIONS

Estimate Class: classes of estimates ('Class C and D') are indicative estimates as defined in the attached document Doing Business with PWGSC.

Equipment: tangible property having a useful life of more than one year and is used in business operations, including:

a) *Fixed Equipment*: fixed, built-in, attached and installed equipment normally included as part of the construction contract and capitalized as part of the facility cost; examples include fume hoods, workbenches and biological safety cabinets;
b) *Moveable Equipment*: equipment that does not require attachment to the building or utility service, other than that provided by an electrical plug or disconnect fittings, or stabilization after installation; normally purchased separately from the construction contract and capitalized separately; examples include electron microscopes, freezers, ovens, Incubators and mass spectrometers; and
c) *Special Purpose Equipment*: technical, medical or scientific equipment needed to operate a lab, human health or animal care facility, or specific to a single purpose and not generally suitable for other purposes. Special purpose equipment may be classified as either fixed or moveable equipment.

Guidelines: guidelines are not mandatory, but typically provide insights, other guidance and the reasoning behind standards, whose application may be mandatory, and recommended best practices for design, construction and commissioning of labs based on confirmed previous experience and best practices; variations from guidelines should be fully justified.

Including: where "including" is used preceding a colon, followed by a list, the list is non-exclusive.

Laboratory, Lab, or Laboratory Facility: typically, refer to the entire facility, including base building and lab rooms.

Laboratory Function: operational activities involving the performance of a range of specialized tasks in support of a defined science program purpose or objective. The term Laboratory Function is interchangeable with common variations in lab identification, such: as lab type; lab name; lab program, research program or lab classification.

Lab Standards and Design Guidelines Catalogue: the Catalogue refers to a component of the RDF that provides capabilities to guide and assist in the planning, design and implementation of future lab workspaces and support areas, including: 1) a compendium of Lab Standards and

Design Guidelines content (see Attachment 3), including base building standards, Reference Designs and design templates; and 2) associated utilities and capabilities to exchange BIM data with systems of record, and provide functional utilities to support the creation, use and maintenance of that content and its application to specific science facility projects.

Laboratory rooms: specific rooms within a lab facility in which scientific / engineering science activities are conducted, as distinct from office, common, and other support areas.

Repeatable Design Framework: a comprehensive framework for guiding the planning, design, development and implementation of science facility projects, including the associated processes, procedures, documentation and tools used to foster repeatable design and otherwise support the delivery of Federal science facility projects.

Science Facility Reference Designs: a Reference Design for science facilities and typologies included in the RDF (Catalogue), including configurations and detailed attributes, covering the full range of A&E Lab design disciplines, for both the base building and interior space, with schematic design and design development, including 'Class C' estimates, as the basis for establishing a repeatable physical identity for Federal Science Facilities.

Standards: standards are issued by authoritative agencies, professional or recognized bodies, and their application may be compulsory; typically, they establish minimum acceptable benchmarks to meet technical specifications or performance levels, usually to:

- safeguard health and safety,
- facilitate common understanding; or
- provide consistency across a large organization such as the Canadian Federal government.

Zero Carbon building: highly energy-efficient building that either produces on-site, or procures carbon-free renewable energy in an amount sufficient to offset the annual carbon emissions associated with operations. (Refer to the Canada Green Building Council Zero Carbon Building (ZCB) Standard, May 2017).

PD 1.4 ACRONYMS AND ABBREVIATIONS

A&E – Architecture and Engineering

AAFC – Agriculture and Agri-Food Canada

CDRL – Contract Deliverable Requirements List

CR – Consultant Requirements

DR – Departmental Representative

DCA – Design Control Authority (Advocate Architect)

IM – Information Management

IT – Information Technology

NCA – National Capital Area

NCR – National Capital region (of PSPC)
P3 – Public Private Partnership
PSPC – Public Services and Procurement Canada
RCMP – Royal Canadian Mounted police
RDF – Repeatable Design Framework
RS – Required Service
SAG – Science Advisory Group
SEC – Science Enterprise Centre
TA – Task Authorization
TOR – Terms of Reference
VfA – Value for Money Analysis

PART 2 – CONSULTANT REQUIREMENTS (CR)

Intent

Canada is expecting the Consultant to be a leading A&E firm with global experience in delivering designs for major science facility projects, and be responsible for providing an integrated multi-disciplinary team comprised of qualified professional and technical expertise capable of meeting the requirements and providing the services identified in Part 4 of the TOR.

CR 2.1 GENERAL

The Consultant must establish a project office and maintain a full-time presence in the NCA, to plan, manage, and deliver the scope of Work and be able to ensure the availability of required resources as well as back-ups to effectively execute the Work in a timely fashion. As required, establish a presence at other locations in support of specific science facility projects as set out in associated Task Authorizations (TAs).

The Consultant Team will comprise identified resources, whether employees, or sub-consultants. The Consultant will be required to maintain the expertise of the Consultant Team for the duration of the Contract. If the Consultant requires a change to the Consultant Team, request and obtain approval from the DR, who will ensure the substituted team members have the required equivalent level of qualification necessary for contract fulfillment.

PSPC will have no direct contractual relationship with sub-consultants engaged through third-party contracts. The Consultant is solely responsible to PSPC under the terms of the Contract.

CR 2.2 CONSULTANT RESPONSIBILITIES

The Consultant is totally responsible for delivery of the services, including Work to:

1. Coordinate and be responsible for Work or services throughout the duration of Contract, including that performed by the Consultant Team and Specialty Consultant resources retained by the Consultant;
2. Ensure clear, accurate and ongoing communication of scope, budget, scheduling and risk issues, including changes, as they relate to the responsibilities of Consultant Team and Specialty Consultant resources retained by the Consultant in fulfilling RSs; and
3. Ensure that the Work of Consultant Team resources meets the requirements of TAs including scope, effort and fees, schedule, completeness, relevance and integration with other work.
4. Manage the quality of services and deliverables and:
   a) resolve deficiencies in a timely and responsive manner;
   b) gather evidence of performance, proactively identify opportunities to improve services, and rectify nonconformities through a continual improvement process to

prevent their recurrence;

c) support external audits of the work;

d) respond to audit findings and adjust accordingly during the Contract Period; and

e) identify and recommend opportunities for continual improvement in efficiencies and cost reductions resulting from incorporation of emerging technologies and systems that could reduce operating costs.

CR 2.3 REQUIRED CONSULTANT RESOURCES

The Consultant Team shall be comprised of the following resources, noting that a resource may have the necessary qualifications and expertise to fulfill more than one role:

Consultant Team Resources

a) Core Team Members (See Note 1 and refer to Table CR 2.3):
- Project Manager
- Lead Architect
- Intermediate Architect
- Chief Lab Design Specialist
- Functional Programming Specialist

b) Other resources:
- Civil Engineer
- Structural Engineer
- Mechanical Engineer
- Electrical Engineer
- Cost Specialist (Quantity Surveyor)
- Commissioning Specialist
- Environmental and Sustainability Practices Specialist
- Industrial Hygienist
- Lab Design Specialist
- Lab Equipment Specialist
- Building Security Specialist
- Building Science Specialist
- Interior Designer
- Acoustics Specialist
- Lighting Specialist
- Hardware Specialist

- Signage and Way-Finding Specialist
- Heritage Conservation Specialist
- IT Infrastructure Specialist
- Building Information Modeling and Management (BIM) Specialist
- Landscape Architect
- Urban Planning Specialist
- Code Specialist (Regulatory)
  - Federal
  - Provincial and Municipal
  - Other Regulatory Authorities
- Energy Modeling Specialist
- Vertical Transportation Specialist
- Building Automation Specialist
- Risk Management Specialist

Note 1: The Core Team, augmented as required by other resources, will be responsible for the overall planning and monitoring of the Work set out in specific Task Authorizations.

The Consultant Team resource responsibilities and definition are included in the below table. The resources shall meet the identified requirements.

TABLE CR 2.3 - Category of resource definitions	
CORE TEAM	
LEVEL	**RESPONSIBILIES AND REQUIREMENTS**
Project Manager	The individual having overall control, and accountability for the overall delivery of the Consultant services. Beyond the traditional responsibilities typically assumed by the Principle in Charge (as referenced in the RAIC Handbook of Practice) with respect to contract performance, the Project Manager shall personally spearhead on a hands-on basis, the active management of the entire consultant team, and its sub-consultants.

Lead Architect	Same as the Senior/Lead Architect role identified in the Architect section of this table. Responsible for managing major architectural design projects and consultant coordination. Over 12 years of experience on major complex projects.
Intermediate Architect	Same as the Intermediate Architect role identified in the Architect section of this table. Responsible for leading teams and establishing/ developing scope of work. Between 5 - 12 years of major project experience.
Chief Lab Design Specialist	Same as the Senior Specialist identified in the Other Specialist section.
Functional Programming Specialist	Same as the Senior Specialist identified in the Other Specialist section.
ARCHITECTURE	
LEVEL	**ROLE AND REQUIREMENTS**
Senior/Lead Architect	Responsible for managing major architectural design projects and consultant coordination. Over 12 years of experience on major complex projects.
Intermediate Architect	Responsible for leading teams and establishing/ developing scope of work. Between 5 - 12 years of major project experience.
Junior Architect	Responsible for developing and detailing the established scope of work. Less than 5 years of experience.
Landscape Architect	Responsible for managing major landscape architectural design projects and consultant coordination. Over 12 years of experience on major complex projects.
Interior Designer	Responsible for managing major interior design projects and consultant coordination. Over 12 years of experience on major complex projects.
Senior Architectural Technologist	Responsible for leading teams and supervising field review/ coordination. Over 12 years of experience on major projects.
Intermediate Architectural Technologist	Responsible for technical development of project, coordinating teams. Between 5 - 12 years of experience on major projects.
Junior Architectural	Responsible for assisting the technical development and detailing of the established

Technologist	scope of work. Has less than 5 years of experience.

ENGINEERING – Civil, Structural, Mechanical, Electrical	
Level	**Role**
Senior/Lead Engineer	Project Lead responsible for managing major projects and consultant coordination. Over 12 years of experience on major complex projects.
Intermediate Engineer	Responsible for leading teams and establishing/ developing scope of work. Between 5 - 12 years of major project experience.
Junior Engineer	Responsible for developing and detailing the established scope of work. Less than 5 years of experience.
Senior Technologist	Responsible for leading teams and supervising field review/ coordination. Over 12 years of experience on major projects. Note 2.
Intermediate Technologist	Responsible for technical development of project, coordinating teams. Between 5 - 12 years of experience on major projects. Note 2.
Junior Technologist	Responsible for assisting the technical development and detailing of the established scope of work. Has less than 5 years of experience. Note 2.
OTHER SPECIALISTS (Refer to the above list)	
Level	**Role**
Senior/Lead Professional	Responsible for managing major projects and consultant coordination. Over 12 years of experience on major complex projects.
Intermediate Professional	Responsible for leading teams and establishing/ developing scope of work. Between 5 - 12 years of major project experience.
Junior Professional	Responsible for developing and detailing the established scope of work. Less than 5 years of experience.

CR 2.4 CONSULTANTS RETAINED BY PSPC

PSPC will engage the services of the following third-party consultants to provide input as required for project-specific planning and design work:

- Environmental Engineering/Industrial Hygiene – Preparation of Designated Substance Reports,

- Geotechnical Engineering – Preparation of Geotechnical Investigations, and
- Surveying Engineering – Property Surveys for legal and topographic aspects.

CR 2.5 CONSULTANT TEAM SECURITY CLEARANCE REQUIREMENTS

Consultant Team members working on the project require the correct level of security clearance as per the Security Requirements Section of the Contract. Refer to the Security Requirements Section of the Contract for further details.

CR 2.6 CONSULTANT TEAM LANGUAGE REQUIREMENTS

The Consultant Team must be capable of communicating both orally and in writing in both Official Languages.

All final deliverables including, but not limited to, catalogues, standards, functional programs and schematic design reports will have be provided in both official languages.

PART 3 – PROJECT ADMINISTRATION (PA)

The contract consists of three streams of effort, as set out in Part 4, each of which is to be administered by the Core Team, with an identified Lead and Consultant Resources required to address the scope of work identified in the TA.

PA 3.1 COORDINATION WITH PSPC

The DR, as primary point of contact and authority for the Contract, and designated PSPC representatives, will act as the liaison between the Consultant and government representatives and third parties as required.

PSPC will administer the Contract and exercise continuing oversight over the services provided by the Consultant. Unless requested otherwise by the DR, the Consultant is responsible for ensuring that reference designs comply with Federal and other requirements and for engaging Authorities Having Jurisdiction and undertaking the following.

1. Carry out services in accordance with the TOR and TAs, and as requested by the DR.
2. Ensure communications carry the PSPC Project Title, Project Number and File Number.
3. Advise the DR of changes that could affect scope, schedule, budget and risks, or are inconsistent with TAs or other Parts of the TOR.
4. Describe the extent of, and reasons for changes, and obtain written authorization from the DR before proceeding.

PA 3.2 TASK AUTHORIZATIONS

General

Provide as-and-when required services in accordance with TAs. TAs will be utilized by Canada as a flexible means to mandate the Consultant to undertake Work under the Contract, setting out the scope and other attributes of Work to be performed, including scope, cost, schedule and resources.

PA 3.2.1 Review and Recommend Initial Task Authorization Content

Draft Initial TA content will be finalized at Contract Inception by the DR. Provide required information and recommend changes to content to support revision of the Initial TA(s) to respond to issues and concerns raised by Canada. Submit final draft TA content to the DR in accordance with the Contract Deliverable Requirements List (CDRL). During the course of the Contract, propose new or revised draft TA content, responding to issues and concerns.

PA 3.2.2 Undertake Work Set Out in Task Authorizations

TAs may include Work of an urgent nature, requiring rapid mobilization and response. Establish flexible and responsive capabilities and resourcing strategies to ensure timely response to TA requirements as they arise.

PA 3.2.3 Prepare Labour Resource and Travel Plans

Prepare detailed Labour Resource and Travel Plans annually, and otherwise as requested to support to the TA process.

PA 3.3 DELIVERABLES

Requirements associated with deliverables are set out in the CDRL in Part 4 and Attachment 4. Where deliverables and submissions include summaries, reports, drawings, plans or schedules, provide soft copies of deliverables and/or as per the requirements of the TOR and TAs. Electronic files that cannot be transferred via email owing to their size (more than 3.5 Megs) or for confidentiality reasons are to be provided as indicated in the applicable TA or via a mutually acceptable secure means, or. As requested, provide hard copies in accordance with TAs.

Ensure that documents, including drawings and specifications, comply with the requirements set out in the most recent issue of PSPC standards, including those set out in the TOR and as per the approved schedule of each science facility project.

Maintain, and on request, provide the DR with material specifications, test and simulation results, and design work generated digitally, in accordance with the most recent issue of PSPC CADD standards, mutually agreed non-proprietary BIM and other electronic information exchange formats, or as otherwise requested by the DR, for future use by Canada, including generated, modeled or imported information used in the development final deliverables.

Provide working drafts of deliverables in English. Provide final versions of technical deliverables, including Repeatable Design Framework and outputs from Required Services in both Official Languages

PA 3.4 LINES OF COMMUNICATION

Communications on Project Administration and Contract matters are to be exclusively with the DR unless the DR provides written authorization otherwise. Specific guidance on communications involving Science Partners will be provided after Contract Award.

Where Work includes tendering by PSPC, PSPC manages the tendering process, including correspondence with bidders, and awards the contract.

Ensure that communications on A&E matters can be carried out orally and in writing with PSPC, Science Partner representatives and other stakeholders in both Official Languages.

PA 3.5 MEDIA

The Consultant Team Resources must not respond to requests for project-related information or questions from the media. Direct inquiries to the DR.

PA 3.6 MEETINGS

Administer required project meetings. Provide agendas, record issues and decisions and prepare and distribute minutes within 48 hours of the meeting, in accordance with the CDRL.

Unless otherwise specified in a given TA, for planning purposes, the typical frequency of project meetings for members of the Core Team is bi-weekly for the duration of the Contract. However, meetings should be held in accordance with approved project schedules. The use of conference calls will be addressed on a case-by-case basis as authorized by the DR.

PA 3.7 WORK REVIEWS AND AUTHORIZATIONS TO PROCEED

Work Reviews and authorizations to proceed will be in accordance with the part 4 of the TOR and as set out in specific TAs.

PART 4 - REQUIRED SERVICES (RS)

STREAM 1: REPEATABLE DESIGN FRAMEWORK SERVICES (RS 1)

RS 1.1 REPEATABLE DESIGN FRAMEWORK DEVELOPMENT AND IMPLEMENTATION

Intent

Creation of an RDF is key to meeting FSTII objectives. The RDF will guide the development and provision of services. Utilizing the Catalogue, it is proposed that scientists, working together with lab design experts, will define their science program needs, drawing from templated science workspaces that will both define the overall functional program at the individual science program level, while also standardizing the definition of requirements.

On a project-specific basis, the inventory of individual science program workspace needs, represented as the output of using the Catalogue, will then be aggregated and integrated into an overall functional program for a given Lab.

The purpose of the RDF Specification is to document the approach that the Consultant will utilize in a manner that can be clearly and readily communicated to the DR and other users. Determine how best to develop the Catalogue and Planning Toolset and the optimal approach for assisting the DR and governance authorities in guiding and providing technical oversight of the planning, design and implementation of science facility projects.

RS 1.1.1 Provide a Repeatable Design Framework Specification

Prepare an RDF Specification, based on an accepted set of Use Cases, in accordance with the CDRL. Describe the processes, procedures, documentation and tools that will be used to foster repeatable design and otherwise support the delivery of Federal science facilities in a manner that will meet FSTII objectives.

Include the following in the RDF Specification.

a) A Repeatable Design Concept, including:

- Identification of Use Cases governing use of the Repeatable Design Framework defining the interactions among various users involved in ensuring that FSTII and science facility project-specific objectives are met, including:
  - the DR and PSPC subject matter experts,
  - the Consultant Team,
  - third parties including architects of record,
  - Science Program owners,
  - Scientists, and others; and
- The roles of the Consultant Team, including the Core Team, Consultant Resources and Specialty Consultants, and the organizational constructs required to respond to specific TAs.

b) Definition of content and functionality requirements and how content will be acquired or

developed for RDF Standards and Guidelines, including what self-generated information will be developed by the Consultant, and what will be drawn from others for:

- Lab Standards and Design Guidelines, including content similar to that provided in the Technical Reference for Federal Office Building Design reference outlining minimum base building and systems performance requirements, Science Facility Reference Designs, and content provided in documents called up in Attachment 2: "Laboratory Standards and Design Guidelines References",
- Demonstration plans, vertical stacking and massing,
- Common modular lab typologies, with a comprehensive set of templates and capabilities for exchanging data with BIM-compliant applications,
- Cost estimating,
- Schematic design, and
- Statements of project design and technical performance;

c) Define the capabilities and attributes of the Repeatable Design Framework, comprising the Catalogue and Planning Toolset, including:

- The RDF design and its underlying structure and commercially available software,
- Performance and security specifications,
- Implementation planning and the approach and initial user content that will be used to demonstrate RDF functionality,
- A Training and Knowledge Transfer Plan, and an Implementation Strategy, in accordance with the CDRL,

d) The processes by which the DCA function will be fulfilled, i.e. for managing relationships with stakeholders, including how the Consultant Team will:

- draw information from Science Partner representatives and through engagement in FSTII science facility projects,
- provide guidance, facilitate and foster collaboration with third-party architects of record and other project delivery entities, and
- undertake design and delivery validation and oversight;

e) The process for consistent documentation supporting continual improvement of the Catalogue and Planning Toolset, including identification and incorporation of:

- Resolutions of science facility design risks, issues and problems, and
- Lessons learned, and global best practices that can be adopted to foster continual improvement;

f) The process for undertaking science facility programming, including how the Consultant will:

- Apply the Catalogue and Planning Toolset,
- Elicit Science Partner functional requirements,
- Capture emergent lab typologies,
- Develop individual science facility programs, and
- Undertake science facility program integration, involving determination of functional affinities, integration opportunities and rationalization / harmonization of requirements of multiple Science Partner representatives and other stakeholders into single, integrated science facility programs;

g) Reference to Required Services (RSs) set out in Part 4 and recommended changes to improve the processes for developing science facility project documentation;

h) The process for acting as the Owner's Technical Advocate, working in close partnership with designated Legal and Financial Advisors for science facility projects delivered utilizing forms of P3s, (Public Private Partnerships), participating in evaluations and commercially confidential meetings, and developing associated documentation, including definition of technical components / content in accordance with the CDRL, :

- Business Cases,
- Terms of Payment,
- Requests for Information (RFIs), for Qualification (RFQs) and for Proposals (RFPs),
- Science facility project agreements and associated science facility Project-Specific Output Specifications,
- Submissions for approval by investment authorities,
- Risk assessments and science facility project costing and analysis, and
- Final science facility project requirements;

i) The processes for accessing and utilizing the Catalogue and Planning Toolset functionality, including utilities for developing estimates;

j) The process for providing access to DR-hosted information, and for distributing and receiving information electronically; and

k) A DCA Procedure, in accordance with the CDRL, summarizing the RDF as it applies to the DCA role and particularly to oversight of work conducted by third parties.

RS 1.1.2 Propose an Acceptance Review Process

Facilitate and participate in an RDF Acceptance Process, including:

a) A Preliminary Acceptance Review, based on high-level descriptions of the RDF components, to achieve Acceptance-in-Principle; and

b) A Final RDF Acceptance Review that includes the Work to achieve acceptance of the RDF Specification described in RS 1.2.

Provide appropriate presentation material, documents, samples and demonstration for each RDF Acceptance Review, including demonstrations and samples, additional information and further explanation as requested by Canada.

Provide an advance sample of information, in accordance with the CDRL, in the form of a description of information and templates, demonstrations and sample content applicable to a given lab typology, to be used by Canada to provide feedback as to the adequacy of the information that the Consultant proposes to submit at the Preliminary RDF Acceptance Review.

Develop and submit an RDF Acceptance Review Plan in accordance with the CDRL, and administer RDF Acceptance Reviews of an appropriate duration, to be hosted by the Consultant at an appropriate venue in the NCA.

Submit updated RDF Acceptance Review Plans within 15 calendar days prior to each review session, setting out the proposed approach, schedule and deliverables for the review session, and:

a) Content of advance submission of deliverables to be reviewed;

b) Draft agendas; and

c) Proposed turnaround times for Consultant follow-up and response to issues and concerns raised by Canada.

Provide additional information and explanation, and revise the RDF Specification to respond to issues and concerns raised by Canada as a result of each RDF Acceptance Review in relation to conformance with the requirements of the TOR, to obtain its acceptance.

RS 1.1.3 Conduct the Preliminary Acceptance Review

Plan, coordinate with the DR and conduct a Preliminary Acceptance Review session no later than 45 calendar days after Contract Award, or as requested.

Provide the following no later than 15 calendar days in advance of the scheduled review session:

a) Overviews of each element of the RDF, in the form of presentations; and

b) A description and the status of Consultant Team capabilities, a preliminary gap analysis in relation to the requirements of the TOR and a plan for closing identified gaps.

Provide an acceptable follow-up plan to rectify deficiencies and respond to issues, risks or problems identified by Canada by the end of the review session.

Provide information to the DR within two weeks after completion of the review session, including evidence to confirm that required changes to the RDF arising from the Preliminary Acceptance Review session have been made.

Provide follow-up information to the DR within 15 calendar days after completion of the review session, confirming that deficiencies in the RDF Specification are being resolved.

Provide the Final Draft RDF Specification within three months after Contract Award, in accordance with the CDRL. Update Repeatable Design Framework based on feedback provided, and, if not already operational, accepting full responsibility for satisfactory RDF performance once fully implemented and operational.

RS 1.1.4 Deploy a Repeatable Design Framework

Deploy the accepted RDF Specification, based on accepted Use Cases, including:

a) a Planning Toolset for both financial and space planning; and

b) The Catalogue.

Referring to Attachment 3, provide content development and planning capabilities to support:

a) Development of Science Facility Programs, including operations, organization, common services and utilities, technical systems and services, involving fully rationalized Lab Standards and Design Guidelines;

b) Production of Science Facility Reference Designs;

c) Production of Schematic Designs covering building floor plans, vertical stacking and massing;

d) Production of Statements of Project Design and Technical Performance, covering building systems and building envelopes, responding to specific site planning conditions;

e) Development of Lab Standards and Design Guidelines; and

f) Provision of supports and guidance for developing new science facility projects, including application guidance for using the Catalogue and Planning Toolset in developing functional program and design schematics for specific projects, and the assessment protocol and criteria for determining whether, when and how science facility project-specific data will be incorporated in the Catalogue.

RS 1.1.4.1 Demonstrate the Repeatable Design Framework

If not already implemented in a production environment, demonstrate a Proof of Solution for the RDF within 105 calendar days after Contact Award, at a suitable location provided by the Consultant, with an initial data set that can demonstrate required functionality. Demonstrate the proper functioning of the RDF with demonstration content. Obtain DR acceptance of the Proof of Solution.

If not already implemented in a production environment, demonstrate the RDF operating in a production environment within 120 calendar days after Contact Award. Demonstrate features of the RDF as a fully managed platform for the design of science facilities:

a) Ensure that the RDF meets performance requirements, and resolve and document technical issues with its utilization; and

b) Keep the document up-to-date over the life of the Contract, reflecting changes made to the RDF or its configuration in accordance with the CDRL, logging any changes and the

associated rationale.

RS 1.1.4.2 Initialize the Repeatable Design Framework and Develop Science Facility Reference Designs

Develop Reference Designs for inclusion in the Catalogue, in a manner consistent with the requirements set out in RS 2.15. Establish the range of required lab room typologies, and a consistent, iconic base building identity for Federal Science Facility functional areas and associated office accommodations. Include drawings and other graphical and textual content in the Reference Design deliverables describing the size, character and materials of science target facilities, including architectural, structural, mechanical and electrical systems, and selected outputs from the full range of lab design specialty practices. Provide demonstration plans and outline specifications for the following Science Facility modular sizes capable of being integrated as intermediate sizes, and including a suitable component of Office Accommodation space, as required:

a) Reference Design 'A': 5,000m2
b) Reference Design 'B': 10,000m2
c) Reference Design 'C': 25,000m2
d) Reference Design 'D': 50,000m2

Upon approval of the scope of required services, draft and recommend TA content, engage the DR, adjusting content as required, and undertake the Work following authorization. Provide planning and design services for the identified scope of Work in close collaboration with those responsible for the maintaining the Catalogue and Planning Toolset**.**

Develop Catalogue content:

a) Provide a detailed timeline leading to an acceptable level of comprehensiveness of Catalogue content;
b) Analyze best practices, regulatory requirements and existing lab standards and design guidelines;
c) Utilize self-generated or other available planning information and data, and information obtained through the literature and otherwise;
d) Utilize planning information provided by Science Partner Representatives through formalized stakeholder engagement, following guidance provided by the DR;
e) Collaborate with the DR, Science Partner Representatives and others responsible for science programming associated with specific science facility projects; and
f) Capture, convert and migrate required data into the RDF.

RS 1.1.5 Conduct a Final Acceptance Review

Conduct a Final Acceptance Review leading to acceptance of the RDF Specification and successful demonstration of the RDF:

a) Plan, coordinate with the DR and conduct the Final Acceptance Review session within 130 calendar days after Contract Award, or as requested;

b) Provide the Final RDF Specification no later than 10 calendar days in advance of the Final Acceptance Review session;

c) Provide a live demonstration of the RDF, demonstrating its functionality for the Use Cases that it is intended to support; and

d) Conduct the review process, aimed at achieving Final Acceptance within 150 days after Contract Award, or as requested.

RS 1.2 CONTINUALLY IMPROVE THE REPEATABLE DESIGN FRAMEWORK

Intent

Information contained and otherwise generated by the Catalogue and Planning Toolset are the property of Canada. It is recognized that the breadth of lab workspace that Canada will require may not be captured in the initial version of the Catalogue. The Catalogue capability must be such as to provide for ongoing updating, with additions and modifications to its content to keep pace with changing lab operations, design changes, findings of completed lab science facility project evaluations and evolving best practices.

RS 1.2.1 Monitor Global Design Trends in Science Program Delivery and Design

Monitor and report on global Lab operational and design trends over the life of the Contract, and evaluate their application to the delivery of Federal science programs.

RS 1.2.2 Evaluate Performance of Lab Facilities Delivered Subject to the Repeatable Design Framework

Monitor the development of specific science facility projects developed utilizing the Catalogue and determine operational and technical performance outcomes that would require modifications to the Lab Standards and Design Guidelines included in the Catalogue. Provide Lessons-learned Reports in accordance with the CDRL.

RS 1.2.3 Continually Improve RDF Functionality

Review the outputs of trend analyses and science facility project-specific performance evaluation activities with the DR. Recommend, and, as accepted, modify the Catalogue and Planning Toolset. Evaluate and continually improve the RDF, its content and features, elaborating and capturing information and data about the required range of lab typologies and capturing emerging best practices, changes in regulatory requirements and newly released applicable standards, and:

a) Update information and data as it becomes available and further develop RDF functionality to reflect evolving Federal Science Facility Program needs;

b) Maintain and update the RDF; and

c) Provide support and training to users to ensure its effective use.

RS 1.2.4 Ownership, Protection and Retention of Information

RDF information and data collected on behalf of, or provided by Canada and its agents remain the property of Canada. The Contactor is solely authorized to use this information and data to satisfy Canada's requirements.

The DR will provide specific instructions as to retention periods for information collected by the Consultant Team. Label and securely store information in a manner sufficient to be used in legal action against those intruding the RDF, or in defending Canada against legal claims.

Treat information collected from or provided by Canada as confidential, and protect it from disclosure unless specifically authorized in writing by the DR.

Adhere to these requirements irrespective of the location of hardware, software and data relating to the provision of the services covered in the TOR.

Ensure that RDF online services obey Canadian laws, including laws regarding privacy of information and access to information.

RS 1.3 SUPPORT THE TRANSFER OF THE REPEATABLE DESIGN FRAMEWORK TO PSPC

Intent

FSTII represents a long-term undertaking in the order of 25 to 40 years involving a series of incremental plans that will serve to increase science collaboration, provide flexible and extendible building envelopes and internal workspaces, reduce overall operating costs, and otherwise improve the sustainability of Federal Science Facilities.

The Consultant Team will be required to develop an operational transfer process and training plan to transition the responsibility for the delivery of required services to the DR as indicated in associated TAs.

RS 1.3.1 Define the Scope of Transition

Develop a Transition Plan in accordance with the CDRL. Utilizing the listing of RSs, identify the task activity responsibilities to be transferred to the DR. Identify an organizational and operational model required to perform these Tasks/Activities, in accordance with the CDRL.

RS 1.3.2 Define the Transition Training Plan

Utilizing the defined scope of transition, prepare a comprehensive training plan and implementation schedule. Integrate the schedule with the proposed staffing plan timeframe for the DR, in accordance with the CDRL.

RS 1.3.3 Provide Training

Provide as-and-when required training to the DR, PSPC subject matter experts and other staff as part of the transfer of the RDF.

RS 1.3.4 Support the Transfer of the RDF to the DR

Support the transition of the RDF role to the DR organization. Undertake the Work in accordance with the provisions of a TA that will be developed for this purpose. As requested:

a) Provide the Catalogue and Planning content to Canada in an interoperable format and suitably persistent media;

b) Develop an output-oriented specification that would specify data interoperability requirements and performance parameters the RDF must meet, i.e. the functionality it provides and content it hosts; and

c) Provide advisory and migration planning services, as requested, to support the orderly transition of these capabilities to Canada or a third party.

STREAM 2: ARCHITECTURE AND ENGINEERING SERVICES (RS 2)

Intent

PSPC will require a range of A&E services to support the delivery of specific science facility projects, from pre-planning to development of Schematic Designs and other design deliverables, as well as to support the development of RDF Catalogue content which will include fully-developed Reference Designs for Science Facilities, including associated office accommodations. Provide these services in accordance with TAs, in collaboration with PSPC subject matter experts and others participating in the role of Owner's Advocate within the DR organization, with designated Science representatives, and with third parties involved in specific science facility projects. A&E Services requirements for specific science facility projects will be indicated in TAs, on an as-required basis, for the following:

a) Project Identification, covering:
   - RS 2.1 Feasibility Studies / Options Analysis
   - RS 2.2 Site Analysis and Selection
   - RS 2.3 Building Surveys, Audits, and Measured Drawings
   - RS 2.4 Functional Programming and Costing
   - RS 2.5 Financial Planning and Costing
   - RS 2.6 Delivery Strategy and Schedule
   - RS 2.7 Detailed Investigation Report
   - RS 2.8 Sustainable Development Strategies and Report
   - RS 2.9 Facility Equipment Evaluation and Recommendations Report
   - RS 2.10 Technical Support to Telecommunications Requirements
   - RS 2.11 Technical Support to Security Requirements
   - RS 2.12 Indicative Cost Report
   - RS 2.13 Decommissioning Report

b) Project Delivery, covering:
   - RS 2.14 Analysis of Science Facility Project Requirements
   - RS 2.15 Science Facility Design Requirements

c) Additional Services, covering:
   - RS 2.16 Risk Management

RS 2.1 FEASIBILITY STUDIES / OPTIONS ANALYSIS

Intent

The intent of a Feasibility Study/Options Analysis is to develop project requirements and identify a range of solutions that could meet those requirements. The Feasibility Report provides the information base used to evaluate investigated solutions and determine the optimum project solution in the context of economic, financial, market, regulatory, environmental / sustainable, functional and technical requirements and issues specific to the site/asset/project's specific TOR. Options analysis must include schematic design tests. Each option must address and discuss advantages and disadvantages, constraints, challenges and opportunities that address scope, 'Class 'D construction costs, indicative schedule, and risks.

RS 2.1.1 Scope and Activities

Undertake the following:

a) Functional Programming, including definition of general space requirements and functional relationships, to identify the scope of the project;

b) Studies of regulations to determine code and zoning constraints, urban design objectives, and community issues related to a project;

c) Identification and evaluation of potential sites;

d) Environmental impact analysis;

e) Financial studies identifying: 1) capital, operating, and maintenance costs 2) sources of revenues, including funds to offset capital and operating costs;

f) Valuation of land and sites;

g) Evaluation of existing facilities, including: building envelope; mechanical, electrical, and structural systems; functional adaptability; and code compliance;

h) Life cycle cost analysis;

i) Studies to determine the compatibility of functional program with an existing or renovated building;

j) Exploration of alternatives, such as the best fit of a functional program with several potential sites;

k) Investigation of existing structures and their adaptive future reuse;

l) Visits to buildings/sites to investigate and analyze the availability and capacity of building services needed for the project;

m) Investigation of functional requirements for the particular facility;

n) Review of availability of construction materials used in the existing facility;

o) Consideration of use of new technologies and energy from renewable sources.

p) Investigation and analysis of project compliance with applicable codes, regulations standards, including: National Building Code, Canada Labour Code, Model National Energy Code, National Fire Protection Association (NFPA), Ontario and Québec Occupational Health and Safety, Medical Research Council;

q) Identification of Authorities Having Jurisdiction;

r) Minimization of environmental impacts of the project consistent with economic constraints and project objectives, as per the Canadian Environmental Assessment Act 2012 (CEAA 2012); and

s) Recommendations on the feasibility of the project.

RS 2.1.2 Options Analysis

At least three options must be developed and analyzed; the status quo option is not permissible. Options analysis must include schematic design tests. Each option must address and discuss advantages and disadvantages, constraints, challenges and opportunities, addressing scope, 'Class D' construction costs, indicative schedule and risks.

The selection of a preferred option will be the outcome of a team/group effort involving the DR and designated Science Partner representatives in brain storming session(s). These sessions are required for:

- the DR to develop a thorough understanding of each option,
- to collaborate in identifying option selection criteria and their relative weight in consultation,
- to evaluate and identify the best option with the DR.

The best option may be another option yet to be developed from the best features of the tabled options. As such, the Feasibility Study concludes with a recommendation that may be one of the studied options or an additional option that would integrate the best elements of the studied options. The recommended option must address and discuss why it is the recommended optimum option in terms of scope, 'Class D' construction costs, indicative schedule and risks.

Involve the DR at each step of the process.

Include the following in Schematic Designs:

a) Bubble and flow diagrams;

b) Adjacencies and functional relationships; horizontal and vertical stacking relationships; orientation and renewable energy;

c) Elevations, cross sections, site plans, schematic floor plans; and

d) Photographs and other graphics required to promote a good understanding of each

option.

RS 2.1.3 Deliverables

Depending on the scope of work, submit drafts at the 33%, 66%, 99% and final as required. The final report must present a comprehensive summary of the existing conditions, feasibility and options analysis and recommendations, and provide the following:

a) Executive summary;

b) Report on existing conditions, deficiencies and life expectancy;

c) Report on functional and technical requirements;

d) Report on applicable codes, regulation, standards and authorities having jurisdiction;

e) Report on options analysis and recommendations;

f) A conclusion with a recommendation that may be one of the studied options or another option that would integrate elements of the studied options - the recommended option must address and discuss why it is the recommended optimum option in terms of scope, 'Class D' construction costs, indicative schedule and risk; and

g) Report on 'Class D' indicative estimates for each option.

RS 2.2 SITE ANALYSIS AND SELECTION

Intent

Site analyses include the evaluation of an existing or potential site in relation to the building program, budget and construction schedule. Review the site of the project and assess its suitability to accommodate the project. In doing so, consider known site constraints, ability to support future additions and alterations, and potential impact of proposed developments in the vicinity of the site.

RS 2.2.1 Data Collection

Evaluate the site. Depending on the project, assemble the following information as required:

a) Existing conditions which have an impact on the design:

- Climate, including prevailing winds, solar orientation, etc.,
- Topography, including site contours, drainage, water courses, visual characteristics, physical features, vegetation, water bodies, etc.,
- Geotechnical or soil information provided by the DR,
- Environmental hazards, and
- Immediate surroundings, including neighboring structures, shading and solar access, noise, views and vistas; and

b) Property description:

- Legal description, including boundary survey, easements, right-of-way, etc.,

- Vehicular and pedestrian access, and
- Utilities and services available to the site.

RS 2.2.2 Zoning and Other Regulations

Depending on the project, identify the zoning or land use regulations which apply to the site, as required, including:

a) Permitted uses;

b) Minimum area;

c) Height restrictions;

d) Setbacks;

e) Lot coverage: floor area ratio, percentage of coverage;

f) Open space requirements;

g) Parking requirements;

h) Other requirements.

RS 2.3 BUILDING SURVEYS, AUDITS AND MEASURED DRAWINGS

Intent

Verify the purpose of the measured drawings and the accuracy required. After confirming the scope with the DR, make measurements, augment with photographs and field notes, and prepare drawings. Prepare measured drawings of visible conditions as set out in the attached document Doing Business with PWGSC.

RS 2.3.1 Deliverables

As required, provide measured drawings, photographs and 3D models.

RS 2.4 FUNCTIONAL PROGRAMMING

Intent

The intent of a Functional Program is to ensure that sufficient information has been gathered to analyze the Science Program's functional and operational requirements, developed an understanding of the technical requirements for the building's infrastructure, and if required, applied the Government of Canada Fit-up Standards.

RS 2.4.1 Functional Programming Requirements

Prepare a Facility Program for the designated science program utilizing the Catalogue, drawing on Reference Designs, including site and base building standards, design criteria and preliminary costing up to 'Class D' Estimates. The development of a project-specific facility will involve planning input from various stakeholders and data sources. Review the outline Facility Program generated from the Catalogue with designated Science Partner representatives and other stakeholders to determine/confirm the fit between the designated

science program and the templated Catalogue selections.

Review the proposed science program project brief and confirm the scope of the operational programs to be accommodated in the new facility, visit existing program facilities to identify special purpose operational requirements not profiled in the Catalogue components selected for the project.

Based on the Catalogue-selected outline Facility Program, existing facility review and consultation with stakeholders, develop the Baseline Lab Standards and Design Guidelines, and Planning Data, expressed as a draft Facility Program.

Review the current real property accommodation plan to determine the opportunity for shared services and expanded facility accommodation for the integration of additional science programs. Where opportunities exist for portfolio integration, analyze and define functional affinities to support planning an expanded or modified accommodation program.

Utilize the RDF and the selected Facility Program Components forming the outline Facility Program to develop the Schematic Design for the proposed facility, including profiling the massing and fit on the proposed site.

Based on a comprehensive review of the planning inputs/outcomes with multiple Science Partner representatives, rationalize/harmonize the science program requirements into a single, integrated Science Facility Program.

Functional Programming includes the Work to develop a written statement that describes various criteria and data for the science facility project, including design objectives, site requirements and constraints, spatial requirements and relationships, building systems and equipment, facility systems and equipment, and future expandability. The purpose of this stage is to describe the requirements which a building (facility) must satisfy to support and enhance human activities. The programming process seeks to answer the following questions:

- What is the nature and scope of the problem?
- What information is required to develop a proper design solution to the problem?
- How much and what type of space is needed?
- What space will be needed in the next five to ten years to continue to operate efficiently?
- How can sustainability be addressed at this stage?

It includes the Work to:

a) develop a design test (in schematic form) for the functional program recommendations to determine that the recommendations can be accommodated in a minimum of three (3) options; and

b) develop a ‘Class D’ construction cost estimate.

RS 2.4.2 Scope and Activities

Examine the stakeholders' world in detail to define occupant needs and objectives. These requirements will establish criteria for evaluating potential design solutions and other strategic alternatives. Undertake the Work to understand:

- the impact of a building's occupants and processes (facilities) on the built environment;
- the social and environmental impacts of the building's program on the community; and
- the planning impacts of its function on the local infrastructure.

Prepare a functional and technical operational review through interviews, research, onsite observations, recording, etc. including:

a) research and information gathered through information sessions with employees, focus group sessions etc.;

b) findings from interviewing users and stakeholders to determine the project's functional and technical requirements based on a function-by-function, room-by-room, or branch-by-branch activity plans as appropriate;

c) staffing plans (current/future);

d) office standards; open vs. closed;

e) lab and other special purpose space;

f) support space; and

g) storage requirements.

Determine the volume of activity planned for specific facility components, such as:

- Throughput (amount of material put through experimentation, analysis); and
- Flow patterns (proximities/circulations).

Develop approximate floor areas and technical requirements for the proposed facility, including:

a) Details of the space, facility, or of the workstation;

b) Lab and other special equipment or furniture configurations; and

c) Environmental and technical criteria.

Advise the DR on alternatives, such as the architectural and financial implications of various building options. Functional programs for science facilities are future-oriented - alternative scenarios may be based on high-, medium-, and low-growth projections, or on fast, medium or slow roll-outs of anticipated events, depending on the nature and pacing of scientific activities. Consult with the DR in assessing the advantages or benefits - and the disadvantages or costs - of each alternative.

RS 2.4.3 Deliverables

Depending on the scope of work, submit drafts at the 33%, 66%, 99% and final stages, as required.

Include the following in an integrated final Functional Program report:

a) Executive summary;

b) The DR's vision, values and objectives;

c) Site requirements, such as parking, circulation, orientation;

d) Definition of the activities which will take place in each space in the building;

e) Detailed space requirements for the project, including:

- Room and data Sheets (sizes, adjacencies, technical requirements, etc.);
- Horizontal Zoning Plans; and
- Vertical Stacking Diagrams; Zoning (Bubble) Diagram;

f) If required/applicable, integration of DR-provided security requirements, furniture requirements, communications requirements;

g) Sketch (schematic) design options;

h) Special technical requirements of each of the spaces and the building systems;

i) Financial requirements and a preliminary "Order of Magnitude" budget;

j) Scheduling and time frame for the project;

k) Additional requirements, including:

- A gap analysis between the existing and proposed facility,
- Regulatory issues such as zoning and building code requirements,
- Other requirements from Authorities Having Jurisdiction,
- Community goals and concerns,
- Ecological and environmental concerns expressed using a sustainability design and assessment tool recognized in Canada,
- A recommended construction delivery strategy, and
- High level Power Point presentation(s).

RS 2.5 FINANCIAL PLANNING AND COSTING

Intent

This service provides for planning assistance to the DR and cost estimating services for

project-specific capital construction estimates and funding submissions.

2.5.1 Financial Planning

The Consultant must be familiar with the costing information available and/or required for early financial planning as well as to be able to develop and provide such information if requested. Financial plans are typically presented as a “pro forma” for all-inclusive project costs which typically include:

a) Hard project costs (construction and land costs);

b) Soft project costs (such as professional fees, realtor fees);

c) Financial costs;

d) Market revenue analysis;

e) Rates of return on investment;

f) Facility management fees;

g) Contingencies and risk allowances;

h) Escalations; and

i) Applicable taxes and other fees.

Financial plans are to provide all-inclusive, broken-down project costs with cash flows based on the recommended planned schedule.

RS 2.5.2 Provide Input to Decision-Documents

Provide cost estimates as requested for recommended content input for decision documents for various purposes, including Community Plans, Feasibility Studies, Treasury Board Submissions, Memorandums to Cabinet, Value for Money Analyses (VfMs) and Business Cases.

RS 2.5.3 Identify Science Facility Design Risks, Issues and Problems

Review the Science Facility Program project delivery and planning environment to determine the risks related to achieving project objectives related to accommodating the science program and delivery of the construction project within the established cost and time plans.

RS 2.5.4 Incorporate Best Practices and Lessons-learned and Foster Continual Improvement

Preparation of project-specific Facility Programs offers the opportunity to evaluate the delivery process and content plans with a view to improving either the process followed or updating the Catalogue content. Convene an annual and science facility project-by-project lessons-learned reviews and action any outcomes for improving the Catalogue or RDF, providing a Summary Report, in accordance with the CDRL.

RS 2.5.5 Provide Planning Guidance and Support

Provide as-and-when required planning assistance to the DR to support program/science facility project business case analyses, funding submissions or project scheduling at both portfolio and individual project levels.

RS 2.5.6 Develop Estimates

Provide estimating capabilities and services to aggregate and roll up costs in various ways, including at the individual science facility project, Community, Regional and National levels, and otherwise as requested. Provide fit-for-purpose estimates ('Class D / C / B') to meet capital construction and lifecycle costing requirements.

RS 2.6 DELIVERY STRATEGY AND SCHEDULE

Intent

The intent of this service is to provide services to recommend and support delivery strategy decision-making to meet science facility project objectives.

RS 2.6.1 Scope and Activities

Provide a detailed delivery strategy and schedule, in consultation with the DR, including:

a) A detailed implementation strategy documenting the activities, milestones and deliverables required for the effective delivery of the project, including time frames for submissions, reviews and approvals.

b) A project schedule in a graphic format such as Critical Path Method (CPM) or Program Evaluation Review Technique (PERT) indicating the activities, milestones including critical deadlines, long lead delivery items and drop-dead dates, required for the effective delivery of the project deliverables, including time frames for submissions, reviews and approvals.

Include the following in the project Implementation Strategy and Schedule described above:

a) Space acquisition strategy, building master plan;

b) Decommissioning and environmental clean-up strategy (information provided by the DR);

c) Move sequencing;

d) Swing space requirements;

e) Procurement of facility equipment and furniture strategy; and

f) Construction strategy.

Advise the DR of any changes to the scope that could affect schedule or are inconsistent with instructions or written approvals previously given. Detail the extent and reasons for the changes and obtain written approval before proceeding.

Submit the Implementation Strategy and Schedule for review; revise it as required and resubmit it for final approval. The original approved schedule will become the "Baseline"

schedule to monitor project progress. Throughout the project, monitor critical path and deadlines for submissions, revisions and approvals. Submit weekly Progress Reports identifying completed deliverables, slippage and upcoming activities.

RS 2.6.2 Deliverables

Provide the Implementation Strategy and Schedule Report.

RS 2.7 DETAILED INVESTIGATION REPORT

Intent

The intent of this service is to provide detailed in-depth technical investigations into aspects of findings and recommendations identified either in Building Condition Reports (BCR) or as per the requirements of the specific science project TOR. Typically, such investigations require openings, testing, swing-stages, scaffolding, special equipment/tools and the use of recording methods such as photography, video, infrared photography, material sampling and the use of testing laboratories, etc.

RS 2.7.1 Scope and Activities

Undertake the following Work, as required:

a) detailed building envelope investigation and testing;

b) detailed air-flow analysis and testing;

c) detailed energy, water and air quality analysis and investigation; and

d) detailed analysis of other building components that have symptoms impacting either the use, performance or management of the facility.

RS 2.7.2 Deliverables

Depending on the scope of Work, submit drafts at the 33%, 66%, 99% and final, as required.

Include the following in the final report:

a) Executive summary;

b) Existing conditions;

c) Photographs, sketches, illustrations;

d) Test results;

e) Building science diagnostic; and

f) Options analysis, recommendations, costs, risks, prioritization of issues and corrective measures.

RS 2.8 SUSTAINABLE DEVELOPMENT STRATEGIES AND REPORT

Intent

The intent of this service is to formalize the sustainability strategies to obtain either

certification or to demonstrate certification equivalency for a given science facility project. In this context, the purpose is to research and investigate a wide range of integrated strategies to achieve sustainability including as per the selected rating system:

a) Recycling and reuse of materials, systems, equipment;

b) Procurement of “green” materials, life cycle environmental impact assessment;

c) Energy reduction and management;

d) Water management;

e) Waste reduction and management; and

f) Life-cycle costing, cost benefit analysis.

RS 2.8.1 Scope and Activities

Research and investigate sustainable development strategies in the context of the project requirements and as further described in GPO 1.3 and its reference documents. Undertake the following Work:

a) Complete a report outlining the sustainability targets for the project using a sustainability assist and assessment tool recognized in Canada;

b) Prepare a detailed inventory of existing non-contaminated materials, systems, equipment identified for reuse, repurposing or recycling - include target markets for recycled material and make recommendations;

c) Investigate and identify potential “green” building materials and products for the project include sourcing;

d) Make recommendations for an Energy Reduction and Management plan;

e) Investigate and analyze potential to increasing energy efficiency; and

f) Based on the recommendations included in a) to e), perform a cost / benefit and life-cycle costing analysis for the Sustainability Strategy for the project.

RS 2.8.2 Deliverables

Depending on the scope of Work, submit drafts at the 33%, 66%, 99% and final, as required. Provide a comprehensive summary of the analysis and recommendations in the final report, including:

a) An executive summary;

b) Report on options analysis and recommendations with pros and cons, impacts on scope, construction costs, schedule and risks; and

c) High-level PowerPoint presentation(s).

RS 2.9 FACILITY EQUIPMENT EVALUATION AND RECOMMENDATIONS REPORT

Intent

The purpose of this stage is to identify and evaluate existing facility equipment and furniture and to make recommendations for their reuse, recycling, refurbishment or replacement.

RS 2.9.1 Scope and Activities

Prepare a detailed inventory of existing furniture and equipment found in workstations/work settings, support space and lab space. Include drawings identifying existing location, layout, and user's name or employee number, if applicable. Verify with the DR.

Based on parameters developed in conjunction with the DR, prepare a furniture and equipment evaluation report that assesses the condition of existing furniture and equipment. Assess the current inventory against the functional requirements. Include an examination of the following: reusing/refurbishing existing furniture and equipment; and/or procuring new furniture and equipment; and current technologies and innovative solutions for the total office facility environment.

Prepare a detailed cost analysis and ‘Class B’ estimate that compares the reuse/refurbishment of existing furniture and equipment, with the purchase of new furniture and equipment. Consideration should be given to cost effectiveness and time frames required for refurbishment of existing furniture and equipment and/or the procurement of new furniture and equipment.

RS 2.9.2 Deliverables

Depending on the scope of Work, submit drafts at the 33%, 66%, 99% and final, as required. Provide a final report including an Executive summary, Inventory, Evaluation Report and Cost Analysis.

RS 2.10 TECHNICAL SUPPORT TO TELECOMMUNICATIONS REQUIREMENTS

Intent

Telecommunications requirements are identified and delivered by Shared Services Canada. The scope of this service involves the identification/programming and design for delivery of the horizontal and vertical pathway infrastructure as well as required rooms and supporting mechanical / electrical services to support the telecommunications requirements identified and delivered by Shared Services Canada.

RS 2.10.1 Scope and Activities

Analyze and prepare a report that documents pathways, rooms and mechanical/electrical required services to support systems identified and to be delivered by Shared Services Canada.

RS 2.10.2 Deliverables

Submit the report for review and revise as required to obtain its acceptance.

RS 2.11 TECHNICAL SUPPORT TO SECURITY REQUIREMENTS

Intent

Security requirements are identified and delivered by the DR. The scope of this service involves the identification/programming and design for delivery of the horizontal and vertical pathway infrastructure as well as required rooms and mechanical/electrical services to support the security requirements identified and delivered by others.

RS 2.11.1 Scope and Activities

Prepare a report that documents pathways, rooms and required mechanical/electrical services to support the security systems identified and to be delivered by others.

RS 2.11.2 Deliverables

Submit the report for review and revise as required to obtain its acceptance.

RS 2.12 DECOMMISSIONING REPORT

Intent

The purpose of this service is to research and investigate the decommissioning requirements of existing specialized equipment and systems.

RS 2.12.1 Scope and Activities

Prepare a report documenting the effect of the project's functional requirements and proposed planning alternatives on current and future requirements. Identify decommissioning requirements and make appropriate recommendations. Prepare a Decommissioning Plan including stand-alone facility equipment and systems to be reused or recycled whenever possible in accordance with PSPC and Treasury Board policy requirements.

RS 2.12.2 Deliverables

Depending on the scope of work, submit drafts at the 33%, 66%, 99% and final as required. Provide a final report including an executive summary, Inventory, Evaluation Report and Cost Analysis.

RS 2.13 INDICATIVE COST REPORT

Intent

The purpose of this service is to provide an indication of the total cost of the project, based on functional and technical requirements to the degree known at the time. It is based on historical cost data for similar work, suitably adjusted for such factors as: effect of inflation, location, risk, quality, size and time, considering, to the extent possible, related factors that could affecting cost. An estimate is strictly an indicative estimate of the project total cost and completion date. This indicative estimate is required for Preliminary Project Approval. Estimating should be in accordance with requirements set out in Doing Business with PWGSC.

RS 2.13.1 Scope and Activities

Undertake the following:

a) Prepare life-cycle cost plans from project briefs, preliminary concepts or other preliminary information;

b) Prepare 'Class D' cost estimates covering design and construction costs, contingencies and risks, and undertake the following:

- investigate and analyze costing alternatives to assist in the identifying the most cost-effective design / construction approach;
- investigate and report on life-cycle costs; and
- document unit pricing, analysis and valuation.

c) Prepare option analysis and "what if" scenarios;

d) Provide advice and project planning recommendations to achieve the most cost-effective project sequence;

e) Identify and quantify potential risks and make contingency recommendations to minimize negative cost impacts;

f) Advise on alternative procurement and construction strategies to create efficiencies wherever possible; and

g) Identify, forecast and analyze project-related issues, including possible market shortages and potential price fluctuations.

RS 2.13.2 Deliverables

Provide the following deliverables:

a) for Cost Planning, provide:

- Cost plans,
- Cost analyses and "what if" scenarios, and
- Cash flows as per the project schedule; and

b) for Cost Estimating, provide:

- Fully detailed 'Class D' cost estimate,
- Documented estimate methodology and assumptions,
- Documented pricing and valuation calculations, and
- Life-cycle costs Report.

RS 2.14 ANALYSIS OF SCIENCE FACILITY PROJECT REQUIREMENTS

Intent

The intent of this service is to integrate and finalize project requirements, scope, costs, schedule and risks in a Project Brief, for confirmation/approval, as the road map for the delivery of a cohesive quality end product. It includes the Work to review, summarize and integrate project requirements from previous studies/reports, identify and resolve issues and conflicts, and identify and bridge gaps are to be. The approved Project Brief becomes the Project Scope of Services that is subsequently utilized to guide delivery of the project.

RS 2.14.1 Scope and Activities

As required, undertake the following Work:

a) Visit building(s)/sites determine how current needs are being met;

b) Analyze the project requirements/program;

c) Review available studies/reports related to the project; identify missing or out-of-date information and provide a gap analysis report;

d) Review the proposed project schedule for verification that milestone dates are achievable;

e) Review the cost plan/budget and verify that the costs are realistic and achievable;

f) Identify and verify Authorities Having Jurisdiction over the project;

g) Identify the codes, regulations and PSPC and other strategic and technical standards that apply; and

h) Establish a framework for the project to minimize environmental impacts consistent with project objectives and economic constraints.

RS 2.14.2 Deliverables

Depending on the scope of Work, submit drafts at the 33%, 66%, 99% and final stages, as required. Present a comprehensive and detailed summary of key project parameters in the Project Brief. Provide a comprehensive summary of project requirements, demonstrating a complete understanding of the scope of work including:

a) Base building system elements;

b) Confirmed or adjusted project cost, schedule and risks; and

c) Identification and resolution of issues, conflicts or other perceived information / clarifying assumptions for DR acceptance.

RS 2.15 SCIENCE FACILITY DESIGN REQUIREMENTS

Intent

The Consultant, as subject matter expert for understanding and applying the Lab Standards and Design Guidelines, will be engaged as required to develop project-specific schematic

designs, including site planning, building design, interior fit-up, outline specifications and cost planning ('Class C' Estimate). The Consultant Team will be engaged, as required, to provide design documentation to support project funding submissions and approvals, and to assist in preparing control documents for the selected project implementation process, e.g. from standard Design-Bid-Build contracts to various forms of P3 arrangements.

The Consultant Team will be engaged as required to translate approved project requirements detailed in the Project Brief into cost-effective and sustainable design concepts. Design concept options are explored and analyzed with respect to priorities and program objectives previously identified. Out of this process, one option that could be a combination of the best features of the studied options will be recommended to proceed.

Following written authorization from the DR as design requirements evolve, the recommended option from Schematic Design will be further detailed and refined based on application of Reference Designs, in support of engagement with designated third parties, including architects of record for specific science facility projects. For P3 Projects this may include deliverables such as drawings and other documents to describe the size, character and materials of the entire project as to architectural, structural, mechanical and electrical systems, and outputs from the full range of other lab design specialty practices materials, and such other elements as may be appropriate leading to a level of design completion and Class 'C' estimate commensurate with the project requirements. For P3 projects the services may include participating in, observing and making recommendations in Commercially Confidential Meetings with third parties.

RS 2.15.1 Scope and Activities

Undertake the following Work:

a) Obtain written approval from the DR for development of schematic design options based on the analysis of the Project Brief;

b) Provide a minimum of three distinctly different design options exploring possible technical and environmental strategies which are viable and have potential for development;

c) Analyze each solution with regard to the project goals, including cost and schedule;

d) Write a preliminary project-description report outlining the various components and system options;

e) Draft an environmental assessment if required under Canadian Environmental Assessment Act 2012 (CEAA 2012) or incorporate the requirements as set out in the Evaluation of Environmental Effects (EEE) letter or report produced by PSPC;

f) Minimize the use of hazardous/toxic materials and products made for endangered or rare species (i.e. tropical hardwoods);

g) Recommend a preferred option for further development with supporting background and technical justifications;

h) If required, register the project with a sustainability assessment system recognized in

Canada, and produce a report that documents the current status of the sustainability of the project using a sustainability design assist and assessment tool recognized in Canada;

i) Produce a 'Class C' estimate for the preferred option; and

j) Produce an implementation schedule, including construction strategies.

Following written authorization from the DR for developing one of the proposed Schematic Design options, undertake the following Work:

a) If any alterations are required, document required changes, analyze the impact on project components, and resubmit for authorization to proceed if required;

b) Expand and clarify the Schematic Design intent for each design discipline;

c) Present the design materials to the DR, design review or other committees as indicated by the DR;

d) Ensure coordination of the full range of A&E Lab design specialty inputs and outputs;

e) Analyze the constructability of the project and advise on the construction strategy and duration;

f) Prepare a milestone schedule with special attention to the impact on occupants based on available information;

g) Continue to review applicable statutes, regulations, codes and by-laws in relation to the design of the project; and

h) Provide a list of National Master Specification (NMS) sections to be used, complete with a full draft specification, catalogue cuts and sustainable development/green choices.

RS 2.15.2 Verify Science Facility Project Requirements

Review the project objectives and range of existing project documentation (e.g. Investment Analysis Report/Functional Program/Site Planning Analysis/Facility Asset Review as applicable) in concert with the emerging PSPC delivery planning and control framework, and prepare a specific Work Plan, in accordance with associated TAs and the CDRL, listing the required services to develop Schematic Designs drawing the Reference Designs included in the Catalogue.

RS 2.15.3 Science Facility Project Planning Design

Upon approval of the scope of required services, contribute and recommend TA content, engage the DR, adjusting content as required, and undertake the Work following authorization. Provide planning and design services for the identified project in close collaboration with those responsible for the maintaining the Catalogue and Planning Toolset**.**

RS 2.15.3.1 Provide P3 Project Pre-procurement Services

Provide pre-procurement support services for P3 projects, including:

a) refinement of functional programs; and

b) development of supporting Programs of Work and Specific Operational Specifications.

Explore design options, and analyze them against previously-identified priorities and program objectives.

Develop Project Specific Output Specifications (PSOSs), providing clear, measurable, and market-acceptable standards, specifications, and requirements ready for incorporation into Project Agreements, covering:

- Performance specs/output requirements (operating – security, lighting, building longevity, information technology, etc.),
- Hand back/lifecycle requirements,
- Standard specifications for applicable items,
- Maintenance schedule – efficiency requirements – key performance indicators including rudimentary energy models,
- Availability payments,
- Financial modelling,
- Value for Money calculations, and
- Risk and rate of return calculations.

RS 2.15.4 Coordinate the Flow of Information with Stream 3 Services

Upon completion and approval of the schematic design, coordinate the flow of information with resources responsible for delivering Stream 3 Services.

RS 2.15.5 Deliverables

RS 2.15.5.1 Architectural Deliverables

Develop and provide the following architectural deliverables:

a) Site plan showing proposed building outlines, orientation, main accesses and traffic patterns;

b) Schematic building plans of alternatives showing relative disposition of main functional areas, circulation patterns, numbers of floors, etc.;

c) Elevations and sections indicating the basic design approach and aesthetic philosophy;

d) Perspectives or massing studies;

e) Outside gross building areas and summary of main functional areas required and proposed; and

f) Horizontal and vertical space relationships.

Following written authorization from the DR as design requirements evolve, provide the following additional deliverables:

a) Floor plans of each floor showing functional space requirements with room names and

calculated areas, including necessary circulation areas, stairs, elevators, etc., and ancillary spaces anticipated for service use. Indicate building grids, modules, etc., and key dimensions;

a) Furniture and equipment plans;

b) Cross sections through the building(s) to show floor levels, room heights, inner corridor or court elevations, etc.; and

c) Detail sections of walls, building envelope design features or other special design features requiring illustration and explanation at this stage, including fireproofing methods.

RS 2.15.5.2 Structural Engineering Deliverables

Develop and provide proposed or alternative structural systems, including foundation methods, explanatory sketches, etc. and a copy of the site report on which the design is based.

Following written authorization from the DR as design requirements evolve, provide drawings indicating the proposed structural framing system, structural materials, and other significant or unusual details proposed. Drawings may be separated or incorporated on the Architectural sheets. Include a copy of the site report on which the design is based.

RS 2.15.5.3 Mechanical Engineering Deliverables

Develop and provide the following mechanical engineering deliverables:

a) include a description of specific mechanical requirements and function in the Schematic Design Submission for each area (room) in the project. Identify any unique or specialized equipment required by the facility. Incorporate a schedule of requirements in the submission, listing rooms and mechanical building services to be provided.

b) Explain the manner in which the proposed mechanical systems correlate with user requirements, in the concept submission.

c) Identify the volume of outdoor air to be supplied per person.

d) Identify the delivery rate of supply air to occupied spaces.

e) Identify whether full time operating staff will be needed for operating any of the mechanical equipment. Differentiate between staff needed by code requirements versus staff needed because of the nature and size of the facility.

f) Identify location of entry point into the building of mechanical services into the building.

g) Identify in square meters the area to be provided for mechanical rooms, and what percentage of total building area this represents. Identify location of mechanical spaces in the building.

h) Analyze alternative mechanical schemes at the schematic design stage to reveal energy consumption of building systems, operating and maintenance costs on a monthly basis for a time be used in life cycle cost analyses to determine the most beneficial mechanical

systems alternative. Base life-cycle cost analyses on a projected building life of 25 years.

i) Carry-out energy analysis on system alternatives.

j) Establish an energy budget for the building and compare it to energy consumption of other similar buildings. Express total energy consumed in kWh/m2.

k) Submit a complete energy analysis using an energy analysis tool recognized in Canada.

l) Identify the type of heating and air conditioning equipment to be used and provide an economic and technical rationale for its selection.

m) List non-Canadian products and materials proposed for the project with written justification.

Following written authorization from the DR as design requirements evolve, provide the following additional deliverables:

a) Site Plan showing service entrances for water supply, sanitary and storm drains and connections to public utility services, including key invert elevations;

b) Drawings showing preliminary sizing of ventilation, cooling and heating systems showing locations, and major equipment layouts in mechanical rooms;

c) Drawings of plumbing system, showing routing and sizing of major lines and location of pumping and other equipment where required;

d) Drawings of the fire protection systems showing major components;

e) Preliminary designs based on the approved schematic design;

f) Update of the energy analysis and energy budget established at the schematic design stage;

g) Information on internal and external energy loads in sufficient detail to determine the compatibility of the proposal with existing services, approved concept and energy budget;

h) Analysis of selected equipment and plant with schematics and calculations sufficient to justify the economy of the selected systems;

i) Description of the mechanical systems and the components of each system, with descriptions of perceived operation of the mechanical systems;

j) Documented explanation of building system operating staff requirements and their expected functions;

k) Description of the building systems control architecture, including preliminary EMCS network architecture, mechanical control schematics and sequence of operation; and

l) Documented explanation of acoustical and sound control measures to be included in the design.

RS 2.15.5.4 Electrical Engineering Deliverables

Develop and provide the following electrical engineering deliverables:

a) Proposed basic electrical systems of significance to the early design.

b) Site plan showing location of service entrances.

c) Distribution diagram showing single line diagrams to distribution centers.

d) Floor plans complete with locations of major electrical equipment and distribution centers.

e) Lighting layouts.

f) Power outlets.

g) Ceiling distribution systems for lighting, power and telecommunications.

h) List of standard PSPC details to be utilized.

i) Telephone rooms, conduits and telecommunication cable systems requirements and layout.

j) Provide an electrical design synopsis, describing the electrical work in sufficient detail for assessment and approval by the DR. Include feasibility and economic studies of proposed systems complete with cost figures and loads.

k) List non-Canadian products and materials proposed for the project with written justification.

Following written authorization from the DR as design requirements evolve, provide the following additional deliverables:

a) Single line diagram of the power circuits with their metering and protection, including:

- Complete rating of equipment.
- Ratios and connections of CT's and PT's.
- Description of relays when used.
- Maximum short circuit levels on which design is based.
- Identification and size of services.
- Connected load and estimated maximum demand on each load center.

b) Electrical plans with:

- Floor elevations and room identification.
- Legend of symbols used.
- Circuit numbers at outlets and control switching identified.
- Conduit and wire sizes except for minimum sizes which should be given in the

specification.

- A panel schedule with loadings for each panel.
- Telephone conduits system layout for ceiling/floor distribution.

c) Riser diagrams for lighting, power, telephone and telecommunication cable systems, fire alarm and other systems.

d) Elementary control diagrams for each system.

e) Schedule for motor and controls.

f) Complete lighting layout and fixture schedule clearly indicating methods of circuiting, switching and fixture mounting.

g) Electric heating layout and schedule.

h) Provide the following data:

- Total connected load.
- Maximum demand and diversity factors.
- Sizing of standby load.
- Short-circuit requirements and calculations showing the ratings of equipment used.

RS 2.15.5.5 Commissioning Deliverables

Define commissioning requirements in consultation with the DR, in a Commissioning Plan to be augmented and updated throughout the life of the project. Refer to the PSPC Commissioning Manual available online at http://www.tpsgc-PSPC.gc.ca/biens-property/sngp-npms/bi-rp/tech/miseenservice- commissioning/manuel-manual-eng.html.

Following written authorization from the DR as design requirements evolve, provide the following additional deliverables:

a) Expand the Commissioning Plan to include the description of major commissioning activities for mechanical, electrical and integrated systems testing; and

b) Define and establish project-specific archives.

RS 2.15.5.6 Sustainable Development Deliverables

Develop and provide the design and evaluation of Schematic Design Options, exploring positive environment strategies, and a report documenting the current status of the sustainability of the project using a sustainability design assist and assessment tool recognized in Canada.

Following written authorization from the DR as design requirements evolve, provide the following additional deliverables:

a) Develop and evaluate options exploring positive environment strategies;

b) Produce a report that documents the current status of the sustainability of the project using a sustainability design assist and assessment tool recognized in Canada.

c) Draft an environmental assessment, if required under and Canadian Environmental Assessment Act 2012 (CEAA 2012) Screening Report; or incorporate the requirements as set out in the Evaluation of Environmental Effects (EEE) letter or report produced by PSPC.

RS 2.15.5.7 Specifications

Develop and provide preliminary outline specification in Uniformat, indicating main building components and options for use of “Green” components and systems.

Following written authorization from the DR as design requirements evolve, provide the following additional deliverables:

a) Provide a list and draft outline specification sections of NMS sections to be used;

b) Submit outline specifications for systems and principal components and equipment;

c) Provide manufacturers’ literature about principal equipment and system components proposed for use in the project in the outline specifications; and

d) Highlight proposed “Green” materials, components and systems.

RS 2.15.5.8 Cost Plan

Develop a Preliminary Cost Plan from the Schematic Design, including:

a) A Preliminary cost analysis;

b) An analysis of options analysis and “what if” scenarios;

c) Advice and recommendations on project planning to achieve the most cost-effective project sequence;

d) Quantified potential risks and contingency recommendations to minimize negative cost impacts;

e) Advice on alternative procurement strategies to create efficiencies wherever possible; and

f) A forecast and analysis of project-related issues including possible market shortages and potential price fluctuations.

Following written authorization from the DR as design requirements evolve, provide an updated cost plan, highlighting changes from the preliminary cost plan, and Include a cash flow analysis.

RS 2.15.5.9 Cost Estimate

Prepare ‘Class C’ cost estimates:

a) Quantify design and construction costs, contingencies and risks;

b) Prepare and investigate costing alternatives to assist in the identification of the most cost-effective design and/or construction approach;

c) Investigate and report on life-cycle costs; and

d) Document unit pricing, analysis and valuation, as applicable.

RS 2.15.5.10 Schedule

Prepare a project master schedule, and:

a) Identify potential risks to schedule; and

b) Advise on alternative delivery strategies to create efficiencies wherever possible.

Following written authorization from the DR as design requirements evolve, update the Schedule, highlighting changes to it.

RS 2.15.5.11 Other Deliverables

Provide the following:

a) Schematic design drawings;

b) Description of options with recommendation on the preferred solution;

c) Waste management report;

d) Project specification amendment;

e) Environmental report;

f) Indoor air quality report;

g) Commissioning Plan;

h) Environmental Assessment Report and recommendations of decisions for the CEAA; and

i) Cost Plan, including cost analysis, “what if” scenarios, potential risks, and alternative procurement and construction strategies.

Following written authorization from the DR as design requirements evolve, provide the following additional deliverables:

a) Floor plans, covering the full range of A&E Lab design specialty disciplines, showing floor elements and services to detail necessary to make design decisions and to substantially estimate the cost of the project;

b) Building sections;

c) Architectural, structural, engineering, millwork and finishing details to determine choice of materials and finishes;

d) Reflected ceiling plans;

e) Elevations;

f) Site and building models as required;

g) Finishes and color schemes – with sample presentation boards;

h) Outline specifications for systems and principal components or equipment;

i) Commissioning Plan;

j) Updated cost plan and cash flow;

k) 'Class C' cost estimate;

l) Preliminary construction schedule including long lead delivery items;

m) Fire Protection Engineers Report including requirements, strategies or interventions for protection of the building and its occupants;

n) Project dossier detailing the basic assumptions of the project and the justifications for major decisions; and

o) Updated sustainable development strategy report.

RS 2.16 RISK MANAGEMENT

Intent

Support to the DR in identifying risks throughout the project life cycle, and, as required, develop and manage the Risk Management process/plan as per the requirements of the Federal National Project Management System described at: https://www.tpsgc-PSPC.gc.ca/biens-property/sngp-npms/bi-rp/conn-know/risque-risk/index- eng.html.

RS 2.16.1 Scope and Activities

Follow the Risk Management Process as described in the above-referenced web site and as per the specific requirements detailed in a science facility Project Brief.

STREAM 3: DESIGN CONTROL AUTHORITY SERVICES (RS 3)

Intent

The Consultant, as developer of the Catalogue will be engaged as DCA through periodic TAs, to perform oversight on a science facility project-specific basis for work undertaken by third parties, to ensure fidelity with Lab Standards and Design Guidelines and to promote adherence to them, providing state-of-the-art facility design and operational solutions for delivery of science programs.

RS 3.1 PROVIDE GUIDANCE AND COLLABORATE WITH THIRD PARTIES INVOLVED IN SCIENCE FACILITY PROJECT DELIVERY

Provide guidance, perform design and delivery validation, assist in oversight, and collaborate with third parties involved in project delivery, including architects of record and project delivery entities in accordance with the RDF specification. Submit Oversight Reports on findings in accordance with the CDRL. Collaborate with and support the DR and Science Partner representatives in activities associated with oversight, confirming adherence to performance specifications, and supporting the approval or acceptance of deliverables from architects of record for specific projects.

RS 3.2 SUPPORT CONTINUAL IMPROVEMENT OF REPEATABLE DESIGN FRAMEWORK COMPONENTS

Obtain and provide project-specific input to support continual improvement of RDF Catalogue content and Planning Toolset in accordance with the RDF Specification. Update the RDF Specification as required to reflect lessons learned and to support its continual improvement.

RS 3.3 PROVIDE SUPPORT IN SCIENCE FACILITY PROJECT DELIVERY PROCESSES

Assist in determining the most cost-effective and timely process for project implementation in accordance with TAs and the CDRL. As required, provide procurement support services for Crown-construct projects. As required, assist the DR in the preparation of business cases, funding submissions and subsequently, preparation of procurement documents, bid evaluation frameworks and contract award, either through traditional Design-Bid-Build contracts to various forms of P3 arrangements.

As required, assume and perform the duties and responsibilities of construction contract administration, which may include acting as the DR's primary technical representative.

RS 3.3.1 Provide Procurement Support Services for P3 Projects

As required, provide procurement support services for P3 projects, including services leading to selection of Preferred Proponents, obtaining the requisite Treasury Board approvals and reaching Commercial and Financial Close. As required, provide the following services:

a) Develop timely responses to design-related questions during the procurement phase of projects

b) Provide technical advice in respect of proponent questions, including at Commercially

Confidential Meetings;

c) Provide technical advice in the context of discussions with private, municipal, provincial, and federal organizations;

d) Provide other technical advice and assistance when needed;

e) Review, discuss, and comment on designs submitted by proponents during the procurement phase; and

f) Act as Canada's advisor on matters related to design-build work, including the design, facility maintenance and financial portions of P3 submissions.

RS 3.4 PARTICIPATE IN COMMERCIALLY CONFIDENTIAL MEETINGS

P3 Projects include various consultation requirements with prospective proponents and the selected bidder. As requested, participate in observing and making recommendations in Commercially Confidential Meetings with proponents.

RS 3.5 CONDUCT CONSTRUCTION DOCUMENT REVIEWS

Review third-party design and construction documentation submissions at 33/66/99% stages of projects to ensure adherence to the approved Facility Functional Program. Provide Construction Document Reviews and prepare and submit Construction Project Assessment Reports in accordance with the CDRL and as indicated in associated TAs.

RS 3.5.1 Provide Construction Support Services for P3 Projects

As required, provide Construction support services in support of P3 Projects, including reviewing the progress of the site-specific drawings from Schematic Design through to Working Drawings, making comments and observations as to the consistency between Canada's needs and successful proponents' bid documents. As required, provide the following services:

a) Review and comment on submissions, including architectural, mechanical, and facility maintenance for content, to confirm operational needs will be met, and are consistent with promises included in bids;

b) Attend meetings as requested;

c) Review and comment on reports;

d) Assist the DR with oversight and follow-up on the Independent Engineer contract, reports, certification and fees;

e) Assist in the evaluation and integration of change requests from other stakeholders;

f) Assist the DR, and participate, when needed, in dispute resolution sessions involving the contracting authority, design and construction team, and the Independent Engineer;

g) Perform occasional spot check audits on site, the frequency and extent of the audits to be adjusted as a function of observations and the noted deficiencies;

h) Assist the DR in the application of payment deduction mechanisms as applicable;

i) Provide technical assessment relating to the suitability of the reports, considering comments, observations, and recommendations stemming from the independent Engineer review;

j) In conjunction with the Independent Engineer; review documents relating to quality assurance and quality control processes to determine whether the proposed system of quality assurance and quality control and its application by successful proponents, complies with the requirements of the contract and the needs of the supported program of work;

k) As requested, participate in on-site meetings, design-construction management or special technical meetings, or pre-established audit schedules, always however in keeping with the specific roles and responsibilities of the respective parties;

l) Visit the work sites to verify that supported programs of work designed, developed or being developed are compatible with site conditions; and

m) Provide related technical advice where applicable.

RS 3.6 PROVIDE OPERATIONAL PHASE SUPPORT FOR P3 PROJECTS

As required, review proposals and changes during the initial operational phase of P3 contracts. These changes could be due to changes in operational imperatives or to confirm that the services outlined in the supported program of work agreement are being done satisfactorily.

Participate as required in establishing reporting norms or participating in any benchmarking activities.

RS 3.7 REVIEW P3 PROJECT FUNCTIONAL PROGRAMS

As required, analyze, comment and report on P3 deliverables that will be specified in the Design-Build portion of Performance Documents, and subsequent addendums and amendments. AS required, express a professional opinion as to whether the recommended option meets the specified functional requirements, is complete and provides the best value. Update the Functional Program as required to include the projected end-state and the anticipated life cycle plan.

RS 3.8 PARTICIPATE IN POST-OCCUPANCY EVALUATION REVIEWS

Prepare an evaluation framework for the performance of a Post Occupancy review one year after substantial completion of the project. Participate in reviewing the time, cost and operational outcomes of the project as input into the maintenance and updating of the Catalogue, cost parameters and design and construction delivery processes. Provide Post-Occupancy Evaluation Review Reports as indicated in associated TAs.

ATTACHMENT 1

FSTII OVERVIEW – PHASE 1 PLANNED SCIENCE FACILITIES: HIGH-LEVEL STATEMENT OF REQUIREMENTS

INTRODUCTION

The Government of Canada is developing an enterprise-wide portfolio approach to renew aging science infrastructure, referred to as the Federal Science and Technology Infrastructure Initiative (FSTII). PSPC will apply innovative delivery models to create a modern platform to support evidence-based policy and enable cost-effective and sustainable scientific program delivery, including buildings, equipment, and information management and technology capabilities.

Currently, the federal government operates over two million square meters of laboratory and science-related facilities in approximately 1,450 facilities at 175 sites across Canada. The National Capital Area (NCA) has over 125 science and technology labs, with facilities at multiple sites in both urban and isolated locations.

Within this context, FSTII emerged as a joint initiative led by the Minister of Science, and Minister of Public Services and Procurement Canada (PSPC) together with the various Science-Based Departments and Agencies/Federal Science Partners to deliver science infrastructure for the science workforce of the future through an enterprise-wide approach.

FSTII proposes the consolidation and modernization of Federal Science Facilities over a 25-30-year period through a series of incremental plans that will serve to increase science collaboration, provide flexible and extensible building envelopes and internal workspaces that reduce overall operating costs, improve operating efficiency, and increase science collaboration.

Public Services and Procurement Canada (PSPC) is working closely with Federal Science Partners, including Federal Departments and Agencies, technology champions and Shared Services Canada, to support the development of state-of-the-art, effective science infrastructure that can meet today's science program needs and be quickly adapted and expanded to support future programs and priorities.

Key FSTII objectives include providing flexible infrastructure that supports both physical and virtual collaboration, while enabling participating organizations to deliver multiple concurrent science programs.

1.1 **Definitions**

General Administrative Offices: offices that accommodate general office functions and activities that do not require special security or other special features. General administrative offices do not have high interface with the public.

Greenhouse: a fully-enclosed and temperature/humidity-controlled containment facility used for the propagation of plant material.

Laboratory, or Laboratory Facility: the entire facility including base building and laboratory rooms.

Laboratory Function: operational activities involving the performance of a range of specialized tasks in support of a defined science program purpose or objective. The term Laboratory Function is interchangeable with common variations in laboratory identification, such: as lab type; lab name; lab program, research program or lab classification.

Laboratory Space: is meant to address lab standards in a systematic manner through separation into distinct clusters of science space users.

Parking Structure: a weather-protected, open-sided multi-storey structure for vehicle storage

Screenhouse: open-sided, screened, weather-protected containment facility used for the propagation of mother plants and for collection of seeds of herbaceous indicator plants. Screenhouses are used for the conservation of positive controls, quarantine plants and healthy plants. Screenhouses provide protection against insects and airborne pathogens, as well as providing the capacity to maintain ambient temperature and access to sunlight.

Special Purpose Space (SPS): space to accommodate specific activities essential to client program delivery. Typically, these spaces are specifically-designed and are often not suitable for conversion to office accommodation because of the special requirements they satisfy. Laboratories are defined as special purpose space.

Support Space: space for office support functions not included in workstations, workplace access or circulation space but not necessary for office operation. Examples of support space include interview rooms, training rooms, meeting rooms, boardrooms, lounges, lunchrooms and public reading rooms, telecommunication and LAN rooms, libraries, mail rooms, storage rooms, waiting areas, receptions areas, display areas and photocopy areas.

Work Settings (Common Areas): work environments that enhance on-the-job learning and support both collaboration and privacy. Examples of include teaming areas, non-dedicated workstations, privacy nooks, resource areas and multipurpose areas.

1.2 **Acronyms**

ASEC – Atlantic Science Enterprise Centre

CBSA – Canada Border Services Agency

CCI – Canadian Conservation Institute

CFIA – Canadian Food Inspection Agency

CNSC – Canadian Nuclear Safety Commission

DFO- Department of Fisheries & Oceans

DSR – Designated Substance Report

ECCC – Environment and Climate Change Canada

HC – Health Canada

IM – Information Management

IT – Information Technology
NCA – National Capital Area
NCR – National Capital Region (of PSPC)
NRC – National Research Council
NRCan – Natural Resources Canada
PC – Parks Canada
PCH – Patrimoine Canadian Heritage
PSPC – Public Services and Procurement Canada
RCMP – Royal Canadian Mounted Police
SAG – Science Advisory Group
SEC – Science Enterprise Centre
TSB – Transportation Safety Board

2 High-Level Requirements

Laboratory Types

Federal scientists use a broad variety of laboratory types, from typical office-equivalent environments, to dry and wet labs with various levels of containment and isolation. With the potential to host most of the science environments currently used by the Federal Government, new facilities will require a wide variety of labs, including ones with high levels of containment as well as laboratories with unique features such as robust foundations and strengthened floors, electro-magnetic and radiation protection, among others.

Public-Private Collaboration

The collaboration mandate for Canada requires that new facilities provide centers of ideas and innovation; but to maximize the spread and application of these innovations, it would be desirable to quickly transfer ideas to the private sector for further development and expansion. It is expected that Federal science facilities would host considerable private sector space. That space would reflect the same concept as FSTII's underlying approach, seeing the interaction of private sector and Federal Government personnel. To this end, the overall size requirements of facilities may include 15% or more space, above FSTII's base Federal science program requirement, to accommodate external parties conducting research at Federal science campuses**.**

Modularity and Expansion Imperative

Reducing the cycle-time for a science environment being available to meet science program needs is a key goal for any high-functioning science organization. Ways and means to reduce the lag from a program being authorized to its infrastructure being available is therefore a key design attribute. Three ways have been identified to expand the science capability of facilities, other than the provision of new and innovative expansion techniques that should also be considered:

1. Adding laboratory modules in a manner that is esthetically and operationally sound;
2. Extending existing infrastructure without disrupting existing operations; and
3. Adding new structures when existing ones reach certain capacity points.

FSTII anticipates the need to provide modularity in two ways: at the structure level and at the laboratory level.

At the structure level, there are several existing examples of modularized science facilities, where after an initial build, additional wings or standard structures can be quickly and economically added to the facility as program needs evolve. The initial building design and layout must include consideration for this type of growth and expansion in a logical and architecturally sound manner. The addition of new structures should in no way interfere with ongoing operations, and should involve minimal redesign time for the construction to occur.

At the lab level, despite their differences, it is expected that a finite set of standard laboratory definitions can be achieved. These lab definitions would ideally be converted into specific laboratory modules of a defined space that can be quickly deployed and removed from the individual facility structures. The organization of buildings should lend to this rapid and flexible laboratory change-out option, with perhaps specific floors or areas in the structure hosting these flexible labs. With proper design, modules could be reconfigured as needs change. The overall goal for such a design is to provide infrastructure that is optimized for the science program, and is readily and economically available for science programs to exploit.

Information Management and Technology (IM/IT) Collaboration Framework

In addition to one or more campuses in the NCA and labs at other locations across Canada, FSTII envisions an IM/IT-enabled Collaboration Framework within and between national science communities will be developed. As state-of-the-art facilities, science campuses can be expected to house cutting-edge scientific and research equipment. Scientists will be able to access these technologies remotely, allowing for more effective utilization of technology investments: fewer, more advanced technologies that are fully utilized are more effective than multiple diluted investments in partially utilized technology. The Canadian scientific community, including private sector researchers and Canadian universities and institutes, should be able to seamlessly connect to, and leverage shared assets available within a Collaborative Framework. This will serve to both accelerate their access to the tools they need, and lead to greater economies in meeting their needs.

Overall, the framework will provide a robust network backbone to meet the often-large data transfer requirements, as well as provide collaboration technologies that enable interaction among scientists, and scientists being able to access their equipment from any location in the country.

Attraction and Retention of Talent

The science facilities will be modern and iconic, as needed to attract world-class scientific talent. As well as work-life balance, the impact of the quality of space on job satisfaction and employee productivity is significant. The esthetic attributes of the spaces and associated amenities will affect the ability to attract collaborators, as the space must reflect the excellence and caliber of the science occurring within. Any measures of this impact would be useful in the development of these new laboratories.

Guiding Principles

FSTII is directed at putting in place an infrastructure platform that can support innovation, collaboration, and open science. FSTII investments will be aligned according to the following guiding principles:

- *Scientific Innovation* - Scientific infrastructure will be designed to enhance the delivery of scientific programs, and promote economic growth and public good.
- *Collaboration* - Facility design will support collaborative spaces and IT-enabled connectivity to maximize program effectiveness.
- *Functionality and Modernization* - Facilities will be world-class and designed to comply with leading edge, functional, flexible, collaborative and IT-enabled standards.
- *Environmental Sustainability* - Facilities will incorporate innovative technology to meet environmental sustainability goals.
- *Optimization of Economic and Enterprise Value* - Facilities will be designed and managed to generate overall economic and public benefits. Federal science infrastructure, which includes both facilities and IM/IT capabilities, has steadily deteriorated to the extent that roughly 36% of facilities are in poor or critical condition, and the investment in IM/IT capabilities has not kept pace with the explosive growth in analytics and computational power as primary scientific tools. In effect, Federal science infrastructure is not adequately serving as an effective platform for science and scientific evidence-based policy decisions.

3 FSTII Objectives

FSTII is moving forward with the development of comprehensive strategies for the complete remediation of the current science footprint based on Real Property Portfolio Planning Principles, and Enterprise Consolidation and Transformation Principles for IM/IT.

FSTII will be guided by Community Plans that will identify specific projects across Canada for the acquisition of new Federal science facilities or the renewal of existing ones to meet science needs.

FSTII will be implemented through a dedicated Departmental Representative (DR)

supported by a management team to plan, direct, monitor, and manage the consolidation and modernization of Federal Science Facilities.

On behalf of Federal Science Partners, FSTII aims to:

c) ensure effective program management in meeting science program needs in a manner that provides best value;

d) support evidence-based decision-making, based on plans and strategies that balance national science needs and enabling assets over its lifecycle; and

e) foster scientific innovation through efficient and responsive approaches to delivering world-class, quality, modern facilities, based on a Repeatable Design Framework that fosters science facilities that are:

- flexible, adaptable, scalable, expandable and sustainable; and
- continually improving with respect to their quality and safety, the predictability of their cost and schedule, and reduced risk, through the consistent application of standards and tools.

4 Federal Science Facility Program - Phase One Project Information

4.1 Sidney Centre for Plant Health, Sidney, British Columbia - Project Information

Context

The Canadian Food Inspection Agency (CFIA) has a network of reference and research laboratory facilities across Canada. CFIA has combined expertise in animal and plant health, foreign animal diseases, and food safety. These laboratories provide the expertise and scientific knowledge needed to inform our regulatory and risk-based approach to keeping Canada’s plants, animals and food safe.

As a new world-class facility announced in Budget 2017, the Centre for Plant Health will support a robust science environment and act as a platform to foster innovation and partnerships with federal, provincial and academic communities. It is expected that the new facility will significantly shorten quarantine and research time to release new plant varietals to the Canadian market. This will help support the safety of Canada’s agriculture and agri-food sector, while facilitating trade and economic growth that benefits all Canadians.

The Centre for Plant Health laboratory is strategically located in Sidney, British Columbia, established to be sufficiently isolated from commercial plantings to safeguard against disease outbreak, and to take advantage of the region’s climate that is suited to cultivating all of Canada's fruit crops and ornamental plants. To achieve its mandate, facility attributes must provide protection from accidental release of plant pests and viruses. In line with FSTII principles, the Centre will use standard repeatable designs to the maximum reasonable extent, while providing for future expansion, collaboration and co-location opportunities.

Other functions the Centre will provide include:

1. Ensuring safe introduction of foreign plants into Canada;

2. Housing a national repository of commercial varieties of fruit and providing for testing and certification of exports and for virus elimination services;
3. Checking the reliability of approved foreign certification programs by testing samples from imported commercial shipments for virus infection and other diseases; and
4. Providing technical support and scientific advice for regulatory decision making, including participation in international panels that aim to develop harmonized standards for moving and testing plant materials in support of trade.

CFIA plans to consolidate its administrative, laboratory, and amenity spaces into a new modern facility on its existing site in Sidney. The site currently has existing facilities for laboratory, office, greenhouses, and secure diagnostic test fields.

High Level Program Description

The estimated construction value for the facility is **$22M.**

CFIA is the main user of the facility and the accommodation requirements include:

1) Laboratory Function 900 m2
2) Support space 600 m2
3) Office accommodation and common spaces 1500 m2
4) Screenhouse 500 m2
5) Greenhouse 1300 m2

Functional Programming and Schematic Design for this project is estimated to require in the order of two years to complete following approval to proceed. Following this, the role of Design Control Authority would be performed for the remaining duration of the project. This would include oversight of activities performed by third parties, including design development, preparation of contract documentation, construction and commissioning activities which are currently estimated to require in the order of three years to complete following approval to proceed.

4.2 Atlantic Science Enterprise Centre, Moncton, New Brunswick - Project Information

Context

A new Atlantic Science Enterprise Centre (ASEC) will be created at the Gulf Fisheries Center in Moncton, New Brunswick, as part of the Federal Government's planned investments in ocean and freshwater science. This facility will provide a long-term accommodation solution for Department of Fisheries and Oceans (DFO) regional headquarters and a joint Environment and Climate Change Canada (ECCC) and DFO SEC, and potentially for other prospective Science Partners.

The existing site is located adjacent to the University in Moncton and was originally designed as a school for girls run by the Catholic Church. The building was built in 1948 and was closed

in 1965. It was renovated in 1982 and in 1986 became the home for DFO office and laboratory functions.

An open area adjacent to the building is used for surface parking, however, the existing structure takes up most of the space on the site. The building itself is in relatively poor condition and is extremely deficient in terms of achieving overarching goals consistent with a modern approach to Federal science facilities.

The building is a prominent fixture in the local community and has heritage value from that perspective. This is an important consideration in the design strategy and must be factored into solutions that are be developed.

High-Level Program Description

The estimated construction value for the facility is **$122.3M.**

The functional program requirements of both DFO and ECCC will need to be integrated as part of the project. The new facility must be designed to accommodate:

1) Laboratory Function 4,920 m2
2) Office Accommodation 6,930 m2
3) Support Space (see note below) 7,650 m2
4) Total Building 19,500 m2
5) Parking: (to by-law requirements) (Combined surface and structured)

Support space that will need to be developed within this program includes provisions for public display, auditorium, cafeteria, lobby, building core, circulation and other common spaces.

Functional Programming and Schematic Design for this project is estimated to require in the order of two years to complete following approval to proceed. Following this, the role of Design Control Authority would be performed for the remaining duration of the project. This would include oversight of activities performed by third parties, including design development, preparation of contract documentation, construction and commissioning activities which are currently estimated to require in the order of three years to complete following approval to proceed.

4.3 National Capital Science Centre/ Campus, National Capital Area - Project Information

Context

While Canada's investment in science is increasing with a renewed focus on science, the state of existing Federal science infrastructure has reached a critical stage and cannot be overlooked. Individual Federal Departments and Agencies are currently the custodians of individual science facility assets whose lifecycle costs are funded through their respective budgets. It has been established that many of these facilities in the National Capital Area (NCA) are beyond their useful life, and require significant recapitalization or entirely new

infrastructure to meet science program needs. Studies have indicated that some 175,000 m2 of science facilities require extensive renovation or outright replacement within the near term.

A number of NCA science facilities are planned to be developed in phases, with Phase One being undertaken to resolve immediate critical infrastructure needs. This first phase will also provide for validation of the overall approach, including the application of Repeatable Design principles and other innovative concepts for the acquisition and operation of Federal science infrastructure, building confidence in the collaboration strategy. Phase One will meet the needs of Science Partners with critical or well-defined infrastructure requirements in the NCA that are able to participate and assist in developing the overall program. As key performance metrics are met, it is planned that additional incremental structures will be efficiently added to these campuses to meet additional science program needs in the NCA.

Logic dictates that, over time, additional facilities in the NCA will deteriorate and the programs they support will be moved to new NCA campuses. As programs are added, or further concentration of science talent is desirable, demand is anticipated to double. It is envisioned that such expansion will include NCA campuses hosting science undertaken by provincial entities or partnerships with private corporations and Canadian universities and institutes. This expansion has to be managed in a cost-effective and timely manner, without disrupting existing operations. Additional structures should be able to be added without altering the esthetics or requiring extensive retro-fitting of existing infrastructure. Numerous examples of corporate headquarters and research campuses exist, where the expansion of the corporation is enabled by adding additional, often identical buildings on pre-designed campus footprints: either wings extending off a common core, or systematic new building addition with sheltered interconnection would be required.

High-Level Program Description

A key objective of FSTII is development of iconic science facilities that clearly reflect Canada's progressive commitment to research as well as serving to attract the best and brightest scientists from around the globe. It is assumed that requirements may be divided up into as many as six locations with the majority in the NCA. Other site assumptions include:

1. Sufficiently large to accommodate expansion,
2. Transit-oriented, and
3. Availability of key services, including water, sewer, natural gas, electricity and internet.

The program is currently defined at a high level that will become more detailed as the project progresses. Main program requirements include:

1. *A Central Facility, for each location,* to act as a focal point and gathering place for the scientific community, including, but not limited to:
    a) A Cafeteria / kitchen sized based on final occupant load;
    b) An Auditorium at a single location for 200 to 300 people, with support facilities such as large break-out rooms and similar conference support functions;

c) A library; and

d) Other amenities that may include a fitness centre and some retail.

2. *Laboratories*: A total gross area of approximately 97,430 m2 with capability to continue to grow in an organized manner. Four broad themes have been established in the functional breakdown below.

Science Program Functional Breakdown of Science Program

1) **Resource Protection and Forensic Science** , including:

a) Resource Protection and Economic Growth: conducting research, surveillance and monitoring, and risk assessment to safeguard human, plant and animal health.

b) Security Science and Engineering: providing critical input to criminal and incident investigations and intelligence to support law enforcement, disaster response and national security efforts within Canada, at the border and overseas.

c) Human Health, Safety and Protection: Developing novel products, methods and data to better detect, identify, and control risks related to human health, food safety, consumer protection, and domestic and imported products.

2) **Terra Canada,** including:

a) Research for Sustainable Growth and a Clean Earth: developing the economic potential of Canada's natural resources in a sustainable manner.

b) Innovation for a Low Carbon Economy: leading the transformation to low-carbon economy, climate change adaptation and the protection of Canada's environment.

c) Science for the Health and Safety of Canadians: developing knowledge to address the impacts of the natural and human-made environment on health.

3) Cultural Heritage – focuses on applied research and development and conservation treatment, from discovery and experimentation to technology development, targeting 1) improved understanding of historic places; 2) conservation of heritage and artistic objects; and, 3) managing risks to heritage places and collections.

4) Transportation Safety - will consolidate components of the federal transportation safety science programs to create a National Centre of Excellence in Transportation Safety to address current day safety issues and work to mitigate future safety risks for Canadians.

Design Priorities

Design work should align with the following priorities:

a) *Modern, Iconic Design*, including the degree to which the design is:

- likely to attract and retain the next generation of scientists;
- unique or groundbreaking;

- likely to set a new standard for labs and campus design;
- likely to stand up over time; and
- resonates with, and is likely to leave an impression on people.

b) *Collaboration*, including the degree to which:

- the design approaches used encourage social interaction throughout the facility;
- spatial arrangements support collaborative research activities; and
- the campus design is likely to contribute to community formation and community-building.

c) *Flexibility*, including the degree to which:

- the infrastructure has been designed to enable space within the campus to be configured quickly to respond to federal science priorities; and
- space can be repurposed or adapted with ease over time to respond to changing science priorities or requirements.

d) *Functional Suitability and Expandability*, including:

- the strength of the concepts for accommodating growth over time;
- the degree to which additional space can be added to the campus with minimal disruption to existing space;
- the approaches that are adopted to establish common and/or core services to support future growth and
- the degree to which the unity of the campus design is maintained over different phases of growth.

e) *Sustainability*, including the strength of the approaches to:

- minimize environmental impacts through the design and construction phases;
- minimize energy consumption over time and/or use green energy sources; and
- managing water collected on site, water resources used in facilities, building emissions and waste materials.

High Level Program Summary

The estimated construction value for the program requirements is **$1,050M.**

Within the total program, there will be an integration of at least eight federal departments, including: National Research Council (NRC), Natural Resources Canada (NRCan), CFIA, Health Canada (HC), Canada Border Services Agency (CBSA), Transportation Safety Board (TSB), Patrimoine Canadian Heritage (PCH) and ECCC. The new facilities must be designed to accommodate:

1) Laboratory Function 97,430 m2

2)	Support Spaces	56,993 m2
3)	Lobby/Core/Circulation	51,097 m2
4)	Total	205,510 m2
5)	Parking	Meet by-law requirements

Support spaces will need to be developed such as common spaces including lobbies, public displays, auditorium, cafeteria, animal holding, storage, building core and circulation areas.

Functional Programming and Schematic Design for this project is estimated to require in the order of two and a half years to complete following approval to proceed. Following this, the role of Design Control Authority would be performed for the remaining duration of the project. This would include oversight of activities performed by third parties, including design development, preparation of contract documentation, construction and commissioning activities which are currently estimated to require in the order of three and a half years to complete following approval to proceed.

5 Definitions

Equipment: tangible property having a useful life of more than one year and is used in business operations, including:

d) *Fixed Equipment*: Fixed, built-in, attached, and installed equipment normally included as part of the construction contract and capitalized as facility cost. Examples include fume hoods, workbenches and Biological Safety Cabinets;

e) *Moveable Equipment*: Equipment that does not require attachment to the building or utility service, other than that provided by an electrical plug or disconnect fittings, or stabilization after installation. These are normally purchased separately from the construction contract and capitalized separately. Examples include electron microscopes, freezers, Ovens, Incubators and mass spectrometers; and

f) *Special Purpose Equipment*: Technical, medical, or scientific equipment that is needed to operate a laboratory, a hospital, a clinic, a clinical research patient care unit, an animal care facility, or is specific to a single purpose and not generally suitable for other purposes. Special purpose equipment may be classified as either fixed or moveable equipment.

General Administrative Offices: offices that accommodate general office functions and activities that do not require special security or other special features. General administrative offices do not have high interface with the public.

Greenhouse: a fully-enclosed and temperature/humidity-controlled containment facility used for the propagation of plant material.

Guidelines: guidelines are not mandatory, but typically provide insights, other guidance and the reasoning behind compulsory standards and recommended best practices for design, construction and commissioning of labs based on confirmed previous experience and best

practices. Variations from Guidelines should be fully justified by the Designer.

Laboratory, or Laboratory Facility: the entire facility including base building and laboratory rooms.

Laboratory Function: operational activities involving the performance of a range of specialized tasks in support of a defined science program purpose or objective. The term Laboratory Function is interchangeable with common variations in laboratory identification, such: as lab type; lab name; lab program, research program or lab classification.

Laboratory Space: is meant to address lab standards in a systematic manner through separation into four distinct groupings of space: Health Sciences/Food and Animal Sciences/Engineering and Physics Sciences/Energy and Environment Sciences.

Parking Structure: a weather-protected, open-sided multi-storey structure for vehicle storage.

ATTACHMENT 2

LAB STANDARDS AND DESIGN GUIDELINES REFERENCES

The following references are providing for consideration in formulating an approach to development of Lab Standards and Guidelines. Various Canadian, American and International standards and guidelines for the design and construction of science laboratories and ancillary facilities. Although these may be referenced by the Consultant in the development process, any specifically cited in this work must be relevant to the Canadian context. Following are a few references considered relevant to the development of Lab Design Standards and Design Guideline for Plant, Food, and Animal Science Labs. This is not a comprehensive listing but is intended to show typical examples.

- Canadian Biosafety Standard (CBS) jointly published by the Canadian Food Inspection Agency (CFIA) and the Public Health Agency of Canada (PHAC)
- Containment Standards for Veterinary Facilities published by the Canadian Food Inspection Agency
- Containment Standards for Facilities Handling Plant Pests published by the Canadian Food Inspection Agency
- Design Requirements Manual (DRM) published by the United States National Institutes of Health, Division of Technical Resources
- A Practical Guide to Containment, Greenhouse Research with Transgenic Plants and Microbes by P. Trainer, D. Adair and R. Irwin
- Biosafety in Microbiological and Biomedical Laboratories (BMBL) published by U.S. Department of Health and Human Services, Public Health Service Centres for Disease Control and Prevention National Institutes of Health.
- ARS Facilities Design Standards (ARS-242.1) published by United States Department of Agriculture Research, Education, and Economics.
- Containment Facility Guidelines for Fungal Plant Pathogens published by United States Department of Agriculture, Animal and Plant Health Inspection Service, Plant Protection and Quarantine
- “Guideline - Project GHG Options Analysis Methodology”, PSPC, approved March 2017

Numerous excellent references are available through the International Institute for Sustainable Laboratories (I2SL), available at: www.i2sl.org. The Contractor is strongly encouraged to use this information when conducting the work of this SOW.

ATTACHMENT 3

REPEATABLE DESIGN CONTENT AND FUNCTIONALITY OUTLINE

1. Overview

Intent

This information is intended to assist the Consultant in finalizing its approach and the definition of deliverables it will produce under the Contract, subject to the Acceptance Review process. Utilize the information in this Annex to inform planning, and to assist in drafting associated Task Authorizations (TAs).

1.1 Content of Laboratory Standards and Design Guidelines

The current concept for the Laboratory Standards and Design Guidelines is that there would be separate instances addressing required *Functional Lab Typologies*, each of which would include base building prototype designs centered around the needs of science clusters associated with specific projects.

1.2 Definitions

The following definitions pertain to laboratory typology requirements.

Archive/Records/Library: areas where bound paper documents, film, or magnetic media are stored. An Archive space type may include both open and closed storage systems and moveable shelving systems, and be applicable to file rooms and other dense storage of material in conditioned office environments.

Auditorium/ Board Room/ Training Room: areas for large meetings, presentations, and performances. Auditorium space type facilities may include assembly halls, exhibit halls, auditoriums, and theaters. Auditorium space types do not include such features as sound reinforcement systems, audiovisual systems and projection screens, food service facilities, proscenium stages with heights greater than 50'– 0" or fly gallery, orchestra pits, revolving or hydraulic stage platforms, flying balconies, movable seating, or billboard systems.

Base Isolation: the facility is built to minimize the vibration that will limit the operational tolerance or the detection limits of scientific equipment. This is usually achieved by providing a partial separation of the building structure from potential vibrations generated by vehicle traffic, trains, earthquake motion, building mechanical operations or human circulation by preventing the building superstructures from absorbing the vibration energy.

Containment Level: a set of containment precautions required to isolate dangerous agents in an enclosed laboratory facility. The levels of containment range from the lowest containment level 1 (CL-1) to the highest at level 4 (CL-4).

Containment Level 1 (CL1): special design features are not required beyond those suitable for a well-designed and functional laboratory. Containment safety cabinets are not required. Work may be done on an open bench top, and containment is achieved through the use of practices normally employed in a basic microbiology laboratory.

Containment level 2 (CL2): The primary exposure hazards associated with agents requiring CL2 are through physical contact. Agents requiring CL2 facilities are not generally transmitted by airborne routes, but care must be taken to avoid the generation of aerosols or splashes. It is sufficiently sealed to maintain the required pressure differential (negative or positive) between adjacent rooms or suites. The HVAC system is only required to provide sufficient air changes per hour. Primary containment devices such as where centrifuges with sealed rotors or safety cups are used as well as appropriate personal protective equipment (i.e., gloves, laboratory coats, protective eyewear). As well, environmental contamination must be minimized by the use of handwashing sinks and decontamination facilities (autoclaves).

Containment Level 3 (CL3): Scientists handle agents that may be transmitted by airborne route, often in a low infectious dose and that can cause serious or life-threatening disease. CL3 emphasizes additional primary and secondary barriers to minimize the release of infectious agents into the immediate laboratory and the environment. All joints, connections and penetrations, including doors and windows, electrical outlets, lights, etc., are fully sealed to ensure no air leakage from lab, other than through the dedicated exhaust system. Additional features to prevent transmission of CL3 agents are appropriate respiratory protection, HEPA filtration of exhausted laboratory air that is independent of other areas and strictly controlled laboratory access.

Containment Level 4 (CL4): Agents used in these labs have the potential for aerosol transmission, often have a low infectious dose and produce very serious and often fatal disease; there is generally no treatment or vaccine available. This level of containment represents an isolated unit, functionally and, when necessary, structurally independent of other areas. CL4 emphasizes maximum containment of the infectious agent by complete sealing of the facility perimeter with confirmation by pressure decay testing; isolation of the researcher from the pathogen by his or her containment in a positive pressure suit or containment of the pathogen in a Class III BSC line; and decontamination of air and other effluents produced in the facility.

Dry Laboratory: Scientists work with dry stored materials, electronics, and/or large instruments with few piped services. It may require temperature, humidity and dust control and clean power.

Engineering Bay/Warehouse space: These facilities provide a proper environment for the purpose of researching with the use of bigger equipment that won't fit in a regular building and that require protection from the elements. Engineering Bay/Warehouses spaces must be designed to accommodate the loads of the equipment, the associated handling of the equipment, and the needs of the operating personnel. These spaces are generally larger, have higher ceilings and space clear of structure, such as hangar facilities or a workshop.

Food Services: includes cafeterias, sandwich shops, coffee shops, fast food retail, and other food services that involve the preparation and handling of food items for the consumer. Food Service space types are distinguished from other spaces where food may be vended (such as employee lounges) by the health and sanitation requirements related to the handling of unpackaged food products and/or processing of non-disposable dishware.

Hazardous Storage: spaces used for storage of chemical or hazardous materials. Safe storage of chemicals must begin with identification of the chemicals to be stored and their intrinsic hazardous properties. Since many chemicals have several hazards, which may vary in degree of severity, depending on quantity and concentration, spaces may require temperature, ignition control, ventilation, segregation and identification.

Lab-related Offices: Enclosed office located adjacent to the laboratory room with an easy access for the lab user.

Light Industrial/General Storage: spaces used for the assembly, disassembly, fabricating, finishing, manufacturing, packaging, and repairing or processing of materials. Light Industrial space types can include but are not limited to spaces for printing, commercial laundry, photographic film processing, vehicle repair garages, building maintenance shops, metal work, millwork, and cabinetry work. Includes a shipping and receiving dock for trucks and vans, a staging area, and at least one office space for dock supervisors or managers.

Lobby/Core/Circulation: includes foyers, entries to halls, and security screening areas at or near the entrance to a building or demarcated space, and are meant to welcome and direct tenants and visitors, control access, and provide exit ways from buildings. This space type is often designed with both secure and non-secure areas. The core includes the central area of a building housing the elevator and stairwells, electrical equipment, restrooms, other facilities and all the circulation area.

Parking: Surface: refers to large paved areas used for extensive vehicle parking—beyond the incidental parking provided for individuals, official government parking, and short-term drop off—located adjacent to a building.

Parking: Outside/Structured: an above-grade, ramp access, open-air structure specifically designed to accommodate vehicle parking.

Radiation Containment: represents an isolated space with thick concrete walls and in some cases completely independent structures. In order to reduce airborne releases, highly efficient filters and radiation monitors must be installed as part of the ventilation systems.

Server/ Computer room: a facility for "vertical" data processing equipment including dense frame and rack-mounted processing systems with critical uptime requirements.

Wet Laboratory: Scientists work with chemicals, drugs, or other material or biological matter, where they are tested and analyzed requiring water, direct ventilation, and specialized piped utilities.

The Consultant should propose various alternative forms and optional approaches to optimize how each instance should be documented, with supporting rationale, for example:

- a common document with separate Annexes for each functional lab type, each of which may have its own Appendices;
- a separate Annex for base building prototype designs; or

- alternative Functional Lab Typologies, although a less desirable option.

While it is recognized that many design requirements will be similar to some extent for most laboratories, it is intended that each of the instances in the set of Standards and Design Guidelines will cover areas responsive to the requirements of the clusters.

Include sustainability targets in the Standards and Design Guidelines based on an assessment derived from the “Guideline - Project GHG Options Analysis Methodology”, PSPC, approved March 2017; and if appropriate, consider its adoption as part of overall requirements.

Differentiate between features that are mandatory, i.e. standards, from those that constitute guidance, i.e. guidelines; and include the associated rationale for the standards and design guidelines applicable to Functional Lab Type instances to promote an understanding of the underlying reasoning behind their selection.

1.3 Laboratory Typology Template

For guidance, following is an initial listing of the types of spaces that constitute a minimum set of required typologies for the NCA:

A. Lab Rooms		
	Dry Laboratory	
	Wet Laboratory (CL1)	
	Wet Laboratory (CL2)	
	Wet Laboratory (CL3)	
B. Engineering lab		
	Base Isolation	
		CL3
	Radiation Containment	
	Engineering Bay/ Warehouse space	
		CL2
		CL3
C. Support spaces		
	Lab related Offices	
	General Administrative Offices (ABW)	
	Auditorium/Bd. Rm/Training Rm.	
	Archive/Records/Library	
	Hazardous Storage	
	Light Industrial/General Storage	
	Food Service	
	Parking: (Outside/Structured)	
	Parking: (Surface)	
	Server/ Computer room	
D. Lobby/Core/Circulation Support spaces		

Include selected laboratory typologies in the Laboratory Standards and Design Guidelines, showing idealized laboratory layouts at several scales of facility, with the intent to outline best practices and standards rather than to prescribe an exact base building design. Include major base building components such as:

- laboratory arrangements,
- corridors and exiting,
- service spaces,
- washrooms and other facilities,

- public spaces and lobbies,
- arrangements for security,
- loading bays, and
- other typical building functions.

The result is intended to achieve a repeatable, standardized approach that can be applied to lab planning and design processes for new Federal science facilities, improving design quality, facilitating the inclusion of best practices and lessons learned, reducing the design effort on the part of eventual facility designers, and otherwise reducing cost. Concepts that might be included, among others, including incorporation of:

- interstitial service space to enable most maintenance activities to be conducted without intruding into laboratory space and providing for easier reconfiguration;
- variable frequency drives, and variable air volume for spaces and fume hoods;
- automated setbacks for lighting (when sufficient natural light is available, at night and when rooms are unoccupied;
- energy recovery wheels;
- smaller modular units for incremental staging for heating/ cooling systems and avoiding simultaneous heating and cooling;
- energy efficient fumehoods and locating them to avoid 'walk-by turbulence'; and
- energy management control systems, and local over-rides on the various systems.

1.4 Ancillary Laboratory Spaces

Lab Standards and Design Guidelines for Plant, Food and Animal Science Labs will be required to cover containment greenhouse complexes, including:

- screenhouses and headerhouses;
- support systems such as water supply, air filtration, lighting, ambient temperature/humidity and ventilation monitoring and controls, effluent collection and treatment; and
- facilities external to main laboratories, such as for the storage of chemicals, gases, grains and animals.

2 Reviews by Federal Science Partner and Real Property Advisory Groups

Advisory groups will be established under the guidance of the DR, including representatives from Science Partners, PSPC and Shared Services Canada (SSC), to participate in the Lab Standards and Design Guidelines review process. Science Advisory Group (SAG) is the generic term used for these groups.

Development of Standards and Design Guidelines will proceed on an incremental, staged basis with interim reviews by the SAG after each stage. In addition to new deliverables for each stage, work completed in each stage will be re-submitted in subsequent stages after

inclusion of responses to feedback by SAGs.

Include provisions for input from SAGs at each Stage of the production of the Standards and Design Guidelines, in the National Capital Area (NCA).

3 Suggested Lab Standards and Design Guidelines Content

USING THE CATALOGUE AND PLANNING TOOLSET

ENQUIRIES

CONTEXTUAL CONTENT

- Purpose and Application of Lab Standards and Design Guidelines
- Scope
- Background

DEFINITIONS

ABBREVIATIONS AND ACRONYMNS

REPEATABLE DESIGN FRAMEWORK CONTENT

- Guiding Principles
  - Scientific Innovation
  - Collaboration
  - Functionality Suitability and Modernization
  - Environmental Sustainability
  - Optimization of Economic and Enterprise Value
  - Consistent Federal Laboratory Architectonic Identity
  - Integration with Information Technology Infrastructure
  - Applicable Code and Standard Versions
  - Provincial Requirements
  - Universal Accessibility
- Design Priorities
  - Modern, Iconic Design
  - Collaboration
  - Flexibility
  - Functional Suitability and Expandability
  - Sustainability
- Financial Performance Based on Life-Cycle Costing
  - Modularity
  - Expandability
  - Flexibility and Adaptability
  - Sustainability and Energy Conservation

PLANNING AND PROGRAMMING CONTENT

- Pre-Design
- Master Plan
- Project Program
- Data Collection
- Risk Assessment
- Lab Planning
- Lab Space Standards
- Lab Typologies (Wet, Dry, Primary, Support)
- Lab Support Systems (power, effluent, lighting, air, security, fire alarm)
- Project Infrastructure

LABORATORY DESIGN CONTENT

- General Laboratory Standards
- Performance-based Standards
- Specific Standards
- Containment Labs
- Non-Containment Labs
- Support, Equipment and Service Areas
  - Shipping and Receiving
  - Storage
  - Freezer Rooms
  - Hazardous Material Waste Room
- Utilities
- Signage

SITE DEVELOPMENT CONTENT

- Site-Specific Analysis
- Urban Design
  - Design Objectives
  - Master Planning
- Civil Engineering
  - Design Objectives
  - Water Supply Services
  - Storm Water Management Services
  - Site Grading
  - Sanitary Service
- Landscape Architecture
  - Design Objectives
  - Site Design
  - Technical Requirements

- Site Utilities

ARCHITECTURE AND INTERIOR DESIGN CONTENT

- Introductory Content
- Design Objectives
- Building Common and Service Areas
  - Building Core and Support Spaces
  - Building Management Spaces
  - Structured Parking
- Building Envelope
  - Exterior Wall Assemblies and Components
  - Exterior Sun Control
  - Glazing
  - Interior Sun Control
  - Exterior Doors
  - Bird Control Devices
  - Window Washing Equipment
  - Roofing Systems
  - Skylights and Sloped Glazing/Atria
  - Thermographic and Air Pressure Testing
- Interior Design Components
  - Partitions/Interior Walls
  - Acoustic Treatment
  - Graphics and Signage
  - Carpet Tile
  - Other Flooring
  - Wall Finishes
  - Material Finishes - Ceilings
- Architectural Woodwork
- Architectural Lab Finishes
- Interior Doors
- Hardware
- Glazing
- Lab Casework

STRUCTURAL ENGINEERING CONTENT

- Design Objectives
- Structural Risk Management Statement
- Floor Loads
- Parking Structures
- Vibration
- Floor Stiffness

MECHANICAL ENGINEERING CONTENT

- Design Objectives
- Mechanical Environmental Requirements
  - Building Pressurization
- HVAC Systems
  - Laboratory HVAC Systems
  - Laboratory Pressure Differentials
  - Air Distribution Systems
  - Fume Dispersion Modeling
  - Exhaust Systems
  - Sustainability Design and Life Cycle Cost Analysis of HVAC Systems
  - Energy Recovery
  - Design Conditions
  - Ventilation System Overview and Goals
  - Ventilation Criteria
  - Chemical Fume Hoods
  - Bio-Safety Cabinet
  - Space Pressurization
  - Noise Control
  - Heating, Cooling and Humidification
- Controls
- Plumbing
  - Domestic Water
  - Laboratory Plumbing Services
  - Laboratory Gases
  - Laboratory Liquids

FIRE PROTECTION ENGINEERING CONTENT

- Design Objectives
- Specialized Functions for Base Building and Tenants
- Sprinkler Systems
- Fire Alarm Systems

- Fire Pumps and Accessories
  - Fire Pump Design and Installation
  - Fire Pump Controllers
  - Jockey Pumps
- Fire Extinguishers

ELECTRICAL ENGINEERING CONTENT

- Design Objectives
- Design Studies
  - Electrical Load Analysis
  - Short Circuit, Device Evaluation and Coordination Study
  - Arc Flash Study
- Site Utility
  - Substation Ownership and Demarcation Points
  - Electrical Services
  - Underground Cable and Conduit
  - Concrete-Encased Duct Banks
  - Electrical Manholes
- Primary Distribution
  - Primary Substations
- Secondary Distribution
  - Secondary Switchgear
  - Distribution Switchboards
  - Secondary Transformers
  - Motor Control Centres (MCCs)
  - Motor Control
  - Electrical Motors
  - Elevator and Escalator Power
  - Panelboards
  - Secondary Distribution Conductors
  - Power Quality
- Branch Circuits
  - Lighting Branch Circuits
  - Receptacle Branch Circuits
- Grounding and Lightning Protection
  - Grounding Systems
  - Lightning Protection
- Placement of Electrical Rooms

- General Workmanship
  - Seismic Design
  - Building Raceways
  - Wiring Methods
- Operator Controls
  - Colour Coding
  - Operating Controls Labeling and Language Policy
- Emergency Electrical Power Supply
  - Emergency Generation Systems
  - Emergency Power Loads
  - Automatic Transfer Switches (ATSs)
  - Uninterruptible Power Supply (UPS) Systems
- Lighting
  - Lighting Design Requirements
  - Lighting Power Density
  - Day Lighting
  - Flexibility and Servicing Accessibility
  - General Luminaire Criteria
  - Lab and Other Specific Lighting Applications
  - Light Pollution Reduction
  - Lighting Controls
- Base Building Light Levels

LIFE SAFETY AND SECURITY SYSTEMS CONTENT

- Life Design Objectives
- Threat and Risk Assessment
- Security Site Brief & Security Design Brief
- Security Systems
  - Access Control Systems
  - Intrusion Alarm Systems
  - Video Surveillance Systems

COMMUNICATIONS SYSTEMS CONTENT

- Voice Communications Systems
- Clock Systems
- Telecommunications Systems
  - Telecommunication Spaces
  - Telecommunication Entrance Facilities
  - Telecommunications/Distributor Rooms

- Telecommunication Raceway Systems
- Service Entrance Pathways
- Telecommunication Grounding and Bonding Systems

COMMISSIONING CONTENT

- Commissioning Process
- Design Stage
- Construction/ Start-Up Stage
- Activation Stage
- Acceptance Stage
- Post-Acceptance Stage
- The Commissioning Team

CODES, REGULATIONS, STANDARDS AND DESIGN GUIDELINE CONTENT

- General Codes, Standards, and Legislation
- Laboratory Codes, Standards and Legislation
- Architectural Codes, Standards, and Legislation
- Window Washing Standards
- Structural Codes, Standards, and Legislation
- Civil Codes, Standards, and Legislation
- Mechanical Codes, Standards, and Legislation
- Fire Protection Engineering Codes, Standards, and Legislation
- Electrical Codes, Standards, and Legislation
- Telecommunication Codes, Standards and Legislation
- Security Codes, Standards and Legislation
- Codes, Standards, and Legislation pertaining to:
  - Environmental Responsibility
    - Prohibited Materials
    - Demolition/Remediation
    - Removal of Asbestos-Containing Materials
    - Fuel Storage Systems
- Compliance with the Canadian Environmental Assessment Act (CEAA)

GRAPHICAL AND VIDEO CONTENT

- Federal Laboratory Base Building Reference Designs (by m2): Architectonic Configuration and Attributes
- Base building prototype designs showing generic or ‘idealized’ layouts with key accessibility, security, circulation, public space, and servicing concepts Demonstration plans, vertical stacking and massing,
- Common modular lab typologies, with a comprehensive set of templates and capabilities for exchanging data with BIM-compliant applications,

- Schematic Design Schematics
- Measured drawings, photographs and 3D models
- A range of 3D and 2D visualization capabilities to supporting a range of visualization options to improve collaboration, communicate design intent, explore design options, ensure constructability, for the full range of template plans for Reference Designs:
  - Reference Design ‘A’: 5,000m2
  - Reference Design ‘B’: 10,000m2
  - Reference Design ‘C’: 25,000m2
  - Reference Design ‘D’: 50,000m2

PLANNING TOOLSET FUNCTIONALITY

A. LABORATORY TYPOLOGIES

B. SUPPORT SPACES

ATTACHMENT 4

CONTRACT DELIVERABLE REQUIREMENTS LIST

The Contract Deliverable Requirements List (CDRL) provided in Table 1 below lists the key deliverables necessary to meet requirements set out in the TOR. The CDRL indicates the Part of the TOR to which the deliverable pertains, a CDRL identifier consisting of a mnemonic and a number, its submission requirements and its submission purpose.

TAs will identify requirements for additional deliverables, particularly for Architecture and Engineering Services.

Deliverables listed in the CDRL use the CDRL identifier with the mnemonic "PF", referring to "Prescribed Format", as the reference for an associated Deliverable Item Description (DID) that sets out the purpose and required content of the associated deliverable, including format and preparation instructions. DIDs are provided separately. The CDRL identifier mnemonic "CG" refers to "Contractor-Generated" which indicates that a DID is not provided for the deliverable which, while meeting the requirements of the TOR, is to be submitted in a format determined by the Consultant.

The Submission Purpose includes the following:

a) *For Acceptance:* deliverables that require a decision from the DR or internal Government approval before proceeding.

b) *For Review:* deliverables that form critical input to an internal Government process or assist in fulfilling internal policy or reporting obligations. Assessment of the information contained in these deliverables may result in changes to how work is performed, but do not require a decision before proceeding.

c) *For Information:* deliverables provided by the Consultant for DR record-keeping, reference or analysis.

Table 2 includes other key deliverables associated with the Contract.

Deliverables that are required on a specific date (e.g. May 1) are due on the first business day that follows that date, in cases where the required date falls on a weekend or statutory holiday.

Apply the following to indicate the status of document deliverables, as they evolve through their life cycle:

a) *Draft*: the format and structure of the document are complete. Further details are being developed. To Be Determined (TBD) items are allowed, even to the extent that an entire section may be TBD, provided that requirements for that section have not been developed.

b) *Preliminary*: the sections of the document are complete and significant detail has been provided. Some TBDs are acceptable where information is not yet available. Whenever possible, TBDs should include bracketed values or text that reflect the most current thinking on an item or approach. Example: TBD [120° C]

c) *Final*: the document is complete. TBDs are allowed on a case-by-case basis subject to acceptance by the DR. Updates to the final document are controlled and treated as document revisions. All final deliverables including catalogues, standards, functional programs and schematic design reports shall be provided in both official languages.

d) *Current*: documents specifically called out in the CDRL for which periodic updates are required to reflect changes.82,

Table 1: Key Deliverables				
TOR Part	Deliverable Title	Submission Purpose	Frequency	Timing
Part 3: Administration	a) Meeting Agendas b) Meeting Minutes	For Information	Per meeting	• Within 2 business days before and after meetings respectively
Part 4: Required Services <u>Stream 1</u>	Work Plan & Schedule [PD 1.2.2]	For Acceptance	a) Initial at Contract Inception; b) Annually; c) Monthly Updates: within 30 days after Contract Award	a) Initial within 30 days after Contract Award; b) Annually by 15 February; c) Monthly Updates: on the 5th Business day
	Mobilization Plan, with Initial Contract Period Labour Resource, Final Consultant Team Structure, and Travel Plan and Contact Information List [PD 1.2.2]	For Acceptance	Once	30 days following Contract Award
	Repeatable Design Framework Specification, including, Lab Standards, demonstration plans, modular lab typologies and costing [RS 1.1.1]	a. For Acceptance-in-Principle for Preliminary Acceptance Review b. For Acceptance for Final Acceptance Review c. For Acceptance of major changes to RDF Spec.	Once; and Updates when changes are made	• Advance Samples: 30 days after Contract Award • Follow-up information: 15 days after Review Session • Final Draft RDF Specification within 90 days after Contract Award • Proposed Changes to RDF Spec 15 days in advance of such changes
	Transition Training Plan [RS 1.3.2]	For Acceptance	Once	30 days following Contract Award

Table 1: Key Deliverables				
TOR Part	Deliverable Title	Submission Purpose	Frequency	Timing
	RDF Acceptance Review Plan [RS 1.1.2]	For Acceptance	As required	15 days prior to review session
	Design Control Authority (DCA) Procedure [RS 1.1.1]	For information	Once	60 days following Contract Award
	Develop Reference Designs & costing [RS 1.1.4]	For Acceptance	Once	150 days following Contract Award
	Demonstrate the functionality of the RDF [RS 1.1.4.1]	For Acceptance	Once	150 days after contract award
	Continual Improvement Summary Report, Lessons Learned Report [RS 1.2.3]	For Information	Annually and By Project	May 1
	Labour Resource and Travel Plan and Updates	For Acceptance	Annually for Plan; Monthly for Updates	By 15 February
	Monthly Progress Reports	For Review	Monthly	5th business day of the month

Part 4: Required Services <u>Stream 2</u>	Typical deliverables associated with RS 2.1 through RS 2.16 are described in Part 4 of Terms of Reference. Specific deliverable requirements for these RSs will be set out in associated Task Authorizations.			
	Functional program drafts [RS 2.4.3] and final Functional Program	For Review For Acceptance	33, 66 and 99% completion and final for each project	As required
	Class D Construction Cost Estimates	For Review	Updated with each draft	Final estimate - completion of functional program.
	3 schematic design options, including outline specifications, schedule and Class D cost estimate [RS 2.15.5.1-11]	For Review and Selection	33, 66% completion for each option for each project	As required
	Completion of design for preferred/selected option and Class C cost estimate	For Acceptance	99% of Schematic Design and Final Completion	As required
	Provide Project Specific Output Specifications (PSOS) for all 3 projects. [RS 2.15.3]	For Acceptance	Once	Upon completion of Schematic Design
	Labour Resource and Travel Plan and Updates	For Acceptance	Annually for Plan; Monthly for Updates	By 15 February
	Monthly Progress Reports	For Review	Monthly	5th business day of the month

Table 1: Key Deliverables				
TOR Part	Deliverable Title	Submission Purpose	Frequency	Timing
Part 4: Required Services Stream 3	Oversight Reports (based on functional program, design and construction reviews) [RS 3.1]	To update client on progress	At 33, 66 and 99%	During design and construction 5th business day of the month
	Updated documents as required [RS 3.2]	To support continual improvement of RDF	As new project specific info/lessons are learned	During design and construction
	Construction Assessment Reports	To update client on progress	As required	TBD
	Post-occupancy evaluation review Reports [RS 3.8]	For information	As indicated in TA	As required
	Labour Resource and Travel Plan and Updates	For Acceptance	Annually for Plan; Monthly for Updates	By 15 February

6 Other Contract Submissions

Table 2 lists other key Contract submissions. It follows the CDRL format and includes the area of the Contracts to which the deliverable pertains, an identifier consisting of a mnemonic and a number, its submission requirements and its submission purpose.

Table 2: Other Contract Submissions List					
Area	Identifier	Deliverable Title	Submission Purpose	Frequency	Timing
Task Authorizations	TAPF-002	Task Authorization	For Acceptance	As required	As required
Invoices	INPF-001	Invoice	For Acceptance	Monthly	5th business day of the month

SUBMISSION REQUIREMENTS AND EVALUATION

SRE 1 General Information
SRE 2 Proposal Requirements
SRE 3 Submission Requirements and Evaluation
SRE 4 Price of Services
SRE 5 Total Score
SRE 6 Submission Requirements - Checklist

SUBMISSION REQUIREMENTS AND EVALUATION

SRE 1 GENERAL INFORMATION

1.1 Reference to the Selection Procedure

An 'Overview of the selection procedure' can be found in R1410T General Instructions to Proponents (GI3).

1.2 Calculation of Total Score

For this project the Total Score will be established as follows:

Technical Rating x 90%	=	Technical Score (Points)
Price Rating x 10%	=	Price Score (Points)
Total Score	=	Max. 100 Points

SRE 2 PROPOSAL REQUIREMENTS

2.1 Requirement for Proposal Format

The following proposal format information should be implemented when preparing the proposal.

- Submit one (1) bound original plus five (5) bound copies of the proposal
- Paper size should be - 216mm x 279mm (8.5" x 11")
- Minimum font size - 11 point Times or equal
- Minimum margins - 12 mm left, right, top, and bottom
- Double-sided submissions are preferred
- One (1) ‘page’ means one side of a 216mm x 279mm (8.5" x 11") sheet of paper
- 279mm x 432 mm (11" x 17") fold-out sheets for spreadsheets, organization charts etc. will be counted as two pages.
- The order of the proposals should follow the order established in the Request for Proposal SRE section

2.2 Specific Requirements for Proposal Format

The maximum number of pages (including text and graphics) to be submitted for the Rated Requirements under SRE 3.2 is forty (40) pages.

The following are not part of the page limitation mentioned above;

- Covering letter
- Consultant Team Identification (Appendix A)
- Declaration/Certifications Form (Appendix B)
- Integrity Provisions – Required Documentation
- Front page of the RFP
- Front page of revision(s) to the RFP

- Price Proposal Form (Appendix C)

Consequence of non-compliance: any pages which extend beyond the above page limitation and any other attachments will be extracted from the proposal and will not be forwarded to the PWGSC Evaluation Board members for evaluation.

SRE 3 SUBMISSION REQUIREMENTS AND EVALUATION

3.1 MANDATORY REQUIREMENTS

Failure to meet the mandatory requirements will render the proposal as non-responsive and no further evaluation will be carried out.

3.1.1 Licensing, Certification or Authorization

The Proponent shall be authorized to provide architectural and multidisciplinary engineering services, licensed, or eligible to be licensed, certified or otherwise authorized to provide the necessary professional services to the full extent that may be required by provincial law in any province of Canada.

3.1.2 Consultant Team Identification

The consultant team to be identified must include the following:

a) Proponent (prime consultant)

- Architectural and/or Engineering firm

b) Key Sub-consultants / Specialists Firms]

Key Sub-consultants must be identified.

c) Key Discipline Individuals

- Project Manager (Core Team Member[1])
- Lead Architect (Core Team Member[1])
- Intermediate Architect (Core Team Member[1])
- Chief Lab Design Specialist (Core Team Member[1])
- Functional Programming Specialist (Core Team Member[1])
- Structural Engineer
- Mechanical Engineer
- Electrical Engineer

Information required: name of firm, key personnel to be assigned to the project. For the Proponent, indicate current license and/or how provincial or territorial licensing requirements would be met. In the case of a joint venture, identify the existing or proposed legal form of the joint venture (refer to R1410T General Instructions to Proponents**,** GI9 Limitation of submissions).

An example of an acceptable format (typical) for submission of the team identification information is provided in Appendix A.

A description of the role, experience and licensing/certification requirements for the Consultant Team resources is provided in section CR 2.3, Required Consulting Resources, of the Terms of References.

Note 1: The Core Team, augmented as required by other resources, will be responsible for the overall planning and monitoring of the Work set out in specific Task Authorizations.

3.1.3 Declaration/Certifications Form

Proponents must complete, sign and submit the following:

- Appendix B, Declaration/Certifications Form as required.

3.1.4 Integrity Provisions – Required documentation

In accordance with the Ineligibility and Suspension Policy (http://www.tpsgc-pwgsc.gc.ca/ci-if/politique-policy-eng.html), the Proponent must provide, **as applicable**, to be given further consideration in the procurement process, the required documentation as per R1410T (2017-08-17), General instructions 1 (GI1), Integrity Provisions – Proposal**, section 3a.**

3.1.5 Security Requirement

1) Proponents must meet the security requirements as outlined under SI6 and SC1.

2) At contract award, the following conditions must be met:

   a. The Proponent should provide this security information as indicated in Appendix F to align with the requirements as set out in the following table:

Proponent/Sub Consultants/Specialists (Firms)	**Security Clearance (FSC TBD) at Contract Award**	**Document Safeguarding (TBD) at Contract Award**
Proponent (Prime Consultant)	**X**	**X**
Sub-Consultant Firms providing Key Discipline Individuals	**X**	

b. The Proponent should provide this security information Appendix F to align with the requirements for the key personnel as set out in the following table:

Key Discipline Individuals	Security Clearance (TBD) at Contract Award
Project Manager (Core Team Member1)	**X**
Lead Architect	**X**
Intermediate Architect	**X**
Chief Lab Design Specialist	**X**
Functional Programming Specialist	**X**
Mechanical Engineer	**X**
Electrical Engineer	**X**
Structural Engineer	**X**

3.2 RATED REQUIREMENTS

3.2.1 Extensiveness of the Proponent's Laboratory Design Activities

Describe the extensiveness of the Proponent's lab design activities as prime consultant on projects.

Information that should be supplied:

- A list of reference projects, the majority of space (more than 51%) having been delivered within the preceding 10 years, demonstrating that the Proponent has delivered a considerable amount of laboratory designs
- Brief project description and intent.
- Client references: name, address, phone, email address and fax of client contact at working level - references may be checked

The Proponent (as defined in R1410T General Instructions to Proponents**,** GI2 Definitions) must possess the knowledge on the above projects. Past project experience from entities other than the Proponent will not be considered in the evaluation unless these entities form part of a joint venture Proponent.

Indicate those projects which were carried out in joint venture and the responsibilities of each of the involved entities in each project.

Table 3.2.1 - Evaluation of Extensiveness of Laboratory Design Activities

0 %	20 %	40 %	60 %	80 %	100 %	Maximum Available Points
Design of up to 500,000m2 of Lab space.	Design of more than 500,000m2 and up to 1,000,000m2 of Lab space.	Design of more than 1,000,000m2 and up to 1,500,000m2 of Lab space.	Design of more than 1,500,000m2 and up to 2,000,000m2 of Lab space.	Design of more than 2,000,000m2 and up to 3,000,000m2 of Lab space.	Design of more than 3,000,000m2 of Lab space.	5 points
Design of up to 250,000 m2 of Lab space delivered within the preceding 10 years.	Design of more than 250,000m2 and up to 500,000m2 of Lab space delivered within the preceding 10 years.	Design of more than 500,000m2 and up to 750,000m2 of Lab space delivered within the preceding 10 years.	Design of more than 750,000m2 and up to 1,000,000m2 of Lab space delivered within the preceding 10 years.	Design of more than 1,000,000m2 and up to 1,500,000m2 of Lab space delivered within the preceding 10 years.	Design of more than 1,500,000m2 of Lab space delivered within the preceding 10 years.	5 points
					Total	**10 points** (See section 3.2: 20 points after Weighting)

3.2.2 Proponent's Execution of Large Laboratory Design

Describe the Proponent's execution of a large science laboratory facility design as prime consultant on the project.

Information that should be supplied:

- A reference project having been delivered within the preceding 10 years, demonstrating that the Proponent has designed a large laboratory.
- Brief project description and intent.
- Client references: name, address, phone, email address and fax of client contact at working level - references may be checked.

The Proponent (as defined in R1410T General instructions to Proponents**,** GI2 Definitions) must possess the knowledge on the project. Past project experience from entities other than the Proponent will not be considered in the evaluation unless these entities form part of a joint venture Proponent.

Indicate if the project was carried out in joint venture and the responsibilities of each of the involved entities in each project.

Table 3.2.2 - Evaluation of Execution of Large Laboratory Design						
0 %	**20 %**	**40 %**	**60 %**	**80 %**	**100 %**	**Maximum Available Points**
Design of a Lab with up to 500m2 of lab space delivered within the preceding 10 years.	Design of a Lab with more than 500m2 and up to 15,000m2 of Lab space delivered within the preceding 10 years.	Design of a Lab with more than 15000m2 and up to 20,000m2 of Lab space delivered within the preceding 10 years.	Design of a Lab with more than 20,000m2 and up to 25,000m2 of Lab space delivered within the preceding 10 years.	Design of a Lab with more than 25,000m2 and up to 35,000m2 of Lab space delivered within the preceding 10 years.	Design of a Lab with more than 35,000m2 of Lab space delivered within the preceding 10 years.	10 points (See section 3.2: 15 points after Weighting)

3.2.3 Proponent's Execution of World Class Design

Describe the Proponent's execution of World Class design which, for the purposes of the Proposal, means building designs that rank among the world's best in relation to the following Design Principles, as evidenced by associated awards.

a. **Iconic Design** – The degree to which the design is unique or ground-breaking and has received global recognition; the degree to which the design set a new standard for labs and campus design in Canada and around the world; the degree to which the design is likely to stand up over time; and the degree to which the design resonates and leaves an impression on people.
b. **Collaboration** – The degree to which the design encourages social interaction throughout the facility; the degree to which spatial arrangements support collaborative research opportunities; and the degree to which the campus design contributes to community formation, community-building and community outreach.

c. **Flexibility** – The degree to which the design enables space within the campus to be configured quickly to respond to evolving science priorities; and the capacity and ease with which space can be repurposed or adapted over time to changing science priorities or requirements.
d. **Functional Suitability and Expandability** – The degree to which the design met existing program requirements effectively while accommodating for growth over time; the degree to which additional space can be added to the campus with minimal disruption to existing space; the degree to which the design established common and/or core services to support future growth; and the degree to which the unity and identity of the campus design can be maintained over different phases of growth.
e. **Sustainability** – The degree to which the design minimized environmental impacts through the design and construction phases; the degree to which the design provided for management of water collected on site, water resources used in facilities, building emissions and waste materials; and the degree to which the design reflected strategic approaches to reduce carbon footprint through appropriate site selection and use of alternative energy sources.

<u>Information that should be supplied:</u>

- A list of a maximum of five (5) Reference Projects undertaken within the last 10 years whose designs individually or collectively demonstrate the Proponent achievement of the above Design Principles.
- A clear indication how project designs have met each of the Design Principles.
- Brief project description and intent. Narratives should include a discussion of design philosophy / approach to meet the intent, design challenges and resolutions.
- Client references - name, address, phone, email address and fax of client contact at working level - references may be checked.
- Awards received, referring to Attachment 1 to the SRE for a listing of examples of acceptable types of awards.

The Proponent (as defined in R1410T General Instructions to Proponents**,** GI2 Definitions) must possess the knowledge on the project. Past project experience from entities other than the Proponent will not be considered in the evaluation unless these entities form part of a joint venture Proponent.

Indicate if the project was carried out in joint venture and the responsibilities of each of the involved entities in each project.

Table 3.2.3 - Evaluation of World Class Design						
	INADEQUATE	**WEAK**	**ADEQUATE**	**FULLY SATISFACTORY**	**STRONG**	
0 %	**20 %**	**40 %**	**60 %**	**80 %**	**100 %**	**Maximum**

						Available Points
Failure to submit information that could be evaluated.	Information presented lacks adequate demonstration of achievement of the Design Principles.	Information presented demonstrates achievement of some but not all of the Design Principles.	Information presented demonstrates an adequate level of achievement of the Design Principles.	Information presented demonstrates a fully satisfactory level of achievement of the Design Principles.	Information presented demonstrates excellence in achievement of the Design Principles.	10 points (See section 3.2: 15 points after Weighting)

3.2.4 Achievements of Key Discipline Individuals

This evaluation area is intended to demonstrate the strengths of the individuals on the team and to recognize their past responsibilities, commitments and achievements. Describe the experience and performance of the Key Discipline Individuals to be assigned to the Work, regardless of their past association with the Proponent, namely:

- Project Manager (Core Team Member[1])
- Lead Architect (Core Team Member[1])
- Intermediate Architect (Core Team Member[1])
- Chief Lab Design Specialist (Core Team Member[1])
- Functional Programming Specialist (Core Team Member[1])
- Structural Engineer
- Mechanical Engineer
- Electrical Engineer

Note 1: See Note 1 at SRE 3.1.2

Information that should be supplied for each individual:

- Professional accreditation
- Accomplishments, achievements and awards
- Relevant experience, expertise and number of years of experience
- Role, responsibility and degree of involvement of individual in past projects

Table 3.2.4 - Evaluation of Achievements of Key Discipline Individuals						
	INADEQUATE	**WEAK**	**ADEQUATE**	**FULLY SATISFACTORY**	**STRONG**	
0 %	**20 %**	**40 %**	**60 %**	**80 %**	**100 %**	**Maximum Available Points**
Failure to submit information that could be evaluated.	One or more Key Discipline Individuals do not have required qualifications and experience.	One or more Key Discipline Individuals are lacking in required levels qualifications and	All Key Discipline Individuals have an acceptable level of qualifications and experience.	All Key Discipline Individuals are qualified and experienced.	All Key Discipline Individuals are highly qualified and experienced.	10 points (See section 3.2: 20 points after

		experience.				Weighting)

3.2.5 Management of Services

The Proponent should describe: how it proposes to perform the Work set out in the Terms of Reference; how the services will be managed to ensure continuing and consistent control as well as production and communication efficiency; how the Consultant Team will be organized and how it fits within the Proponent's existing organization structure; and how the team will be managed.

If the Proponent proposes to provide multi-disciplinary services that might otherwise be performed by a sub-consultant, this should be reflected here.

Information that should be supplied:

- Confirm the makeup of the full project team including the names of the sub-consultants and specialist personnel and their role on the project.
- Organization chart with position titles and names (Consultant team); joint venture business plan, team structure and responsibilities, if applicable
- What back-up will be committed
- Profiles of the key positions (specific assignments and responsibilities)
- Outline of an action plan for delivery of the services, including optional services, with implementation strategies and sequence of main activities
- Reporting relationships
- Communication strategies
- Response time: demonstrate how the Proponent will ensure timely response to evolving requirements
- Work Plan - detailed breakdown of work tasks and deliverables for the Services set out in Streams 1, and RS 2.4 and RS 2.15 of Stream 2
- Schedule - proposed major milestone schedule

Table 3.2.5 - Evaluation of Management of Services						
	INADEQUATE	**WEAK**	**ADEQUATE**	**FULLY SATISFACTORY**	**STRONG**	
0 %	**20 %**	**40 %**	**60 %**	**80 %**	**100 %**	**Maximum Available Points**
Failure to submit information that could be evaluated	Information on the approach to managing the services indicates weaknesses that are highly unlikely to be able to be corrected. There is no confidence that the approach will be adequate.	Information on the approach to managing the services indicates weaknesses that are unlikely to be able to be corrected. There is little confidence that the approach will be adequate.	Information on the approach to managing the services indicates weaknesses that can be corrected. There is confidence that the approach will be adequate following correction of weaknesses.	Information on the approach to managing the services indicates no significant weaknesses. There is confidence that the approach will be adequate.	Information on the approach to managing the services indicates no apparent weaknesses. There is high confidence that the approach will be adequate.	10 points

3.2.6 Design Philosophy / Approach / Methodology

The Proponent should elaborate on aspects of the Work considered to be challenging, as well as setting out its design philosophy / approach / methodology and approach to resolving design issues, focusing on unique aspects of the Work.

Information that should be supplied:

- Design Philosophy / Approach / Methodology
- Description of the significant challenges and how these will be addressed by the Consultant Team.

Table 3.2.6 - Evaluation of Design Philosophy / Approach / Methodology						
	INADEQUATE	**WEAK**	**ADEQUATE**	**FULLY SATISFACTORY**	**STRONG**	
0 %	**20 %**	**40 %**	**60 %**	**80 %**	**100 %**	**Maximum Available Points**
Failure to submit information that could be evaluated	Information on the design philosophy, approach or methodology indicates a lack of understanding of the requirements. There is no confidence that requirements will be met.	Information on the design philosophy, approach or methodology indicates weaknesses that are unlikely to be able to be corrected. There is little confidence that requirements will be met.	Information on the design philosophy, approach or methodology indicates weaknesses that can be corrected. There is confidence that requirements will be met following correction of weaknesses.	Information on the design philosophy, approach or methodology indicates no significant weaknesses. There is confidence that requirements will be met.	Information on the design philosophy, approach or methodology indicates no apparent weaknesses. There is high confidence that requirements will be met.	10 points

3.2.7 Proponent Presentation

A consultant presentation will be required. FSTII is a group of very high profile projects of international significance. The Proponent will be required to present its proposed Core team members, with a minimum of two (2) members in attendance, including the Lead Architect, and to demonstrate how they will meet the requirements of Streams 1 and 2. Effective communications with stakeholders, particularly managing the flow of lab design information between scientists and science program owners, and architecture and engineering specialists is critical to the success of the Contract.

Table 3.2.7 - Evaluation of Proponent Presentation					
	INADEQUATE	**WEAK**	**ADEQUATE**	**FULLY SATISFACTORY**	**STRONG**
0 points	**2 points**	**4 points**	**6 points**	**8 points**	**10 points**
Failure to attend the presentation with required attendees.	The Proponent's presentation failed to demonstrate effective communications capabilities. There is no confidence that stakeholder engagement would be successful.	The Proponent's presentation indicates weaknesses that are unlikely to be able to be corrected. There is little confidence that stakeholder engagement would be successful.	The Proponent's presentation indicates weaknesses that can be corrected. There is confidence that stakeholder engagement would be successful following correction of weaknesses.	The Proponent's presentation indicates no significant weaknesses. There is confidence that stakeholder engagement would be successful.	The Proponent's presentation indicates no apparent weaknesses. There is high confidence that stakeholder engagement would be successful .

3.3 EVALUATION AND RATING

In the first instance, price envelopes will remain sealed and only the technical components of the proposals which are responsive will be reviewed, evaluated and rated by a PWGSC Evaluation Board in accordance with the following to establish Technical Ratings:

Criterion	Weight Factor	Rating	Weighted Rating
3.2.1 Extensiveness of Laboratory Design Activities	20	0 -10	200
3.2.2 Execution of Large Laboratory Design	15	0 - 10	150
3.2.3 Proponent Execution of World Class Design	15	0 - 10	150
3.2.4 Achievements of Key Discipline Individuals	20	0 - 10	200
3.2.5 Management of Services	10	0 - 10	100
3.2.6 Design Philosophy / Approach / Methodology	10	0 - 10	100
3.2.7 Proponent Presentation	10	0 - 10	100
Technical Rating	**100.0**		**0 - 1000**

To be considered further, proponents **must** achieve a minimum Technical Rating of five-hundred (500) points out of one-thousand (1000) points available as specified above.

No further consideration will be given to proponents not achieving the pass mark of five-hundred (500) points.

SRE 4 PRICE OF SERVICES

All price proposal envelopes corresponding to responsive proposals which have achieved the pass mark of five-hundred (500) points will be opened upon completion of the technical evaluation. When there are three or more responsive proposals, an average price is determined by adding all the price proposals together and dividing the total by the number of price proposals being opened. This calculation will not be conducted when one or two responsive proposals are received.

All price proposals which are greater than twenty-five percent (25%) above the average price will be set aside and receive no further consideration.

The remaining price proposals are rated as follows:

A. The lowest price proposal receives a Price Rating of 1000

B. The second, third, fourth and fifth lowest prices receive Price Ratings of 800, 600, 400, and 200 respectively. All other price proposals receive a Price Rating of 0.

C. On the rare occasions where two (or more) price proposals are identical, the matching price proposals receive the same rating and the corresponding number of following ratings are skipped.

The Price Rating is multiplied by the applicable percentage to establish the Price Score.

SRE 5 TOTAL SCORE

Total Scores will be established in accordance with the following:

Rating	Possible Range	% of Total Score	Score (Points)
Technical Rating	0 - 1000	90	0 - 900
Price Rating	0 - 1000	10	0 - 100
Total Score		100	0 - 1000

The Proponent receiving the highest Total Score is the first entity that the Evaluation Board will recommend for the provision of the required services. In the case of a tie, the proponent submitting the lower price for the services will be selected.

SRE 6 SUBMISSION REQUIREMENTS - CHECKLIST

The following list of documents and forms is provided with the intention of assisting the Proponent in ensuring a complete submission. The Proponent is responsible for meeting all submission requirements.

Please follow detailed instructions in R1410T General instructions to Proponents**,** GI16 Submission of proposal, as amended in SI2 Proposal documents. Proponents may choose to introduce their submissions with a cover letter.

- Team Identification - see typical format in Appendix A
- Declaration/Certifications Form - completed and signed - form provided in Appendix B
- Integrity Provisions – Required documentation – **as applicable** in accordance with the Ineligibility and Suspension Policy (http://www.tpsgc-pwgsc.gc.ca/ci-if/politique-policy-eng.html) and as per R1410T (2017-08-17), General instructions 1 (GI1), Integrity Provisions – Proposal, **section 3a.**
- Integrity Provisions - Declaration of Convicted Offences – **with its bid, as applicable** in accordance with the Ineligibility and Suspension Policy (http://www.tpsgc-pwgsc.gc.ca/ci-if/politique-policy-eng.html) and as per R1410T (2017-08-17), General instructions 1 (GI1), Integrity Provisions – Proposal, **section 3b.**
- Proposal - one (1) original plus 5 copies

- Front page of RFP
- Front page(s) of any solicitation amendment
- Appendix F – Security Information

In a separate envelope:
Price Proposal Form - one (1) completed and submitted in a separate envelope.

Attachment 1 to the SRE

Internationally Recognized Awards

Following are examples of notable awards that will be considered as acceptable under Section 3.2.1.

- The Governor General's Medals in Architecture
- Laboratory of the Year Awards
- Stirling Architecture Prize
- The International Architectural Awards
- Royal Gold Medal
- UIA Gold Medal
- AIA Gold Medal
- Architizer A+Awards
- ENR Awards
- National Council of Structural Engineers Associations Awards
- American Architecture Awards
- World Green Building Council Awards
- International Design Awards (IDA)
- Canadian Design-Build Award of Excellence
- American Institute of Architects Committee on the Environment – Top 10 Green Projects
- International Interior Design Association Award
- ARIDO Design Awards and those of other Provinces
- National Recognition Award (2018)
- Engineering Excellence Awards
- American Council of Engineering Companies Awards
- Excellence in Green Building: New Construction Institutional Award
  OAQ, OAA and other provincial architectural associations' Awards of Excellence

APPENDIX D

Public Services and Procurement Canada | Services publics et Approvisionnement Canada

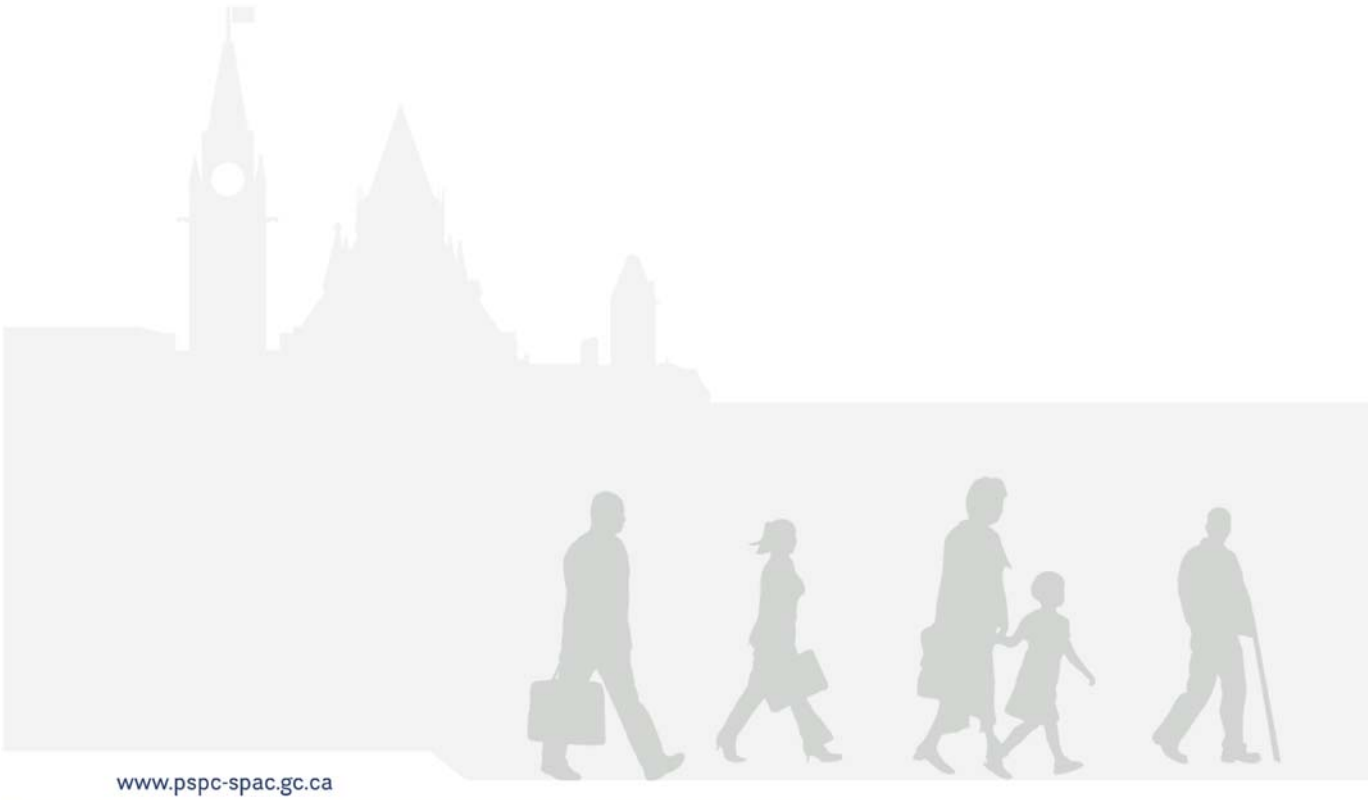
Canada

Respect • Integrity • Excellence • Leadership

Serving GOVERNMENT, Serving CANADIANS.

Doing Business with PWGSC

Documentation and Deliverables Manual



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Contents

Revisions

Version	Date	Description
0.1	August 14, 2017	Draft version for consultation.
1.0	January 12, 2018	Original Issuance

1 General

1.1 Effective Date

January 12, 2018

1.2 Authority

This manual is issued by the authority of the Director General, Technical Services, Real Property Branch (RPB), Public Works and Government Services Canada (PWGSC).

1.3 Purpose

This document provides architectural and engineering (A&E) consultants with the requirements for producing deliverables for PWGSC projects in order to ensure a well-documented design process, and facilitate review by PWGSC staff.

1.4 Scope

This document shall apply to design-bid-build projects undertaken by PWGSC on its own behalf as well as for other government departments (OGDs). It is applicable to all regions of PWGSC and can be supplemented with regional addendum.

1.5 Harmonization with Terms of Reference

This document shall be used in conjunction with the project's Project Brief / Terms of Reference (TOR). In case of a conflict between documents, the requirements of the TOR prevail over those of this document.

1.6 Departmental Name Change

In the fall of 2015, Public Works and Government Services Canada (PWGSC) was renamed Public Services and Procurement Canada (PSPC).

This name change is occurring in a phased approach, and for most documents PSPC should be used. However, all contract documents shall use the legal name Public Works and Government Services Canada (PWGSC) until the name has been changed in legislation.

1.7 Terminology

This document utilizes the following terminology:

- "shall" is used to express a requirement, a provision the Consultant is obligated to meet; "should" is used to express a recommendation; and
- "may" is used to express an option or that which is permissible within the limits of this document.

1.8 Definitions

Addenda: Changes to the construction documents or tendering procedures, issued during the tendering process.

Construction Documents: The drawings and specifications (including addenda).

Drawings: The graphic means of showing work to be done, as they depict shape, dimension, location, quantity of materials and relationship between building components.

Reports: Written account given of a particular matter after thorough investigation or consideration prepared by the Consultant.

Specifications: Written descriptions of materials and construction processes in relation to quality, colour, pattern, performance and characteristics of materials, installation and quality of work requirements.

2 Construction Documents

2.1 General

This section provides direction to Consultant firms on the preparation of construction documents (namely specifications and drawings) to be submitted to PWGSC for real property projects across Canada.

Specifications, drawings, and addenda shall be complete and clear so that contractors can prepare bids without guesswork.

2.1.1 Principles of PWGSC Contract Documents

Contact documents shall be prepared based on common public procurement principles. PWGSC does not use Canadian Construction Documents Committee (CCDC) documents.

PWGSC is responsible for preparing and issuing the construction contract and the terms and conditions as well as all other related bidding and contractual documents. For detailed information, the standard acquisition clauses and conditions commonly used by PWGSC in the contracting process are available on the buyandsell.gc.ca website.

2.1.2 Translation

When bilingual documents are required in the Terms of Reference, all documentation including drawings, specifications, reports as well as all bidder questions shall be in both official languages.

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

2.1.3 Construction Documents Definitions

Unless otherwise indicated in the Project Brief / Terms of Reference, construction document submissions (33%, 50 or 66%, 99%, and 100% / final) shall meet the definitions outlined below. Further discipline based requirements may be included in the TOR.

- 33%: shall demonstrate general intent of design and compliance and alignment with relevant standards. Summary specification required, but not a full specification.
- 50% or 66%: shall show full system, all components, requirements, and lack only minor details on drawings. Specifications shall be well advanced and contain major work and material requirements and lack only minor details.
- 99%: shall be for final review by PWGSC, lacking no detail and complete with a project specific specification.
- 100% (or final): shall address comments by PWGSC as required, signed and sealed by the responsible design professional in compliance with various provincial jurisdiction requirements, ready for tender.

2.1.4 Quality Assurance

It is the sole responsibility of the Consultant firms to undertake their own quality control process and to review, correct, and coordinate their documents (between disciplines). The Consultant shall also ensure the constructability of their design.

2.1.5 Quality Assurance Deliverables

For every construction document submission (33 %, 50 % or 66 %, 99 % and 100 %), the Consultant shall provide:

- a completed and signed Checklist for the Submission of Construction Documents (see Appendix A); and
- an index as per Appendix B.

2.1.6 Terminology & Quantities

The Consultant shall 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,” “equivalent to,” and “to be determined on site by Departmental Representative” shall not be indicated in specifications nor in drawings, as such wording promotes inaccurate and inflated bids.

Construction documents shall permit bidders to bid accurately. If a precise quantity is impossible to identify (e.g. cracks to be repaired), then provide an estimated quantity for bidding purposes (to be used in conjunction with unit prices). Ensure that the terminology used throughout construction documents is consistent and does not contradict applicable codes and standards.

2.1.7 Units of Measure

All units of measure within drawings and specifications shall be based on the International System of Units (SI).

2.2 Drawings

2.2.1 General

Drawings shall be prepared in accordance with the *PWGSC National CADD Standard* and the Canadian Standards Association CSA B78.5-93: *Computer-Aided Design Drafting (Buildings)*. Drawing shall also meet the following criteria:

- dimensions shall be in metric only (no dual dimensioning);
- no trade names present on any drawings; and
- no specification-type notes are on any drawing.

2.2.2 Information to be Included

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

2.2.3 Title Blocks and Revision Notes

PWGSC title block shall be used for drawings and sketches (including addenda).

The percent of drawing completion should be included in the revision notes. Revision notes shall be inputted during design development, but cleared for 100% complete drawing (ready for tender).

2.2.4 Drawing Numbers

Drawings should be numbered in sets according to the type of drawing and the discipline involved as indicated in the following table. The requirements of the *PWGSC National CADD Standard* supersede these requirements, where warranted.

Discipline	Drawing
Demolition	D01, D02, etc.
Architecture	A01, A02, etc.
Civil	C01, C02, etc.
Landscaping	L01, L02, etc.
Mechanical	M01, M02, etc.
Electrical	E01, E02, etc.
Structural	S01, S02, etc.
Interior Design	ID01, ID02, etc.

2.2.5 Presentation Requirements

Present the drawings in sets, providing the applicable demolition, site plan, civil, landscaping, architecture, structural, mechanical, and electrical drawings in that order. All drawings should be of uniform standard size.

2.2.6 Legends

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

2.2.7 Schedules and Tables

Where schedules or tables occupy entire sheets, locate them at the back of each set of drawings for convenient reference.

2.2.8 North Arrow

Include a north arrow on all plans. 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.

2.2.9 Drawing Symbols

Follow generally accepted drawing conventions, understandable by the construction trades and in accordance with PWGSC publications.

2.2.10 As-Built Drawings

As-built drawings are official record drawings and shall represent as constructed conditions including location and size of equipment, devices, plumbing lines, mechanical and electrical equipment, structural elements etc. As-built drawings shall be updated in CAD, handwritten notes are not acceptable.

2.2.11 Submission Format

Unless otherwise stated in the Terms of Reference, drawing submissions shall be in electronic and hard copy format.

2.2.11.1 Drawing Hard Copy Deliverable Format

Drawing submitted in hard copy shall be:

- printed to scale with black lines on white paper;
- bound with staple or other means into sets, where presentations exceed 50 sheets, the drawings for each discipline may be bound separately for convenience and ease of handling; and
- of a paper size as agreed to with the Departmental Representative.

2.2.11.2 Drawing Electronic Copy Deliverable Format

Drawing submitted electronically shall be provided:

- without password protection or printing restrictions;
- in two formats:
    - PDF/E-1 (in compliance with ISO 24517-1);
    - .dwg format; and
- in accordance with Appendix D.

2.3 Building Information Modelling (BIM)

PWGSC is committed to using non-proprietary or "OpenBIM" standards. As such, the Consultant is not required to use any specific proprietary software format. For the sake of legacy information quality, the Consultant shall use the international standards of interoperability for BIM (IFC) in all cases where models are submitted. Consultants shall to work with software that is compliant to this standard.

Where used, BIM shall not replace the submission requirements outlined by this document. Rather, consultants shall submit models in addition requirements outlined herein.

Where BIM is used, models and modelled information shall be submitted in the following two formats:

- .native (whichever format is native to the Modelling software used by the Consultant);
- .ifc (Industry Foundation Classification – IFC4 – ISO 16739:2013); and

All Modelled Information, and Model Information Exchanges shall conform to:

- Project-specific requirements, such as they are laid out in the Project Execution Plan, Project Documentation and Model Element Table; and
- The project-identified BIM Standards & Guidelines.

Models for electronic submissions shall be organized as per Appendix D.

2.4 Specifications

2.4.1 National Master Specification

Specifications prepared for PWGSC shall follow the most current version of the *National Master Specification* (NMS) format offered by the National Research Council.

The Consultant has overriding responsibility for the content of construction project specifications. For each specification, he or she shall edit, amend, and supplement the NMS template as deemed necessary to produce an appropriate project specification free of conflict and ambiguity. The Consultant should refer to the latest *NMS User's G*uide and *NMS Development Guide* issued by the National Research Council for further guidance on using the NMS.

2.4.2 Index

Specifications shall include an index which list all specification sections, including numbers of pages, as well as the division and section names in the format shown in Appendix B.

2.4.3 Specification Organization

Narrow scope sections describing single units of work should be used for complex work. Broad scope sections may be used for less complex work. The Consultant shall use consistently for the entire specification either the NMS 1/3 page format, the NMS 2/3-page format or the Construction Specifications Canada (CSC) full-page format.

Start each section on a new right hand page and show the PWGSC project number, NMS section title, NMS section number, page number, and specification date on each page. The project title, and Consultant's name are not to be indicated.

2.4.4 Standards

Code and standard references in the NMS may not be up to date, the Consultant shall ensure that the project specification use the current applicable edition of all references quoted.

2.4.5 Specifying Materials

Specifications should make use of generic names in referencing construction materials. The Consultant should refer to the latest version of the *NMS Development Guide* issued by the National Research Council for further details. The term "Acceptable Manufacturers" shall not be used, as this restricts competition and does not ensure the actual material or product will be acceptable.

2.4.5.1 Alternate Products and Materials

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.

2.4.5.2 Sole Sourcing

Sole sourcing of materials and/or work is only allowed in exceptional and justifiable circumstances. Prior to including sole source materials and/or work, the Consultant shall contact the Departmental Representative to obtain approval for the sole sourcing. Consultants shall provide proper justification for all individual sole source requirements.

Sole sourcing for materials and work may be required when performing work on existing proprietary systems, such as fire alarm systems, building automation systems (BAS) etc.

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

Designated Contractor

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

Wording for the sole source of building automation system should be in Part 1 as follows:

Designated Contractor

.1 Retain the services of [_____] or its authorized representative to complete the work of all building automation system sections.

Wording for the sole source of building automation system should be in Part 2 as follows:

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 (i.e. fire alarm systems) should be in Part 2 as follows:

Acceptable Materials

.1 The only acceptable materials are [_____].

2.4.6 Measurement for Payment

The measurement for payment shall be provided in lump sum or unit prices.

2.4.6.1 Unit Prices

Unit prices should only be used in instances where the quantity can only be roughly estimated (e.g. earth work). The approval of the Departmental Representative shall be sought in advance of their use. In each applicable NMS section where unit prices are used, add new or replace paragraph title "Measurement for Payment" with "Unit Prices." and 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.

Provide a unit price table, sample shown below, to designate the work to which a unit price arrangement applies. The table shall include:

- the price per unit and the estimated total price for each item listed;
- a complete description of each type of work covered; and
- items 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	

2.4.7 Cash Allowances

Construction documents shall be complete and contain all of the requirements for the contractual work. Cash allowances are to be used only under exceptional circumstances (i.e. utility companies, municipalities), where no other method of specifying pricing is appropriate.

To include cash allowances, obtain approval from the Departmental Representative in advance, and use Section 01 21 00 – Allowances of the NMS to specify the criteria.

2.4.8 Warranties

The 12-month warranty period specified in PWGSC's standard acquisition clauses and conditions with regard to the contract should typically be retained as is. Extended warranties should only be used where experience has shown that serious defects are likely to appear after expiry of the standard one-year warranty period. When necessary to extend beyond the 12 month warranty period,

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 [_____] months.

Where the extended warranty is intended to apply to a particular part of a specification section, modify the previous text as follows:

> For [_____], the 12 month warranty period is extended to [_____] months.

2.4.9 Miscellaneous Requirements

Paragraphs noted as “Scope of Work” shall not be included. Within Part 1 – General of specifications, the paragraphs “Summary” and “Section Includes” shall not be utilized.

2.4.10 Specification Coordination

All sections of the specifications shall be coordinated, including the “Related Sections” portion of specifications and appendices. References to non-existent sections shall not be present within the specifications.

2.4.11 Regional Guide

The Consultant should contact the Departmental Representative to obtain the region’s requirements for Division 01 (General Requirements) or other short-form specifications as appropriate.

2.4.12 Health and Safety

All project specifications are required to include Section 01 35 29 – Health and Safety Requirements. Confirm with the Departmental Representative to determine if there are any instructions to meet regional requirements.

2.4.13 Subsurface Investigation Reports

If required, subsurface investigation report(s) shall be included after Section 31, and the following paragraph added to Section 31:

> Subsurface Investigation Report(s)
>
> .1 Subsurface investigation report(s) are included in the specification following this section.
>
> If the Departmental Representative 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 providing the subsurface investigation report(s), the foundation information required by the current *National Building Code of Canada* (Division C, Part 2, 2.2.4.6) shall be included on foundation drawings.

2.4.14 Prequalification and Pre-Award Submissions

Do not include in the specifications 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 Departmental Representative.

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

2.4.15 Contracting Issues

Specifications describe the workmanship and quality of the work and shall not contain any contracting issues. Division 00 of the NMS is not used by PWGSC, except for the Seals page 00 01 07 and the Table of Contents 00 01 10. In specifications, remove all references to the following:

- general instructions to bidders;
- general conditions;
- Canadian Construction Documents Committee (CCDC) documents;
- priority of documents;
- security clauses and clearances;
- terms of payment or holdback;
- the tendering process;
- bonding requirements;
- insurance requirements;
- alternative and separate pricing;
- site visits (mandatory or optional); and
- the release of lien and deficiency holdbacks.

2.4.16 Specification Submission Format

Unless otherwise stated in the Terms of Reference, specification submissions shall be in electronic and hard copy format.

2.4.16.1 Specification Hard Copy Deliverable Format

Specifications submitted in hard copy shall be printed on both sides of 216 mm x 280 mm white bond paper.

2.4.16.2 Specification Electronic Copy Deliverable Format

Specifications submitted electronically shall be:

- provided in PDF/A (in compliance with ISO 19005) format, without password protection and printing restrictions; and
- in accordance with Appendix D.

2.5 Addenda

2.5.1 Format

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

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

No Consultant information (name, address, phone #, Consultant project #, etc.) should appear in addenda or their attachments (except on sketches).

2.5.2 Content

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

Where there are many or major changes to a section or drawing, consider deleting the entire section or drawing and replacing it with a new version.

3 Cost Estimates

3.1 Cost Estimates Submission Formats

3.1.1 Format

Construction cost estimates for projects shall be prepared in the elemental analysis format, which is in accordance with the latest edition issued by the Canadian Institute of Quantity Surveyors (CIQS) for all PWGSC regions excluding Quebec. Within Quebec region the cost estimates shall be prepared in the Uniformat II format.

3.1.2 Contents

All cost estimates shall contain the following:

- introduction narrative complete with an outline description of the cost estimate basis;
- description of information obtained and used in the cost estimate including the date received;
- listing of notable inclusions;
- listing of notable exclusions;
- listing of items/issues carrying significant risk;
- summary of the itemized cost estimate;
- itemized breakdown of cost estimate by elemental analysis for Class B, C, and D; and
- itemized breakdown of costs estimate in both elemental analysis and National Master Specification division format for Class A, including measured quantities, unit rate pricings and amounts for each item of work.

Allowances, if deemed necessary by Consultant, shall contain the following:

- design allowance to cover unforeseen items during design phase;
- escalation allowance for changes in market conditions between the date of the cost estimate and the date tender is called;
- construction allowance to cover unforeseen items during construction; and
- the basis of calculations of the above allowances.

3.2 Classes of Cost Estimates for Construction Projects

PWGSC applies a detailed, four-level classification using the terms Class A, B, C and D. Apply these estimate classifications at the project stages as defined in the TOR. For projects required to be submitted to Treasury Board (TB) for approval: an indicative estimate shall be at least a Class D and a Substantive Estimate shall be at least a Class B.

3.2.1 Class D (Indicative) Estimate

Based upon a comprehensive statement of requirements, an outline of potential solutions and/or functional program, this estimate is to provide an indication of the final project cost that will enable ranking to be made for all the options being considered. This cost estimate shall be prepared in elemental analysis format. The level of accuracy of a Class D cost estimate shall be such that no more than a 20% design allowance is required.

3.2.2 Class C Estimate

Based on schematic/conceptual design and/or comprehensive list of project requirements, this estimate shall be adequately detailed and shall be sufficient for making the correct investment decision. This cost estimate shall be based on measured quantities of all items of work and prepared

in elemental analysis format. The level of accuracy of a Class C cost estimate shall be such that no more than a 15% design allowance is required.

3.2.3 Class B (Substantive) Estimate

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

This cost estimate shall be based on measured quantities of all items of work and prepared in elemental analysis format. The level of accuracy of a Class B cost estimate shall be such that no more than a 10% design allowance is required.

3.2.4 Class A (Pre-Tender) Estimate

Based on completed construction drawings and specifications prepared prior to calling competitive tenders, this estimate shall be sufficient to allow a detailed reconciliation and/or negotiation with any contractor's tender submission. This cost estimate shall be based on fully measured quantities of all items of work and prepared in both elemental analysis and Trade division format as per MasterFormat™. The level of accuracy of a Class A cost estimate shall be such that no more than a 5% design allowance is required.

4 Project Schedules

4.1 Schedule Format

Project schedules shall be submitted in the .mpp file extension (compatible with MS Project). The schedule shall include:

- major and minor milestones;
- activities representing discrete elements of work assigned to one person which:
    - are named using verb-noun combination (i.e. Review Design Development Report);
    - contain realistic durations in days;
- project logic linking activities with appropriate relationships finish-start (FS), finish-finish (FF), start-start (SS); and
- Identification of the critical path activities.

4.2 Progress Report

The progress report shall detail the progress of each activity up to the date of the report. It shall also include any logic changes made, both historic and planned; projections of progress and completion; as well as the actual start and finish dates of all activities being monitored.

The contents of each progress report will vary depending on the requirements at each project phase. A progress report should include:

- an executive summary;
- a narrative report;
- a variance report;
- a criticality report;
- an exception report (as required);
- the master schedule with cash flow projections; and
- the detailed project schedule (network diagram or bar charts).

4.2.1 Executive Summary

The executive summary should provide a synopsis of narrative, variance, criticality and exception report, and is not to exceed one page.

4.2.2 Narrative Report

The project narrative shall detail 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 Detailed Schedule, and Critical Paths.

4.2.3 Variance Report

The variance report, with supporting schedule documentation, should detail the work performed to date and compare work progress to work planned. It should summarize the progress to date and explain all causes of deviations and delays and the required actions to resolve delays and problems with respect to the detailed schedule and critical paths. The variance report shall be presented in the following format:

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

4.2.4 Criticality Report

The criticality report identifies all activities and milestones with negative, zero, and up to five days' Total Float. It is used as a first sort for ready identification of the critical paths, or near-critical paths, through the entire project. The criticality report shall be presented in the following format:

Paper size:	Letter
Orientation:	Portrait
Title format:	Project Title, Report Type, Print Date, Data Date, Revision Block
Body text:	Narratives for each report to match other reports
Columns:	Activity ID, Activity Name, Duration, Start, Finish, Activity % Complete, Total Float

4.2.5 Exception Report

The exception report shall be provided when unforeseen or critical issues arise. The Consultant shall advise the Departmental Representative and submit the details and proposed solutions in the form of an exception report. The report shall include sufficient description and detail to clearly identify:

- scope changes, including identifying the nature, reason, and total impact of all identified and potential project scope changes affecting the project;
- delays and accelerations, including identifying the nature, reason, and total impact of all identified and potential duration variations; and
- options enabling a return to the project baseline, including Identifying the nature and potential effects of all proposed options for returning the project within the baselined duration.

The exception report shall be provided in the following format:

Paper size:	Letter
Orientation:	Portrait
Title format:	Project Title, Report Type, Print Date, Data Date, Revision
Body text:	Narrative to match other reports

Paper size:	Letter
Orientation:	Landscape
Title format:	Project Title, Report Type, Print Date, Data Date, Revision
Columns	Activity ID, Activity Name, Duration, Remaining Duration, Start, Finish, Total Float

4.2.6 Master Schedule

A master schedule including cash projection shall be provided in the following format:

Paper size:	11X17
Orientation:	Landscape
Columns”	Activity ID, Activity Name, Duration, Activity % Complete, Start, Finish, Total Float
Footer format:	Project Title, Report Type, Print Date, Data Date, Revision Block
Sorting:	Early Start, then Early Finish, then Activity ID based on the WBS.

4.2.7 Detailed Project Schedule

A detailed project schedule shall be provided along with a network diagram or bar charts in the following format:

Paper size:	11X17
Orientation:	Landscape
Columns:	Activity ID, Activity Name, Duration, Activity % Complete, Start, Finish, Total Float
Footer format:	Project Title, Report Type, Print Date, Data Date, Revision Block
Sorting:	Early Start, then Early Finish, then Activity ID based on the WBS.

Appendix A Checklist for the Submission of Construction Documents

Date:	
Project Title:	**Project Location:**
Project Number:	**Contract Number:**
Consultant's Name:	**PWGSC Departmental Representative**
Review Stage (stages may vary at discretion of project team): **33% □ 50% or 66% □ 99% □ 100% □**	

Drawings\Design			
Item	**Verified by**	**Explanations**	**Action By**
1 Index			
1a The index shows a complete listing of drawing titles and numbers.			
2 Title Blocks			
2a The title block is as per the *PWGSC National CADD Standard*.			
3 Units			
3a All units of measure are metric.			
4 Trade Names			
4a Trade names are not used.			
5 Specification Notes			
5a There are no specification-type notes.			
6 Terminology			
6a The term "Departmental Representative" is used instead of "Engineer," "PWGSC," "Owner," "Consultant," or "Architect."			
6b 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.			
7 Information to be included			
7a The project quantities, configurations, dimensions, and construction details are included.			
7b References to future work and elements not in the tender documents do not appear or are kept to an absolute minimum and clearly marked.			

Drawings\Design			
Item	**Verified by**	**Explanations**	**Action By**
8 Quality Assurance			
8a Coordination review of the design between various disciplines has been completed by the Consultant.			
8b Constructability review of design has been performed.			
9 Signing and Sealing			
9a Every final drawing bears the seal and signature of the responsible design professional in compliance with various provincial jurisdiction requirements.			

Specifications			
Item	**Verified by**	**Explanations**	**Action by**
1 National Master Specification			
1a The current edition of the National Master Specification (NMS) has been used.			
1b Sections have been included for all work identified on drawings and sections have been edited.			
2 Index			
2a The index shows a complete list of specifications sections with the correct number of pages.			
3 Organization			
3a Either the NMS 1/3- or 2/3-page format or the Construction Specifications Canada full-page format is used consistently for the entire specifications.			
3b Each section starts on a new page and the project number, section title, section number, page number and date is shown on each page.			
3c The Consultant's name is not indicated.			
4 Terminology			
4a The term "Departmental Representative" is used instead of "Engineer," "PWGSC," "Owner," "Consultant," or "Architect."			
4b 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.			
5 Dimensions			
5a Dimensions are provided in metric only.			
6 Standards			
6a The current edition of all references quoted is used.			
7 Specifications Materials			
7a The method of specifying materials uses recognized standards. Actual brand names and model numbers are not specified.			
7b Materials are specified using standards and performance criteria.			

Specifications			
Item	**Verified by**	**Explanations**	**Action by**
7c Non-restrictive, non-trade name "prescription" or "performance" specifications are used throughout.			
7d The term "Acceptable Manufacturers" is not used.			
7e No sole sourcing has been used.			
7f If sole sourcing has been used, the correct wording has been used and a justification, estimate, and specification have been provided to the Departmental Representative for the sole-sourced products.			
8 **Measurement for Payment**			
8a Unit prices are used only for work that is difficult to estimate.			
9 Cash Allowances			
9a No cash allowances have been used or if they have, approval from the Departmental Representative has been received.			
10 Miscellaneous Requirements			
10a No paragraphs noted as "Scope of Work" are included.			
10b In Part 1 - General of any section, the paragraphs "Summary" and "Section Includes" are not used.			
11 Specification Coordination			
11a The list of related sections and appendices are coordinated.			
12 Health and Safety			
12a Section 01 35 29.06 – Health and Safety Requirements is included.			
13 **Subsurface Investigation Reports**			
13a Subsurface investigation reports are included after Section 31.			
14 Prequalifications			
14a There are no mandatory contractor and/or subcontractor prequalification requirements or references to certificates, transcripts, licence numbers of a trade or subcontractor, or other such documentation or item included in the bid.			

Specifications			
Item	**Verified by**	**Explanations**	**Action by**
15 Contracting Issues			
15a Contracting issues do not appear in the specifications.			
15b Division 00 of the NMS is not used except 00 01 07 (Seals Page) and 00 01 10 (Table of Contents).			
16 Quality Assurance			
16a There are no specification clauses with square brackets "[ ]" or lines "__" indicating that the document is incomplete or missing information.			
17 Signing and Sealing			
17a Every final specification bears the seal and signature of the responsible design professional as required. Seals and signatures shall be shown in NMS section 00 01 07.			

I confirm that the drawings 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 Drawings and Specifications Table of Contents Template

B.1 General

List all drawings by number and title.

For specifications, list all divisions, sections (by number and title), and the number of pages in each section.

B.2 Sample Table of Contents

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

DRAWINGS:

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

SPECIFICATIONS:

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

Appendix C Addenda Formatting Template

C.1 Instructions

To re-issue a drawing with an addendum:

- indicate the drawing number and title; and
- list the changes or indicate the revision number and date.

To re-issue a specification with an addendum:

- indicate the section number and title; and
- list all changes (i.e. deletions, additions, and replacements) by article or paragraph.

The addendum, drawings and specifications should be sent as separate files.

C.2 Sample Addendum

Date: _____

Addendum Number: _____

Project Number: _____

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

DRAWINGS:

1 A1 Architecture
  .1

SPECIFICATIONS:

1 Section 01 00 10 – General Instructions
  .1 Delete article (xx) entirely.
  .2 Refer to paragraph (xx.x),
  delete the following: …
  and replace with the following: …

2 Section 23 05 00 – Common Work Results - Mechanical
  .1 Add new article (x) as follows:

Appendix D Directory Structure and Naming Convention Standards for Construction Tender Documents

D.1 Electronic Submissions

Electronic submittals of drawings, specification and models shall be in the following format unless otherwise specified in the Terms of Reference or instructed by the Departmental Representative:

- On media burned to read only memory (ROM) on either CD-ROM or DVD+R where:
  - CD-ROMs comply with ISO 9660:1988 standards;
  - DVD+Rs are 4.7 GB, single-sided, single-layer and comply with ISO/IEC 17344:2006 standards;
  - media is “closed” upon completion of burning; and
  - media is usable in such a way that files may be accessed and copied from it.

If BIM model size is greater than storage capacity of a DVD, refer to Terms of Reference or contact the Departmental Representative for transmission instructions.

Some projects may require the Consultant to upload files to an electronic system outlined in the Terms of Reference or as instructed by the Departmental Representative.

D.2 Directory Structure

D.2.1 1st Tier Subfolder

The 1st tier of the directory structure shall be “Project ######” 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.

D.2.2 2nd Tier Subfolder

The 2nd tier of the directory structure shall consist of: “Bilingual - Bilingue”, “English” and “Français” folders. The folders of the 2nd tier cannot be given any other names since the Government Electronic Tendering System (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 subfolders of the 3rd tier.

D.2.3 3rd Tier Subfolder

The 3rd tier of the directory structure shall consist of: “Drawings - Dessins”, “Drawings”, “Models”, “Specifications”, “Reports”, “Dessins”, “Modèles”, “Devis” and “Rapports”. 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.

D.2.4 4th Tier Subfolder - Drawings

The 4th-tier subfolders for Drawings should reflect the various disciplines of the set of drawings. Because the order of appearance of the subfolders on the screen will also determine the order of printing, it is necessary to start with a number the identification name of the subfolders in the “Drawings – Dessins”, “Drawings” and “Dessins” folders. The first subfolder 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.

The 4th tier “Drawings” and “Dessins” folder shall follow the naming convention:

- 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 – Électrique

The numbering of the 4th tier subfolders is for sorting purposes only and is not tied to a specific discipline. For example, “Architecture” could be numbered 05 for a project where there is four other disciplines before “Architecture” in the set of drawings or 01 in another project where it’s the first discipline appearing in the set.

The order of the drawings shall be 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 subfolders 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-older will be printed in alphanumerical order before the drawings in the 02 sub- folder etc.);

Each drawing PDF file within each subfolder 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.).

D.2.5 4th-Tier Subfolders for Specifications

The “Specifications” and “Devis” folders must have 4th tier sufolders created to reflect the various elements of the specifications. Because the order of appearance of the subfolders on the screen will also determine the order of printing, it is necessary to start with a number the identification name of the subfolders in the “Specifications” and “Devis” folders.

The 4th tier subfolders 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

Numbering of the 4th tier subfolders 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 subfolders 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 subfolder will be printed, in alphanumerical order before the PDF files in the 02 subfolder, etc.).
- Each specifications PDF file within each subfolder 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.).

D.2.6 Directory Structure Example

The following is an example of the directory structure for the tender document, refer to previous sections for requirements, and use only sections applicable to the given project:

Project ######
- Bilingual – Bilingue
  - Drawings – Dessins
    - 01 - Drawing List – Liste des dessins
    - 02 – Demolition – Démolition
    - 03 – Architecture – Architectural
    - 04 – Civil – Civil
    - 05 – Landscaping - Aménagement paysager
    - 06 – Mechanical – Mécanique
    - 07 – Electrical – Électricité
    - 08 – Structural - Structural
    - 09 – Interior Design – Aménagement intérieur
- English
  - Drawings
    - 01 - Drawing List
    - 02 – Demolition
    - 03 – Architecture
    - 04 – Civil
    - 05 – Landscaping
    - 06 – Mechanical
    - 07 – Electrical
    - 08 – Structural
    - 09 – Interior Design
    - …
  - Models
  - Specifications
    - 01 – Index
    - 02 – Divisions
    - 03 – Appendices
  - Reports
- Français
  - Dessins
  - Modèles
  - Devis
  - Rapports

D.3 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 subfolder of the directory structure.

D.3.1 Drawing File Names

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

X### - Y

Where:

X = the letter or letters from the drawing title block (“A” for Architecture 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 subfolders must be named with the same letter (“A” for Architecture 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 subfolder 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 subfolder, 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.

D.3.2 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 drawings 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.

D.3.3 Documents Other Than Specifications Divisions

Because PDF files within the Specifications subfolders are sorted alphanumerically (in ascending order) for both on screen display and printing order, all files that appear in folders other than the “Divisions” subfolder 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 – Drawings and Specifications Index

D.3.4 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 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.

D.4 Media Label

The CD-ROM or DVD+R shall be labeled with the following information:

Project Number / Numéro de projet

Project Title / Titre du projet

Documents for Tender / Documents pour appel d’offres

Disk X of/de X

Example:

Project 123456 / Projet 123456

Repair Alexandra Bridge / Réparation du pont Alexandra

Documents for Tender / Documents pour appel d’offres

Disk 1 of/de 1

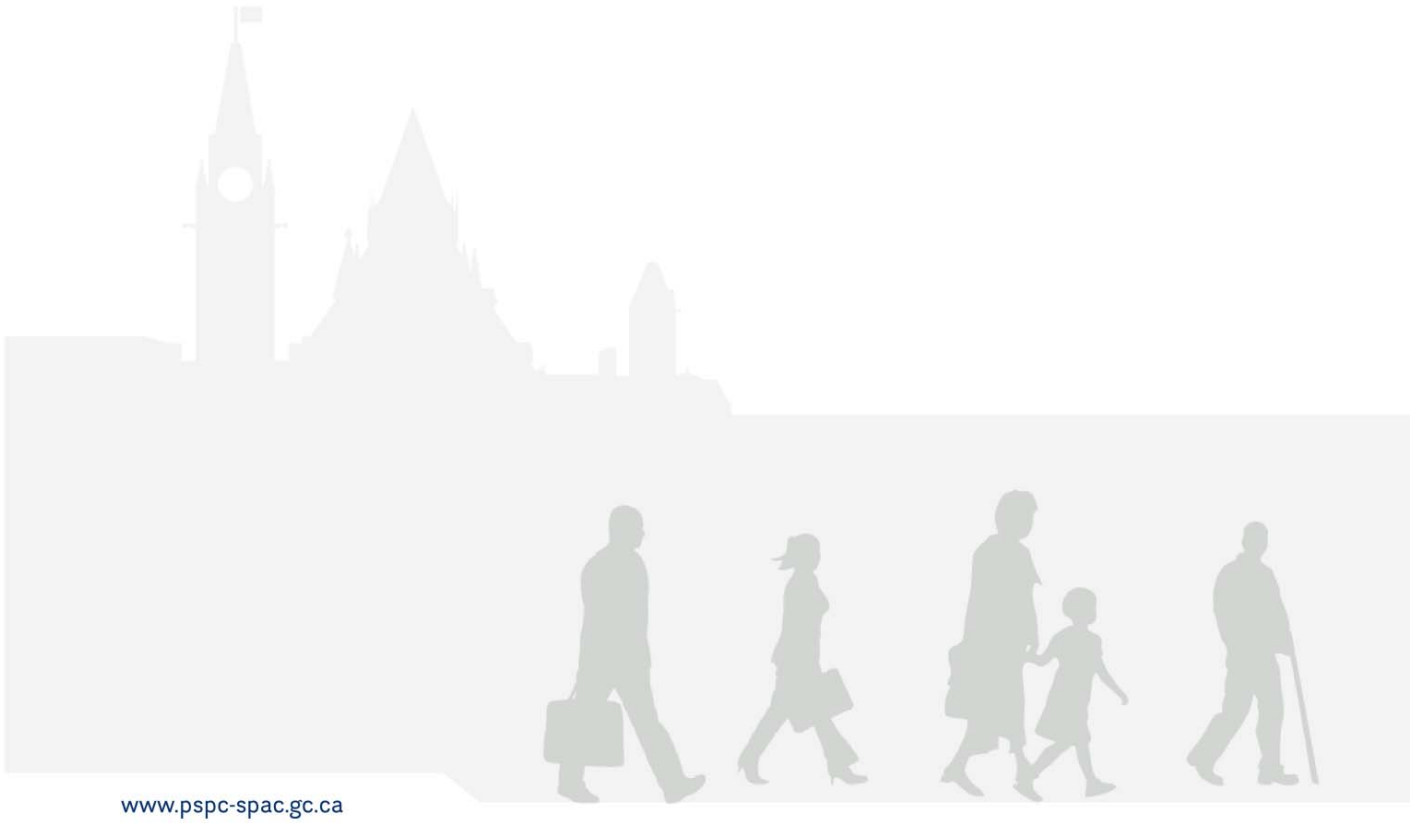
Public Services and Procurement Canada | Services publics et Approvisionnement Canada

Canada

Respect • Integrity • Excellence • Leadership

Serving GOVERNMENT, Serving CANADIANS.

TECHNICAL REFERENCE FOR OFFICE BUILDING DESIGN



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Revisions

Version	Date	Description
1.0	May 27, 2016	Original issuance.
1.1	March 6, 2017	Issuance of draft version to Federal / Industry Real Property Advisory Council (FIRPAC) for consultation. The document is renamed to the Technical Reference for Office Building Design, and has a re-written general section, and various edits to the technical content.
2.0	April 3, 2017	Issuance for use under the RPB Policy Framework. Contains edits to technical content of the electrical section, additional requirements for accessible washrooms, improved translations of the French version and minor edits to the scope.
2.1	July 20, 2017	ISBN and catalogue numbers added for publication.

Table of Contents

1 General

1.1 How to Use This Document

This document describes both the general approach to the design of Public Service and Procurement Canada (PSPC) custodial office buildings, and the technical aspects that apply to each major discipline involved in the design. These objectives must always be balanced against all other government objectives including, but not limited to, security, accessibility, sustainability, heritage conservation and end user requirements.

When using this technical reference, apply common sense and ensure best value to Canadians. The application of this document must always be interpreted and considered, both at the scoping stage and throughout design development, by a project team following an integrated design approach to question the validity of each of its components against the problem at hand.

This technical reference is a generic document, while appropriate project-specific requirements can be found in the request for proposal (RFP).The technical reference should be applied to new buildings in their entirety and to renovations of existing buildings, given their constraints, to the greatest extent possible. In its application to renovations of existing buildings, the document is not intended to be applied retroactively. As such, the opportunity to incorporate changes to meet these objectives should be considered as part of the scope of all renovation projects that involve related aspects of planned work. The requirements in this document should not be considered as justification to initiate a project but as minimum requirements.

1.2 Effective Date

April 3, 2017

1.3 Cancellation

This document supersedes *National Performance Standards (NPS)*, and draft Real Property Branch (RPB) *Federal Office Building Standard* (FOBS).

1.4 Authority

This document is issued under the authority of the Director General (DG) Technical Services, Real Property Branch (RPB), Public Services and Procurement Canada (PSPC).

1.5 Context

This document is issued pursuant to the *Department of Public Works and Government Services Act* which states that the roles, duties and functions of the department's minister include:

- the construction, maintenance and repair of public works, federal real property and federal immovable;
- the provision of accommodation and other facilities for departments; and
- the provision to departments of advice on or services related to architectural or engineering matters affecting any public work, federal real property or federal immovable.

The document also supports the PSPC *Sustainable Buildings Policy* and complements *Government of Canada Workplace 2.0 Fit-up Standards*.

1.6 Scope

This technical reference applies to construction projects undertaken by PSPC or by the private sector on behalf of PSPC on crown owned buildings for which PSPC is custodian and for which the predominant

use is office accommodations. This includes buildings predominantly used to offer office space categories such as general administrative, secure administrative, quasi-judicial office space, and call/contact centres.Variances from this technical reference must be justified in writing and submitted for acceptance to the regional PSPC office for Architecture and Engineering Services (AES).

The requirements of this document are not retroactive to existing buildings but do apply to renovation projects to the extent practical given existing conditions.

1.7 Purpose

The purpose of this document is to establish baseline building design and technical requirements for office buildings in order to ensure:

- office buildings are built to a high level of quality that meet operational needs;
- office building requirements are clearly defined and applied consistently by private sector service providers and PSPC staff;
- the design and construction of office buildings contributes to meeting Government and PSPC sustainability targets;
- design excellence;
- sound stewardship of our federal identify; and
- the design and construction of office buildings presents best value to the crown.

1.8 Enquiries

Enquiries about this document should be directed to the Director of Architecture and Engineering Services, Technical Services, Real Property Branch, Public Services and Procurement Canada at: TPSGC.dgbisag-rpbaes.PWGSC@tpsgc-pwgsc.gc.ca.

2 General Design Objectives

Most of the interactions between the federal government and Canadians occur in buildings delivered by PSPC. The quality of these buildings must project a consistent and positive image of the Government of Canada to the public. Design solutions must:

- meet the standards prescribed in this document, and 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 adaptable to future uses and changing priorities.

The general design objectives noted below must be incorporated and applied to all design solutions for office buildings:

- functional suitability
- health, safety, universal accessibility, and security
- sustainable and enduring development
- creativity, innovation, and technical competence
- inspiring and attractive
- financial performance based on life-cycle costing
- heritage conservation
- environmentally responsible

2.1 Functional Suitability

Ensure design solutions are appropriate to their use and consider the 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.

2.1.1 Code and Standard Versions

The design solutions must comply with all applicable federal laws, regulations and the codes referenced therein. This document references many codes and standards in a dynamic manner, meaning that for all codes and standards referenced, refer to the latest version published. For a full listing of codes and standards referenced in this document, refer to section 13.This is not an exhaustive list of all applicable codes and standards.

2.1.2 Provincial Requirements

When provincially mandated inspections are required in order to facilitate a utility connection or ensure safety of a system through a provincial inspection, the provincially adopted version of a code or standard may be applied to the project.

2.2 Sustainable and Enduring Development

PSPC is committed to the principles of sustainable development in all of its operations. The principles of sustainability must be incorporated in all phases of project delivery, especially in the initial stages when most of the key decisions are made. The building's design for energy use must be optimized through an integrated design approach with all disciplines. It must also meet the performance requirements outlined below as well as those listed throughout this document.

Ensure design solutions maximize a sustainable approach aimed at:

- improving the social value to support more livable communities;
- creating economic efficiencies; and
- reducing our environmental footprint by reducing, recycling, and reusing.

Design solutions must:

- meet the Leadership in Energy and Environmental Design (LEED) Gold for new buildings, alternately Level 4 Green Globes, and meet the *National Energy Code of Canada for Buildings*;
- meet the LEED Silver for renovations, alternately Level 3 Green Globes, and meet the *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 the local climate to ensure the durability and high performance of building systems;
- have an effective choice of building materials and systems to ensure durability and meet pre-determined durability targets set out for each project;
- be consistent with the Federal Sustainable Development Strategy (FSDS); and
- Comply with CSA-S478-95 Guidelines on Durability in Buildings.

2.3 Creativity, Innovation, and Technical Competence

Ensure design solutions demonstrate creativity, innovation, and technical competence in their approach to the functional 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;
- demonstrate technical competence in the integration of design, building science, and engineering disciplines; and
- provide best value to the Crown over the life cycle of an asset.

2.4 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;
- be recognizable as a federal office building, reflecting a positive image of the Crown and its core value of long-term sustainability;
- integrate visually within the unique context of the area; and
- provide clarity and consistency of architectural form and detailing.

2.5 Financial Performance Based on 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 the use of a life-cycle approach to the financial performance of the asset from construction to demolition; and
- be evaluated using life-cycle cost analysis according to industry best practice.

2.6 Heritage Conservation

The requirements of this document are not retroactive, however, major rehabilitation projects of federal heritage buildings should seek to address as many of the principles outlined within this document as possible while still respecting the *Standards and Guidelines for the Conservation of Historic Places in Canada*.

2.7 Environmentally Responsible

PSPC must meet applicable environmental legislation and policies. PSPC is committed to sustainable development, applying it across all business practices, in compliance with environmental laws and regulations, in using environmentally beneficial products and services, and in using resources in a sustainable manner.

The essential principles of environmentally responsible design and construction include:

- Site - Optimize site potential
- Energy - Minimize non-renewable energy consumption
- Materials - Use efficiently environmentally preferable products
- Water - Protect and conserve water
- Indoor Environmental Quality - Enhance indoor environmental quality
- Operations and Maintenance - Optimize operational and maintenance practices over the full life cycle of the facility

These principles serve as the basis for planning, programming, budgeting, construction, commissioning, operation, maintenance, decommissioning of all new PSPC facilities, and for major renovation and alteration of existing buildings and facilities.

2.7.1 Prohibited Materials

The use of the following materials is prohibited on all PSPC projects:

- products containing asbestos;
- products containing pure formaldehyde;
- products containing polychlorinated biphenyls;
- products containing chlorinated fluorocarbons;
- solder or flux containing more than 0.2 percent lead and domestic water pipe or pipe fittings containing more that 8 percent lead; and
- Surface coatings with a concentration of lead in excess of 0.009 percent by weight, as per the *Hazardous Products Act's* Surface *Coating Materials Regulations*.

2.7.2 Demolition/Remediation

Paint must be tested for lead content when alteration or demolition requires sanding, burning, welding or scraping painted surfaces. Do not abate lead-based paint when a painted surface is intact and in good condition, unless required for alteration or demolition. In child care centers, test all painted surfaces for lead and abate surfaces containing lead-based paint.

2.7.3 Removal of Asbestos-Containing Materials

Asbestos abatement is under the jurisdiction of provincial governments and PSPC applies processes and procedures that are consistent with the relevant requirements and regulations. Ensure that the asbestos management plan meets all applicable requirements.

Prior to design in a facility to be renovated, a building evaluation should be performed by a qualified inspector including a review of previous inspection reports and a site inspection. If asbestos damage or the possibility of asbestos disturbance during construction activity is discovered, an asbestos management plan shall be proposed and implemented. (Ref. DP 057, Asbestos Management).

All design drawings and specifications for asbestos abatement shall be produced by a qualified specialist. In general, projects should be designed to avoid or minimize asbestos disturbance. The environmental standards vary in each provincial / territorial jurisdiction and should be supplied by PSPC.

All PSPC construction work that disturbs asbestos shall be performed using appropriate controls for the safety of workers and the public.

2.7.4 Fuel Storage Systems

Storage tank systems must comply with applicable *Canadian Environmental Protection Act* (CEPA). The owner of the storage tank system must identify and register the storage tank system with Environment Canada. Under the Regulations, both the owner and the operators of storage tank systems must comply with the Regulations. The owners and operators both share the responsibility to prevent leaks and spills, report spills, implement emergency response and exercise due diligence in everyday actions.

Storage tank systems are also regulated under one or more of the following federal regulations: the *Canadian Council of Ministers of the Environment (CCME) Code of Practice*, the *National Fire Code of Canada* and the Installation for oil-burning equipment, CSA B-139-09.

If a leak is detected / discovered, the owner or operator (i.e. the property manager or his representative) shall notify Environment Canada and the provincial authority and provide all information requested.

2.7.5 Compliance with the Canadian Environmental Assessment Act (CEAA)

The *Canadian Environmental Assessment Act* (CEAA) assesses the impacts of a project on the surrounding environment which includes the natural environment, health, socio-economic conditions, and the physical and cultural heritage. Its purpose is to promote sustainable development to ensure that environmental impacts of projects are minimized and that the process is open and participatory.

An Environmental Assessment (EA) is a planning and decision making tool which is used to predict and identify environmental effects before they occur, plan mitigation to be incorporated into project design and determine whether a project should proceed. Ensure that EA checklist requirement is completed.

3 Site

The site provides the first impressions to Canadians of a federal office building. The Real Property Branch (RPB) is a custodian of real property assets and a provider of general-purpose office accommodations to federal departments. RPB's goals include:

- meeting the custodial requirements of accommodation as per Treasury Board standards;
- 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;
- meeting applicable environmental legislation and policies to ensure protection and preservation of ecological zones and habitats; and
- meeting the various site-development requirements of Leadership in Energy and Environmental Design (LEED) or Green Globes pre-established for the project.

3.1 Site-Specific Analysis

A site-specific analysis report must be prepared for each project illustrating 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.

3.2 Urban Design

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

3.2.1 Design Objectives

Urban design is important to ensure an appropriate "fit" of the facility within the urban environment. The building's form and adjacent open space areas must be integrated to ensure a cohesive, sensitive solution. Urban design objectives include:

- demonstrating compatibility with the physical characteristics of the area and the environment surrounding it, including neighbouring land uses;
- 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; and
    - preserving and protecting the ecological features and the heritage and cultural values of the community;
- supporting the livable qualities of the neighbourhood and community by:
    - building massing that includes adequate setbacks proportional to the 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; and
    - illustrating a respect for human scale and use at the 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, and bus shelters with the building's design to assist in improving the functionality of the streetscape and neighbourhood;
- locating service entrances away from active public streetscapes, and if space is limited, designing service entrances so they are screened from the street in order to preserve the sense of place and aesthetic appeal of the streetscape, while ensuring that there is no manoeuvring or backing in from the street; and
- the use of crime prevention principles through environmental design for the planning of the site, including taking advantage of opportunities for passive surveillance and territorial control.

3.2.2 Master Planning

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

- the site's capacity to accommodate the building or building complex's functional, operational, and experiential components;
- the natural and built environment, including topography and climatic conditions;
- the surrounding context of the site in relation to:
  - rural, suburban, and urban core contexts;
  - neighbourhood and streetscape typologies;
  - heritage designations;
  - servicing;
  - emergency access; and
  - public transit opportunities;
- the projected growth and development of the surrounding area;
- the on-site circulation of employees, business operations, functional requirements, public transit links, and general public use;
- all applicable legislation 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 costs, risks and other issues associated with the site's development.

Furthermore, master planning for a multiple-building complex or campus must incorporate open areas, which can be either adjacent to the building or at another location as determined by the site master plan.

In addition, security elements must be integrated with the site design and building design.

3.3 Landscape Architecture

The intent of landscape architecture design for federal office buildings is to provide integrated design and technical solutions to create liveable and sustainable environments. At varying scales of planning, design, and management, design strategies must encompass innovative and creative built-site infrastructure utilizing natural landscape elements to support and enhance federal office buildings.

3.3.1 Design Objectives

The objective of this section is to establish sound landscape architectural design requirements for federal office buildings. Sites for federal office buildings range in scale from single buildings in urban and rural settings to large campuses, precincts, and districts. Landscape architecture design objectives are to:

- create a well-developed site that will support and enhance the building's function and operation;
- enhance the user's outside experience;
- 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; the reducing, recycling, and reusing of materials; and other sustainable practices and strategies;
- support and enhance the social values by applying universal accessibility best practices for all main access and exit points to buildings and sites, parking, and other amenities; and
- ensure low-maintenance solutions to create operational efficiencies.

3.3.2 Site Design

Site design strategies must utilize the local climate and 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 occupants and visitors;
- 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 view lines to and from the site;
- demonstrating how the design of the exterior circulation systems and site amenities supports the building's functionality, such as selecting appropriate locations for principal building entrances and key destination points that are easily identifiable when approaching the building; and
- demonstrating how wayfinding and orientation systems are efficient and effective and assist in preserving the cultural and aesthetic values of the landscape surrounding the building.

3.3.3 Technical Requirements

3.3.3.1 Site Areas

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

- designed with natural 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 the 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 and assist in achieving reductions in heat and glare on hard surfaces, as well as to contribute to the general enhancement of pedestrian health and comfort; and

- planned with the intent of integrating planting in and around the building and parking area in order to promote visual surveillance for safety and security.

3.3.3.2 Circulation

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

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

3.3.3.3 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 the site on a ratio of two new trees for every tree removed; and
- integrated pest management using, where possible, natural predators to control infestations and monitoring programs where infestations have occurred.

3.3.3.4 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:

- reuse materials, where possible, through efficient excavation;
- minimize the transport and placing of excavated materials to limit compaction;
- avoid the potential for settlement resulting from compression of the underlying soils;
- 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.

3.3.3.5 Site Drainage

The site drainage planning must include the development of a strategy to minimize the volume of stormwater and snowmelt 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:

- the use of above- and below-ground, sustainable green infrastructure stormwater control systems and site design such as the elimination of concrete curbs;
- incorporation of an integrated stormwater retention and detention system for the roof in order to reduce stormwater runoff and, where applicable, to provide irrigation;
    - for example, implementing a green roof or rainwater harvesting strategy should be considered, the viability and effectiveness of which must be clearly demonstrated;
- the provision of grey water irrigation to assist on-site vegetation growth if irrigation is required; and
- the 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 criteria must be respected:

- all surface stormwater runoff must be addressed on-site;
- a major drainage system must be designed to address a 1:100 year storm event;
- where a minor drainage system is required, it must be designed to address a 1:5 year storm event; and
- storm drainage systems must rely on gravity flow wherever possible.

3.3.3.6 Soil Erosion

Site planning and design must include strategies to 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 the erosion and sediment control requirements of the provinces and municipalities; and
- mitigate risk of erosion of the embankments and sloped areas, especially those that could impact riparian zones, waterways, and stormwater retention ponds.

3.3.3.7 Site Furniture

The design and provision of site furnishings and shaded rest stops are an important aspect of site planning. The requirements of the functional program must be met and the selection of furnishings must:

- fit with the design concept for the building and surrounding site;
- be made of durable long-lasting materials; and
- require little or no maintenance.

3.3.3.7.1 Bicycle Storage

Secured bicycle storage for 5% or more of the regular building occupants should be provided within 60 m of the building. Bicycle racks should be placed in a location that is convenient to riders, such as a parking garage, parking lot or near a building entry. Bicycle racks should be located to avoid potential conflicts between cyclist and pedestrian traffic and also ensure that users do not cut across turf or planting areas. This location should be highly visible by building occupants, security personnel, security monitoring systems or by general traffic or in a secure (locked) area for use only by employees. Racks should have provisions for locking bicycles to them. Bicycle racks should be compatible with other site

furnishings and with the architectural and landscape design. Bicycle storage requirements should also be reviewed in conjunction with local regulations.

Materials for outdoor bicycle racks should be very durable and resistant to vandalism. Movable racks can be an important component in effective outdoor spaces. However operational considerations must be given as to the risk of theft and their storage. Metals that require repainting should not be permitted.

3.3.3.8 Site Lighting

Site lighting designs must achieve necessary light pollution reduction. Refer to section 8, Electrical Engineering, for additional requirements. Designs must:

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

3.4 Civil Engineering

3.4.1 Design Objectives

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

- aligning with provincial and municipal requirements found in official plans, zoning bylaws, technical standards, and other design and technical guidelines for the development of sites;
- integrating the project requirements of the utility and services authorities having jurisdiction, including those related to equipment installation, access, maintenance, and replacement;
- locating piping for all systems under dedicated service corridors or vehicular circulation routes to ensure year-round accessibility for maintenance;
- addressing trenching to minimize differential frost settlement of the cuts, reduce the settlement effects of trenches and pipes, as well as ensure frost protection of the pipes;
- controlling stormwater and sanitary sewage to meet the 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; and
- providing sanitary systems separate from stormwater systems.

3.4.2 Water Supply Services

The planning and design of water supply services for a campus must include the requirements to use a loop system fed from more than one source and to configure the entire distribution network 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:

- the system design must confirm the 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:
    - the National Building Code of Canada;
    - the National Fire Protection Association NFPA 24: *Standard for the Installation of Private Fire Service Mains and Their Appurtenances*; and
- domestic water demands (peak and average) must be met;
- service lines to buildings are to be grounded as required by the *Canadian Electrical Code,* specifically the use of 3.0 m minimum metallic, continuous ductile iron or copper piping outside the building footprint is the preferred method of grounding;
- modular wall seals must be provided at water service entries to buildings; and
- cathodic protection of water mains and associated appurtenances must be provided based on soil and groundwater conditions and municipal standards.

3.4.3 Stormwater Management Services

Stormwater management services must be integrated with landscape architectural requirements for surface water flows. Refer to section 3.3.3.5, Site Drainage, 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 conditions;
- optimization of on-site water detention; and
- stormwater system components that meet the following requirements:
    - catch basin leads must be a minimum of 200 mm in diameter;
    - maintenance holes must be a minimum of 1200 mm in diameter;
    - sumps must be provided in maintenance holes and catch basins; and
    - safety platforms must be provided in maintenance holes that are more than 5.0 m deep.

3.4.4 Site Grading

Site grading must be integrated with landscape architectural design requirements. Refer to municipal requirements and to section 3.3.3.4, Site Grading, for detailed requirements.

3.4.5 Sanitary Services

On campuses, the sanitary sewer system design for individual buildings must be integrated with landscape architectural design requirements.

In rural areas, follow the requirements of the provincial and municipal authorities having jurisdiction for septic systems for on-site sewage treatment. Cesspools are not permitted.

The sanitary system of individual sites and buildings must be sized to accommodate “peak waste flow” as well as the long-term needs of the site. The system must meet the following design and technical requirements:

- cleanouts are to be located in the interior of the building, and maintenance holes must be provided where exterior access is required;
- municipal requirements as well as local guidelines of leakage allowances must be followed, and these design values for extraneous flow rates must be included in calculating peak sanitary flows; and

- pipe velocity flow rates must be confirmed after construction and data must be submitted as part of the commissioning process;
- sanitary system components must meet the following requirements:
    - sanitary sewers must be a minimum of 200 mm in diameter;
    - maintenance holes must be a minimum of 1200 mm in diameter;
    - maintenance holes must be benched;
    - external drop pipes must be provided for maintenance holes where the inlet elevation exceeds 600 mm or in accordance with the local authority having jurisdiction; and
    - safety platforms must be provided in maintenance holes that are more than 5.0 m deep.

4 Architecture and Interior Design

4.1 Design Objectives

The site, setting, and appearance of a federal building contribute to the image of the Government of Canada. In this context, the base building design of 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 also be integrated into the design of the building.

Federal buildings must have a load factor ranging from 1.1 to 1.3 based on the 2010 American National Standards Institute / Building Owners and Managers Association ANSI/BOMA Z65.1-2010: *Office Buildings: Standard Methods of Measurement* using Method B. Buildings must also meet the following technical performance standards with reference to other detailed requirements in sections 6, Mechanical Engineering, and 8, Electrical Engineering:

- the building must meet a maximum air leakage rate of 0.20 air changes of building volume per hour at the standard building pressure of 50 N/m2, and all buildings must undergo air leakage testing to confirm that this target level of airtightness is met;
- the building must be designed to minimize stack effect, and solutions to achieve these objectives must be identified; and
- the building design service life is to be a minimum of 50 years according to CSA S478: *Guideline on Durability in Buildings*.

4.2 Building Common and Service Areas

4.2.1 Entrances

The building must be designed to direct the visitor to a principal entrance, which must be conveniently located, have a grade-level approach based on existing site conditions, as well as be clearly articulated on the exterior of the building. Secondary and tertiary entrances must also be clearly articulated on the exterior of the building.

Building entrances 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;
- provide conventional swing doors and a vestibule at the principal and secondary entrances, revolving or sliding doors may;
- provide a personnel door for exterior overhead door locations;
- incorporate building and wayfinding signage in compliance with the applicable treasury board federal identity policies, including standard federal signage mounted on a prominent facade and a flagpole mounted on a facade or the 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.

4.2.2 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 in the daytime and at night;
- have the elevator lobby and main building lobby located such that they are visible from the building entrance vestibules;
- be laid out to allow a continuous flow of pedestrian traffic with space large enough to accommodate all employee traffic during peak hours;
- provide interlink ground floor entrance areas from the street and the parking lot areas;
- accommodate circulation requirements that include additional floor area for a visitor and a security desk approximately 24 m^2 in size 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, including elevator lobbies and escalator lobbies;
- be designed to adhere to security requirements (see section 10, Security);
- utilize durable interior finishes for all areas and high-impact-resistant finishes for areas with heavy pedestrian traffic, using finishes that can be easily cleaned and maintained (painted gypsum wallboard [GWB] is not considered durable);
- have appropriate decorative or accent lighting to support the design concepts; and
- at least one accessible washroom must be provided in close proximity to areas where public events may be held.

4.2.3 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 Leadership in Energy and Environmental Design (LEED) requirements, with the workstations located no more than 12 m from the window wall.

Planning of office floor plates must be flexible to allow the subdivision of typical floors into a minimum of two separate tenant areas while not compromising life safety for occupants.

There must be an acoustic separation of sound transmission class (STC) 52 between the building core and occupant areas.

Requirements for building support areas and inter-relationships determined by the functional program must be achieved in the design.

4.2.3.1 Elevators

All occupied areas of a federal multi-story building must be served by at least one passenger elevator. Elevator cab sizes, class, and service capacity are to be determined through an elevator traffic capacity, wait times, and system analysis. Elevators must meet the following design and technical requirement:

- passenger elevators, if more than one, must be grouped in banks of at least two for efficiency;
- travel distances from a given office or workstation to an elevator must not exceed 60 m;
- the location of stairs and their design within buildings must be inviting and encourage their use rather than elevators, to the fullest extent feasible;
- if no separate freight or service elevator is provided, one passenger elevator must be designated as a service elevator;
- a freight elevator must be provided for midrise and higher office buildings;

- a minimum ceiling height of 2.7 m is required in service elevator cabs, and freight elevators must have a ceiling height of no less than 3.7 m;
- elevator wait times must be no more than 24 to 27 seconds during the morning peak time and no more than 31 to 35 seconds during the noon peak time;
- the number of passenger elevators must be determined by the elevator traffic and system analysis;
- provide shuttle elevator(s) from the ground floor lobby to below grade parking with fully automatic operation with selective-collective operation. Capacity must be based on anticipated traffic flow and system analysis; and
- where equipment penthouses are provided, service elevators must provide access to that level.

A non-proprietary elevator control system must be used, and the PSPC project manager must define the extent of control. Destination control systems must be used. Security controls must be installed with override systems as required by the functional program.

Passenger elevator 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, and walls and ceilings must be metal. Flooring must durable, non-slip, easily maintainable, and replaceable.

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

All elevators must meet the requirements for firefighters emergency operation, with the service elevator designated as the dedicated firefighters elevator for the building.

4.2.3.2 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.

4.2.3.3 Mechanical and Electrical Rooms

Mechanical and electrical 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:

- mechanical rooms must be located to minimize heat and sound transmission 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;
- equipment rooms must have hoists, rails, and fasteners for chains to facilitate installation or removal of heavy equipment;
- easy access must be provided to roof-mounted equipment by an elevator cab stop or a large stairway to facilitate maintenance, and temporary ladders, steep stairwells, and ship’s ladders must not be used;
- main mechanical and electrical equipment rooms (such as mechanical penthouses or basement rooms) must not be less than 3.6 m clear in height from the underside of the structure;

- doorways and corridors to the building exterior must be of adequate size to permit the replacement of equipment; and 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 the main secondary switchgear must not be located below garage ramps, washrooms, or janitor closets or be at an elevation that requires sump pumps for drainage;
- transformer vault rooms and emergency generator rooms must be located following the requirements of the local authority having jurisdiction;
- floor-mounted electrical and mechanical equipment such as switchgears, main building transformers, motor control centres and generators, chillers, boilers, pumps, air-handling units, electric motors, motor starters, and tanks must be set on concrete housekeeping pads, curbs, or saddles at least 100 mm thick and at least 100 mm wider on all sides than the equipment they support; and
- fuel tanks or storage tanks must have a housekeeping pad that incorporates a raised barrier of adequate volume for spill containment.

4.2.3.4 Vertical Shafts

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

- shafts must be straight vertical runs for services;
- shafts must be sized 20% larger in area to accommodate planned expansion of the systems; and
- bus ducts require a raised containment curb edge at floor slab penetrations, and sleeves are to continue to 75 mm above the floor slab.

4.2.3.5 Washrooms

Washrooms must be located adjacent to vertical shafts at the building core. At least one washroom on each floor must be accessible, meeting the requirements of CSA B 651 *Accessible Design for the Built Environment*.

They must be designed with water-resistant, easily maintainable, durable finishes on all walls and floors. A mirror must be provided above each sink, or a continuous mirror provided across the entire 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 must have two recessed waste receptacles, in stainless steel, one for paper towels and one for garbage. Washroom plumbing fixtures must be of a low-flow specification in all areas except basement areas.

4.2.3.6 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.

4.2.3.7 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 a minimum area of 20 m^2 in the basement, on the ground floor adjacent to loading docks, and in the rooftop penthouse. Coordinate requirements with the functional program.

4.2.3.8 Janitor Closets

Janitor closets must be directly accessible from the office floor corridor and discretely located near the washroom facilities.

4.2.3.9 Recycling Centres

Corridor areas must be provided with multi-material waste and recycling recesses. A minimum of three containers is typical: one each for recyclables, mixed recyclables, and compostables. However, the requirements must be confirmed with building management. A minimum of one station per floor or one station per 1000 m^2 must be provided.

4.2.3.10 Waste Management Rooms

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

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

4.2.4 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 the requirements of the building-specific functional program.

4.2.4.1 Security Control Centre

The security control centre must be located adjacent to the main lobby. Approximately 20 m^2 must be allocated for this room, which will require rough-in of specialized conduit in the floor slab and ceiling areas for the workstations. Rough-ins are also required for the building automation system (BAS), the emergency power system, as well as the fire alarm annunciator panel.

Planning for a security command centre and inspection station must be considered if it is not required at the time of building design. The security control centre design criteria outlined above must be used in conjunction with the Royal Canadian Mounted Police (RCMP) physical security guide G1-013: *Security Control Centre Space Requirements*.

4.2.4.2 Loading Docks, Shipping, and Receiving

The loading docks and shipping and receiving areas are to be available to PSPC 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 the following:

- 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 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;
- the edges of loading docks must be protected with edge guards and bumpers; and
- spot lighting must be provided to illuminate the inside of trailers for the loading and unloading activities.

4.2.5 Structured Parking

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

- structures and parking spaces must be laid out for maximum efficiency;
- parking stalls must be full-sized, and compact vehicle-sized parking stalls are not to be provided;
- two-way aisles must have a minimum width of 6.7 m, one-way aisles a minimum width of 3.6 m, and parking spaces must be a minimum of 2.6 m wide and 5.2 m long;
- preferential parking spaces are to be provided for accessible parking and for electric vehicles with 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 are to use bollards and guardrails to safeguard routes;
- entrances and enclosures of elevator lobbies must be located so that they are visible from the interior of the parking facility, and must have a glazed wall area that is a minimum 50% of the total wall area;
- 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), and each stall must have direct access to an aisle;
- the entire length of the entrance and exit ramps must be protected from snow and ice, and snow and ice must not accumulate on the ramps;
- all vehicular entrances to structured parking are to be secured with overhead doors or grilles that must be electric-powered, on an emergency power circuit, and operated by card-readers or other means of remote control;
- garage openings must have a minimum width of 3.6 m and a minimum height of 2.4 m, and must be monitored by video camera;

- the clear height throughout the vehicular accessible areas of a parking structure must not generally be lower than 2.25 m; and
- a headache bar, with signage indicating the clear height, must be provided in front of each garage 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. In addition, pedestrian crossings of vehicular circulation lanes must be identified.

4.3 Building Envelope

The objective is to have a building envelope that provides an effective separation between the interior and exterior environments to ensure the comfort of occupants and meet passive solar and energy consumption goals. The exterior enclosure must have a high level of refinement in the aesthetic expressed by the proportions, scale, and relief as well as the materials and colours used.

4.3.1 Exterior Wall Assemblies and Components

The exterior building envelope must be designed in accordance with the "rainscreen" principle. Face-sealed envelope systems must not be used. The envelope must meet or exceed the requirements established in the CSA S478: *Guideline on Durability in Buildings*. Design and technical requirements include the following:

- walls must have a minimum 50-year full service life and at least 30 years of service life prior to a major rehabilitation;
- windows must have a minimum 25-year full service life and at least 15 years of service life prior to a major rehabilitation of gasket and seal replacements;
- roofs must have a minimum 20-year full service life;
- the exterior wall design must provide complete control of the migration of heat, air, and moisture through the building enclosure, and minimizing risk of moisture-related failures must be prioritized in the design of exterior walls;
- the cladding design must have the means to evacuate moisture from the wall assembly and must comply with the American Society of Heating, Refrigerating and Air-Conditioning Engineers ASHRAE 160: *Criteria for Moisture-Control Design Analysis in Buildings;*
- the percentage of vision glazing and the energy performance characteristics of glazing selected for facades must reflect passive solar design best practices, and vision glazing is not to exceed a maximum of 40% of the envelope areas;
- curtain walls must be a pressure-equalized rainscreen design;
- curtain walls and windows must use high thermal performance thermally broken, metal frames with high-performance glazing units;
- metal and glass cladding systems must meet the requirements of the American Architectural Manufacturers Association and CSA Group's AAMA/CSA 101-A440 *North American Fenestration Standard / Specification for Windows, Doors, and Skylights* in terms of maximum air leakage, as well as meet the performance class AW40;
- opaque wall assemblies must be a pressure-equalized rainscreen design and must reduce thermal bridging to a minimum, to less than 5% maximum of the wall area;
- window wall assemblies are not permitted for multi-storey buildings; and

- a thermal analysis of the window systems must be provided based on the National Fenestration Rating Council's 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 the migration of heat, air, and moisture from the exterior to the interior environments. They must be designed to:

- resist displacement due to wind uplift;
- allow for access to operable equipment; and
- be airtight and insulated to limit condensation on the enclosure materials.

In addition, equipment or distribution systems that may be affected by weather must not be located inside soffits.

4.3.2 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. 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 exterior sun-control system design.

4.3.3 Glazing

The choice and thickness of double- or triple-glazed glass windows and 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 the use of highly reflective glass that produces mirror images to avoid creating glare that would impact the surrounding streets and buildings.

Comply with legislation that aims to reduce danger to migratory birds.

The design of the building must include provisions for cleaning the interior and exterior surfaces of all windows, as per the CAN/CSA Z91-M90: *Safety Code for Window Cleaning Operations*, as amended from time to time.

4.3.4 Interior Sun Control

All windows on 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 degradation by temperature variations and colourfast 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.

4.3.5 Exterior Doors

Entrance doors must be constructed of heavy-duty materials that can 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.

4.3.6 Bird Control Devices

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

Design facades to meet the best practices contained in the *Bird-Friendly Development Guidelines* and the *Bird-Friendly Development Rating System* published by the City of Toronto (*www.toronto.ca/lightsout/pdf/development_guidelines.pdf*).

4.3.7 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 the technical requirements found in the CAN/CSA Z91-02: *Health and Safety Code for Suspended Equipment Operations.*

4.3.8 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 the following:

- roofing design, including metal flashing and trim, must follow the recommendations of the Canadian Roofing Contractors' Association (CRCA) and provincial roof associations;
- roof membranes are to be 2-ply, fully adhered membranes, and loose-laid and single-ply roof membranes must not be used;
- all inverted roof assemblies including green roofs must incorporate suitable wiring systems to facilitate the use of the electric field vector mapping (EFVM) non-destructive testing method to test for leaks in the waterproof membrane;
- roofing is to be sloped to drains and to avoid ponding on the surface of a membrane;
- the exterior surface of parapet walls and penthouses must 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 recurring inspection and maintenance, and 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 must 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, and roof anchors, must be integrated into the building structure and roof design; and
- all podiums and rooftop areas providing access to building occupants and the public must have protected waterproof membranes and insulation, as well as structural assemblies that will withstand the structural loading of planned activities and parapet heights that will address occupancy requirements.

4.3.9 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:

- skylight design must follow the requirements of the American Architectural Manufacturers Association (AAMA) / Window and Door Manufacturers Association (WDMA) standard AAMA/WDMA 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 rainscreen (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 the cleaning of all sloped glazing and skylights, including access and equipment required for both exterior and interior faces.

4.3.10 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 on airtightness based on the following standards and guidelines published by the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE); the National Institute of Building Sciences (NIBS); and ASTM International:

- ANSI/ASHRAE 90.1: *Energy Standard for Buildings Except Low-Rise Residential Buildings*;
- ASHRAE Guideline 0: *The Commissioning Process*;
- NIBS Guideline 3: *Building Enclosure Commissioning Process*; and
- ASTM E2813: *Standard Practice for Building Enclosure Commissioning*.

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 that the actual construction and specified requirements have been met for the integrity of the air, vapour barrier, and waterproof membrane assemblies within the building enclosure.

Enclosure airtightness testing on all five faces of the building must be undertaken to confirm airtightness achievements. All five faces must meet the airtightness maximum air leakage of 1.27 $L/s \cdot m^2$ at 50 mPa, following ASTM E779: *Standard Test Method for Determining Air Leakage Rate by Fan Pressurization* and ASTM E1827: *Standard Test Methods for Determining Airtightness of Buildings Using an Orifice*

Blower Door, as noted in ANSI/ASHRAE 189.1: Standard for the Design of High-Performance Green Buildings.

4.4 Architectural Components

4.4.1 Partitions

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

- tolerances for deflection and long-term creep must be designed at the top of structures abutting partition walls;
- partition finishes used at the perimeter of a humid space, such as a bathroom, basement, or limited air control area, must be resistant to moisture, mould, and mildew;
- shower areas must use water-durable and mould-resistant partition materials as the substrate; and
- physical security control area walls must include full-height 18 gauge expanded metal mesh as part of the assembly.

4.4.2 Interior Doors

Interior doors must meet the durability requirements, functional program requirements, and the following additional standards, including those published by the Steel Door Institute (SDI), Window and Door Manufacturers Association (WDMA), and Door and Hardware Institute (DHI):

- heavy-duty doors and frames must be used that meet the Level 2 rating per ANSI/SDI 250.4: *Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors*, and all doors and frames should be certified with the Underwriters Laboratories of Canada (ULC) label, factory-primed, and prepared for hardware installation;
- door hardware must meet the Best Grade requirements of the Canadian General Standards Board (CGSB);
- wood doors must be constructed to ANSI/WDMA I.S. 1A: *Interior Architectural Wood Flush Doors* and ANSI/DHI A115-W: *Wood Door Hardware Standards, Hardware Preparation*; and
- doors leading to high-traffic areas must be 70% glazed.

4.4.3 Acoustic Treatment

Acoustic performance must meet project requirements as well as the following:

- the sound transmission class (STC) rating 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; and doors and other openings must use sound attenuation techniques appropriate to the STC;
- ceiling tiles must have a minimum noise reduction coefficient (NRC) or sound absorption average (SAA) coefficient of 0.75 and a minimum ceiling articulation class (CAC) rating of 180;
- reverberation time control in the main lobby areas must not be higher than 0.7 seconds at 500 Hz; and
- performance must comply with the “Maximum Ambient Noise Levels” table and evaluation standards found in the PSPC standard MD 15000: *Mechanical Environmental Standard for Federal Office Buildings*.

4.4.4 Graphics and Signage

Graphics and signage must meet the requirements set by the *Policy on Communications and Federal Identity*.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 as well the following requirements:

- signs for washrooms, elevators, stairwells, emergency exits, and doors of main corridors must comply with the tactile signage section of the *Federal Identity Program Manual*;
- for heritage buildings, signage must be compatible with the original signage design, using the materials, finishes, colours, typefaces, size, and scale as a guide for the new signage design; and
- all equipment and piping in maintenance rooms and in mechanical and electrical rooms, must be provided with signage.

4.5 Interior Design Components

PSPC provides finished interior service and occupant areas as part of the base building. Refer to the functional program for detailed requirements.

4.5.1 Carpet Tile

Commercial-grade carpet tiles must be specified for all base building areas that 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:

- for optimum performance, products must be of tufted-loop construction, with a multi-colour/textured pattern and a minimum of 4 fibre colours, with colour selection to take into consideration the ability to mask soiling and staining;
- 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 able to resist trafficking and numerous hot-water extractions without losing its effectiveness;
- carpet fibre must be a minimum pile weight of 576 g/m^2 with sufficient density to ensure long-term resistance to matting and crushing;
- water-based releasable adhesives are to be used that are best suited for the project or for environmental or flexibility reasons;
- carpet tile backings must be chosen based on project application and longevity;
- carpet tile must be certified by the Carpet and Rug Institute (CRI) Green Label Plus standard and must contain a minimum of 40% recycled material, use recovered materials, and be recyclable;
- all existing carpet being removed from buildings must be recycled; and
- during carpet removal, dust control procedures must be followed using high-efficiency particulate air (HEPA) filters.

4.5.2 Other Flooring

Primary public entrance areas to the building and lobbies, including elevator lobbies, must be finished with hard surfaces and with 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 standards to exceed a 50-year life cycle and be easy to maintain.

Secondary and support areas of the building, as well as 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 volatile organic compound (VOC) emission, low embodied energy, and low toxicity.

4.5.3 Wall Finishes

Primary public entrance areas to the building and lobbies, including elevator lobbies, must be finished for the full height of the walls using materials that exceed the 50-year life-cycle standard of durable building standards. Wall finishes must have a high density and low moisture absorbency, and these hard surfaces are to be chosen for their ease of maintenance. Painted gypsum board is not considered a durable finish.

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

4.5.4 Material Finishes - Ceilings

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

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

4.5.5 Architectural Woodwork

All wood products must be certified either by Forest Stewardship Council (FSC) Canada, the Sustainability Forestry Initiative (SFI), or to the CSA Group *Sustainable Forest Management System (SFM) standard*. The requirements are as follows:

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

5 Structural Engineering

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

Furthermore, the *Treasury Board Policy on Management of Real Property* serves as the basis for structural design because it places protection of the heritage character of federal buildings on an equal footing with other considerations related to real property management and it is within this policy that departmental obligations and responsibilities are defined. The Treasury Board policy stipulates that departments must manage the buildings they administer so as to conserve their heritage character throughout their lifecycle.

5.1 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;
- for existing buildings, guidance provided in the Commentary L of 'Application of NBC Part 4 of Division B for the Structural Evaluation and Upgrading of Existing Buildings' of the "User's Guide – NBC 2010 Structural Commentaries" must be considered;
- the design for seismic protection must conform to the *Real Property Services Policy on Seismic Resistance of PWGSC Buildings*;
- alterations to and additions to heritage buildings shall be achieved by providing sustainable solutions while respecting the heritage value of the site in accordance with the *Standards and Guidelines for the Conservation of Historic Places in Canada*;
- design service life must be established per the 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.

5.2 Structural Risk Management Statement

A structural risk management (SRM) statement must be prepared and submitted at each stage of the project. Documentation and submission requirements must be in accordance to the PSPC publication *Doing Business with Real Property Branch (RPB).*

The structural vulnerability of the building and critical building elements for the following areas of potential risk must be identified:

- Environmental loads (wind, rain, snow, ice, geotechnical and site such as hydrostatic pressures, temperature effects, corrosive environment)
- Seismic protection (main structure and non-structural elements, i.e. Operational and Functional Components or OFCs)
- Serviceability requirements (vibration, deflection, fire protection, potential lack of proper maintenance)
- Security concerns (blast threat, progressive collapse prevention)
- Sustainability consideration
- Heritage protection concerns

- Other areas of identified structural risk

Each of these risks and their potential impacts must be included in the SRM statement. The SRM must include statements describing how each of these risks will be mitigated and/or minimized.

Scenarios related to a change in structural conditions or actions should be specified in the structural risk management plan in order to identify possible critical situations for the structure. Each scenario is characterized by a predominant process or action and, where appropriates, by one or more accompanying processes or actions. The identification of scenarios represents the basis for the assessment and design of interventions to be taken to ensure structural safety and serviceability.

The SRM statement must also include a summary description of the structural systems and design loads.

5.3 Floor Loads

Office floor loads must be designed for 3.8 kPa live load unless higher values are required for localized loads such as moveable filing systems.

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.

5.4 Parking Structures

New parking structures must be designed in accordance with the CSA S413*: Parking Structures* standard.

6 Mechanical Engineering

6.1 Design Objectives

Mechanical products and systems must be properly coordinated with architectural, structural, civil, electrical and other building systems based on whole building design concept and life-cycle review.

Mechanical design must be based on proper selection and application of sustainable, high-performance heating, ventilation, and air-conditioning (HVAC), plumbing and drainage systems and technologies to enhance overall building performance.

Meeting the National Energy Code of Canada is a minimum requirement. Based on specific project requirement and desired Green Building rating (LEED, Green Globes etc.), the design team must target for a higher energy performance.

6.2 Mechanical Environmental Requirements

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

- indoor design temperature;
- relative humidity operating limits;
- operating temperature range;
- outdoor design temperature;
- minimum outdoor air ventilation rate;
- flushing of air for new constructions and major renovations;
- provision of outdoor air to flush out the building on a floor-by-floor basis;
- indoor air contamination control; and
- acceptable acoustical environment.

All HVAC systems shall include devices to measure and control minimum outdoor air flow.

For spaces not listed in MD 15000 section 5.1, Acceptable Acoustical Environment, the maximum noise levels must not exceed the levels specified by the National Joint Council *Occupational Health and Safety Directive,* Part VII, Noise Control (Levels of Sound).

6.2.1 Building Pressurization

Design systems to ensure proper building pressurization. Ensure control of proper space pressure of the building to manage moisture, water vapor, airborne contaminants and potential for mold growth. The building automation system (BAS) must alarm when the building pressurization drops below a predetermined low limit.

A negative pressure must be maintained relative to the 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. Ensure that stack effect is controlled during both natural and mechanical ventilation strategies.

6.3 HVAC Systems

6.3.1 General Requirements

At least three distinct HVAC options must be considered at the pre-design or design concept stages complete with life cycle costing including capital costs, maintenance and operations costs, and replacement costs. The options analysis must consider low energy consumption and address

advantages and disadvantages of each option. The selected HVAC system will have low maintenance costs and be known to have proven durability and high performance in the industry.

The energy consumption for each HVAC option shall be obtained by using industry recognized energy simulation software. Submit proposed energy simulation software at early stages of design for approval.

The general requirements of the HVAC systems are:

- HVAC products and systems have an integrated whole building design approach based on Life Cycle evaluation.
- The evaluation of high performance and sustainable design strategies must be carried out during the Investigation and Report (I&R) or initial conceptual design stage.
- Energy/Heat recovery systems must be incorporated when required by applicable code or when feasible based on Life Cycle Evaluation.
- High-occupancy and highly variable occupancy areas must be provided with demand-controlled ventilation (DCV) systems with CO_2 sensors.
- HVAC systems must be capable of automatically maintaining space comfort conditions for all building load variations during the heating and cooling seasons.
- HVAC systems shall include devices to measure and control minimum outdoor air flow.
- 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.
- Noise generating HVAC components such as dampers and coils are located outside private offices to minimize disturbances.

6.3.2 Supply, Return, and Exhaust Fans

All fans must bear the Air Movement and Control Association (AMCA) seal, and performance must be based on tests made in accordance with the ANSI/AMCA 210: *Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating* standard. Fans must be selected based on optimum efficiency, required horsepower as well as sound power level ratings at full-load and part-load conditions. Fan motors must not run at overload anywhere on their operating curves; they must be selected for a 1.15 service factor and fan shafts must operate below the first critical speed.

Variable-speed operation of supply and exhaust fans must be accomplished through the use of variable-speed drives and inverter duty-rated motors. For smaller fans, electronically commutated motors (ECMs) may be used for variable-speed operation.

Fans must be provided with proper vibration isolation, thrust resistant supports or devices, grease box or extended grease lines, belt or coupling guard, inlet and outlet safety screen, companion flanges, flow measuring system and any other accessories necessary for particular application. Fans must be statically and dynamically balanced.

6.3.3 Air-Handling & Air-Distribution Systems

Air Handling Units must have double-walled insulated low leakage casing construction.

Other internal features like internal flow measurement and control, integrated mixing box, integrated energy/heat recovery system, internal LED service lights, thermal break, low leakage insulated dampers, factory installed DDC controls, redundant fans or fan arrays, dehumidification control and single point power must be provided based on specific application requirements

The air-handling unit and its internal components must comply with applicable Air-Conditioning, Heating, and Refrigeration Institute (AHRI) standards.

Individually finned tube coils must be certified to the AHRI 410: *Forced-Circulation Air-Cooling and Air-Heating Coils* standard, and the number of rows and fin spacing must be selected to allow 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.

Selection of heating and cooling coils must consider the following:

- select heating and cooling coils to optimize system performance and energy efficiency;
- select proper coil headers and fin spacing for effective cleaning;
- minimize or eliminate water droplet carryover downstream from the dehumidification coils;
- provide adequate distance to downstream equipment from the dehumidification coils;
- provide mist eliminators where necessary; and
- provide coil slope for drainage;

Air Handling Units must be provided with double insulated stainless steel drain pans complete with indirect connection to waste systems and deep trap seals suitable for the system pressure.

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

Low-leakage AMCA-certified volume control dampers must be utilized for outside air mixing boxes where necessary. Use high-efficiency, low-pressure drop air blenders when proper mixing may not be possible within the air-handling unit. The location of air blenders must be selected based on actual site conditions.

Access doors must be provided for all internal sections of an Air Handling Unit to facilitate proper operation, inspection, service and maintenance. Access door construction must be similar to the Air Handling Unit casing construction.

Air – Distribution System must be designed and constructed in accordance with SMACNA and ASHRAE.

VAV terminal units, VAV diffusers, Grilles, Diffusers, Registers and other components must be properly selected for specific application. Air – Distribution systems must be designed for low pressure drop to minimize over all fan energy use without compromising on comfort at full load and part load conditions.

6.4 Humidification and Water Treatment Systems

Design humidification levels must be coordinated with the overall mechanical HVAC and envelope design to prevent condensation on the interior surfaces, control water vapour migration into the exterior wall assembly, and ensure adequate building pressurization. Analysis of local water supply shall be part of the humidification system design to identify the type of water treatment systems required for the humidification equipment.

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

6.4.1 Humidifiers

Humidification systems must comply with the following requirements contained in section 5.12, Humidifiers and Water-Spray Systems, of the American Society of Heating, Refrigerating and Air-Conditioning Engineers standard ANSI/ASHRAE 62.1: *Ventilation for Acceptable Indoor Air Quality*:

- Make-up water for humidification systems must originate directly from a domestic cold-water source. Air-washer systems are not permitted for humidification purposes.
- Direct steam injection type humidifiers must not be used.

Humidifiers must be CSA-approved and be certified by the Underwriters Laboratories of Canada (ULC-listed) where applicable.

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

6.4.2 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 the 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.

6.5 Hydronic Systems

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 must 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 change-over 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 the CAN/CSA B214: *Installation Code for Hydronic Heating Systems* for detailed information on hydronic systems and components.

6.5.1 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.

6.5.2 Pipes and Valves

Hydronic system designs must be properly sized with two-way control valves for variable-flow to minimize the pressure drops and reduce pump energy in systems with multiple heating/cooling coils. Closed-loop piping system designs must incorporate pressure-balancing controls, pressure independent balancing valves, 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.

The horizontal supply and return pipe network feeding floor perimeter heating systems shall be located at the bottom of the heaters as opposed to being at the top in order to prevent air entrainment inside the coils, prevent noise, provide proper heating and reduce maintenance labor costs related to the purging of the coils.

Provide local strainers for all terminal units, heating and cooling coils, and heat exchangers. Isolation and shut-off valves greater than 65 mm Ø must be high-performance butterfly valves, and those below 65 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.

6.5.3 Hydronic Pumps

Design the hydronic pumping system to meet the following requirements:

- inverter duty-rated pump motors for variable-flow systems;
- provide best efficiency point (BEP) selection for the most frequently used flow rate (not the maximum flow rate);
- full flow range pumping capability without any overload conditions;
- maximum 1800 r/min 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 ANSI/ASHRAE 90.1: *Energy Standard for Buildings Except Low-Rise Residential Buildings*.

6.5.4 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.

6.6 Heating Systems

6.6.1 Heating Plants

New buildings or existing buildings undergoing major renovations must be designed to use low-temperature hot water heating systems from dedicated Hot Water Boiler System.

In cases where Central heating and cooling plant (CHCP) steam from District Energy Heating System is the only option, buildings must use steam-to-low-temperature-hot-water heat exchangers as part of energy transfer stations (ETSs). The building heating system must be designed for supply water of maximum 60 °C and return water of minimum 35 °C. Central Heating and Cooling Plant (CHCP) steam must not be distributed throughout any building as a heating medium.

For heat exchange systems, provide accessibility to all components without interfering with the operation of other systems and equipment, including the replacement of the tube bundle and/or disassembly of components. 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.

6.6.2 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. 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 PSPC'S *DP 001: Policy for Emergency Preparedness in Public Works and Government Services Canada* and the Treasury Board of Canada Secretariat's *Operational Security Standard - Business Continuity Planning (BCP) Program*.

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

- high efficiency 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;
- smart boiler and heating system controls integrated with 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 the ANSI/ASHRAE 90.1: *Energy Standard for Buildings Except Low-Rise Residential Buildings*;

- primary heating sources for a building that do not include electric resistance heating and/or electric boilers, except when justified by a life-cycle costing analysis or when utilizing renewable energy sources;
- sodium/potassium-free (Na-K-free) gas valve actuators;
- breeching, vents, stacks, and chimneys, in compliance with the National Fire Protection Association standards 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; and material types, ratings, and distance to adjacent building materials that are in compliance with NFPA 54 and NFPA 211; and
- heat transfer fluid that is free of ethylene glycol.

6.7 Cooling Systems

Cooling systems must be designed in compliance with the CAN/CSA B52: *Mechanical Refrigeration Code.*

Refrigeration systems, the choice of refrigerant, and leak mitigation measures must comply with the ANSI/ASHRAE 15: *Safety Standard for Refrigeration Systems* and ANSI/ASHRAE 34: *Designation and Classification of Refrigerants.*

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

6.7.1 Chilled Water Systems

Ensure that the cooling plant controls are integrated with the chillers, cooling towers and distribution system for overall maximum integrated efficiency.

Chillers must meet the 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 the basis for the selection or omission of the following:

- variable-frequency drive (VFD) centrifugal, screw, or scroll chillers;
- water cooled or air cooled chillers
- magnetic bearing chillers
- waterside economizer (free cooling) systems
- heat recovery or heat pump chiller if required for specific application
- thermal storage solutions;
- absorption chillers;
- centrifugal chillers with oil-free 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;
- 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
    - 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 the 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 PSPC's DP 001: *Policy for Emergency Preparedness in Public Works and Government Services Canada (001)* and the Treasury Board of Canada Secretariat's *Operational Security Standard - Business Continuity Planning (BCP) Program*.

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) require 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 under the *Canadian Environmental Protection Act*.

6.7.2 Cooling Towers

Cooling tower designs must incorporate the following:

- wet bulb design temperatures that meet the parameters specified in the ASHRAE 90.1: *Energy Standard for Buildings Except Low-Rise Residential Buildings*;
- *Legionella* abatement strategies, including microprocessor controls capable of communicating with the BAS;
- performance certified by the Cooling Technology Institute (CTI) under the STD-201: *Certified Cooling Towers* standard;
- cooling tower fan power requirements that comply with ASHRAE 90.1;
- 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, polyvinyl chloride (PVC), or stainless steel construction for condenser piping, cooling tower basins, and housings, free of bolted or riveted connections;
- vibration and sound isolation in accordance with the CTI STD-201 standard 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.

6.8 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 stormwater 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 requirements outlined in this document as well as those contained in the applicable codes listed in section 13 in the Mechanical Codes, Standards, and Legislation section.

Hot water heaters, tanks, heat exchangers and pumps are to be located in mechanical rooms. Demonstrate that life-cycle costing (LCC) has been used as the basis for the selection or omission of heat recovery, instantaneous heating systems, high efficiency heating equipment, and renewable heat sources.

6.8.1 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*, the CAN/CSA B651: *Accessible Design for the Built Environment* standard, and the PSPC *Real Property Branch Accessibility Procedure*.

6.8.2 DCWS, DHWS, and DHWR Systems

The domestic water system must be designed to prevent the following:

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

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

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

6.8.3 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 to prevent 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 requirements of the authority having jurisdiction.

6.8.4 Stormwater Drainage Systems

Roof drains and overflow drains must be cast iron body type with high dome grates designed to provide adequate drainage.

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

Stormwater lift stations and sump pumps must only be used where gravity drainage to municipal storm sewers is not possible. Stormwater 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.

6.9 Advanced Metering System

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 the CAN/CSA-ISO 50001: *Energy Management Systems* standard.

Advanced metering systems must be installed in all new construction and major renovation 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). 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:
    - electrical, gas and other fuels consumption;
    - domestic water consumption;
    - cooling tower water consumption;
    - steam and/or hot water;
    - chilled water (Energy/BTU metering); and
    - 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 the ANSI/ASHRAE 90.1: *Energy Standard for Buildings Except Low-Rise Residential Buildings*.

6.9.1 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 must measure, at a minimum, the phase voltage, phase current, power consumption, power factor, and harmonic distortion.

6.10 Building Automation Systems

The building automation system (BAS) must have a non-proprietary design to monitor, control, and report on all mechanical, environmental-control, and energy-consuming systems, and must be based on Ethernet BACnet TCP/IP network, native BACnet controllers and other devices. The BAS must be able to provide an integrated platform for intelligent, smart and high performing building

The BAS must include as a minimum:

- controllers;
- sensors and other field devices (use smart sensors and devices where feasible);
- Networks;
- Computers;
- All necessary software components including energy management;
- engineering;
- new wiring;
- complete graphical package, including dashboards;
- installation;
- programming;
- start-up;
- commissioning;
- as-built and documentation;
- warranty and maintenance; and
- any devices or accessories to make a complete system.

The BAS must comply with ANSI/ASHRAE 135: *A Data Communication Protocol for Building Automation and Control Networks* and ANSI/ASHRAE 135.1: .Method of Test for conformance to BACnet

The system 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 provide means for direct access to all setpoints, trends, and objects using BACnet protocol (BACnet/IP or native BACnet). The “As-built” documentation must provide the list of all setpoints, trends, and objects with explanation of their function and/or meaning.

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

Existing proprietary systems can be used in existing buildings only after a detailed life-cycle cost analysis has been done that can justify the continued use of such proprietary systems or non-BACnet systems.

6.10.1 Operator Work Stations

The primary operator work station (OWS) must be capable of displaying information from the BAS as well as the advanced metering system

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

6.10.2 Controllers

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

- the use of BTL-listed DDC controllers only;
- microprocessors (CPUs) 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;
- a controller power supply that accepts local power and provides all conditioning necessary for reliable, fail-safe operation;
- a 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.

6.11 Mechanical Systems for Special Spaces

6.11.1 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*.

6.11.2 Elevator Machine Rooms

Maintain space temperature conditions, as required by equipment specifications and in accordance with the American Society of Mechanical Engineers (ASME) / CSA Group (CSA) standard ASME A17.1/CSA B44: *Safety Code for Elevators and Escalators*. 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.

6.11.3 Mechanical and Electrical Rooms

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

Install equipment in a manner that the servicing of any equipment will not require shut-down of other equipment. Identify operational requirements and redundancy requirements where applicable at early stages of design.

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 ANSI/TIA 569: *Telecommunications Pathways and Spaces* and its addenda.

6.11.4 Computer Room Cooling and Ventilation

Provide computer room ventilation in accordance with PSPC's MD 15000: *Mechanical Environmental Standard for Federal Office Buildings*.

Provide high performance, low energy cooling system. Cooling systems must be evaluated based on specific use and application of computer rooms.

Identify operational requirements and redundancy requirements where applicable at early stages of design. Demonstrate that an evaluation based on life-cycle costing (LCC) has been used as the basis for the selection or omission of the use of heat recovery and or water side economizer (free cooling) systems.

6.11.5 Service Areas

Requirements for mechanical systems in service areas include the following:

- janitor closets must not be used for the location of any equipment;
- air 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;
- the construction, ventilation, and equipping of all rooms containing refrigeration units, such as chiller equipment rooms, must comply with the ANSI/ASHRAE 15: *Safety Standard for Refrigeration Systems*, the ANSI/ASHRAE 34: *Designation and Classification of Refrigerants*, as well as the CAN/CSA B52: *Mechanical Refrigeration Code*;
- indoor parking garages must include supply and exhaust systems activated by carbon monoxide detectors, and must use energy recovery systems where justified by a life-cycle costing analysis;
- the design of the HVAC for the indoor parking areas must include a life-cycle costing analysis of energy recovery systems and of variable air flow systems;
- mailrooms must have independent HVAC systems to deal with the potential for chemical/biological contamination;
- uninterruptible power supply (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, and in addition:
    - the exhaust system must be connected to the emergency power distribution system;
    - fans must be explosion-proof; and
    - ductwork must consist of a dedicated, negative pressure system of corrosion-resistant material; and
- high-occupancy and highly variable occupancy areas must be provided with demand-controlled ventilation (DCV) systems with CO_2 sensors, with enthalpy energy recovery and de-humidification systems provided where justified by a life-cycle costing analysis.

6.12 Fuel Storage Systems

For fuel storage systems refer to section 8.11.1 Emergency Generator System and 2.7.4 Fuel Storage Systems.

6.13 Miscellaneous Requirements

6.13.1 Acoustical Insulation

Provide acoustical insulation where required to satisfy the requirements listed in Table 5-1, Maximum Mechanical Noise, in PSPC's 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.

6.13.2 Identification of Mechanical Systems

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

6.13.3 Outdoor acoustical treatments

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

7 Fire Protection Engineering

7.1 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. Fire protection and suppression systems must comply with the *National Building Code of Canada* and *National Fire Code of Canada*.

All sites on or off municipal services must be evaluated and strategies provided to address issues related to health and safety. Municipal installations must meet the National Fire Protection Association's 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.

7.2 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, general storage facilities within base buildings must meet the requirements of the NFPA 13: *Standard for the Installation of Sprinkler Systems* and the NFPA 231: *Standard for General Storage.*

Specialized tenant functions identified 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, NFPA 231, and NFPA 231C: *Standard for Rack Storage of Materials*;
- the storage arrangements and protection of an inflammable and combustible liquid storage area, which must meet the requirements of the *National Fire Code of Canada*, the 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*;
- Sprinkler systems such as wet, dry, deluge or pre-action as required for the type of occupancy and approved by Departmental Representative; and
- fire protection requirements for cooling towers, which must meet the requirements of NFPA 214: *Standard on Water-Cooling Towers*.

7.3 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 installed in any new construction or renovation projects must be listed by a nationally recognized testing facility such as Underwriters Laboratories of Canada (ULC);

- all quick-response glass bulb sprinklers must be equipped with a protective device to reduce damage prior to installation, and the protective device must be removed after the sprinkler is installed;
- all sprinkler escutcheons installed in any new construction or renovation projects must be ULC-listed equipment;
- 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 the 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 comply with the specifications in Schedule 40 and must be threaded;
- steel pipe sizes larger than 50 mm must at a minimum comply with the specifications in Schedule 10;
- piping less than Schedule 40 must be roll-grooved;
- threadable lightwall pipes 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 (private automatic branch exchange [PABX]) rooms;
        - * note that sprinklers can be omitted in the transformer vault if the vault is provided with a 3-hour fire separation; however, appropriate fire protection devices must be provided in the vault as required by the local utility and authority having jurisdiction; and
    - all electrical equipment must be provided with a sprinkler-proof enclosure;
- 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, 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;
- sprinklers in historically significant spaces must be carefully placed to minimize damage to ornamental materials, and in addition:

    - detailed drawings must be developed for architecturally sensitive areas, showing precise sprinkler locations and finishing notes as necessary to ensure proper installation; and
    - sprinklers must be centred and placed symmetrically in relation to ornamental patterns and architectural features that define the space, such as arched openings;
- sprinklers and escutcheons must match the original architectural surfaces or hardware; and
- oxidized brass or bronze heads are recommended for use in deeply coloured (unpainted) woodwork.
    - in elaborately decorated ceilings, heads must be camouflaged by custom coating and by omitting escutcheon plates, and in such cases, low-profile, quick-response sprinklers are preferred.

7.4 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:

- have a non-proprietary, open protocol for interoperability with other building systems;
- be monitored by the building automation system in a one-way, read-only manner; and
- be standalone systems able to function independently of other building systems.

In addition, fire protection conduits must meet the requirements set out in section 32 of the *Canadian Electrical Code*.

7.5 Fire Pumps and Accessories

7.5.1 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: *Standard for the Installation of Sprinkler Systems*;
- NFPA 14: *Standard for the Installation of Standpipe and Hose Systems*; and/or
- NFPA 20: *Standard for the Installation of Stationary Pumps for Fire Protection*.

Fire pumps must be designed for manual and/or automatic shut-down. Manual shut-down 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.

7.5.2 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.

7.5.3 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.

8 Electrical Engineering

8.1 Design Objectives

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

8.2 Design Studies

8.2.1 Electrical Load Analysis

An electrical load study must be performed for new office building construction as well as renovation 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-hour use (nighttime and weekends), emergency scenarios, and different seasons.

8.2.2 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 renovation 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.

8.2.3 Arc Flash Study

An arc flash study must be performed for new building construction as well as renovation 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 the CSA Z462: *Workplace Electrical Safet*y standard. Safety labels, also in accordance with CSA Z462, must be applied on all panel boards, motor control centres, switchgear, and major electrical equipment. Labels must comply with the *Official Languages Act*, including bilingual labels for regions prescribed under subsection 35(2) of the Act.

8.3 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 building 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 if a cost-benefit analysis finds the redundant connection to be warranted. Redundant service should be requested for larger building (over 25,000 m^2 of floor space).

8.3.1 Substation Ownership and Demarcation Points

PSPC 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 PSPC to own substations due to cost benefits, security requirements, operational requirements, or agreement with the local utility.

8.3.2 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.

8.3.3 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.

8.3.4 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.

8.3.5 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.

8.4 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 PSPC-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; and
- provide a minimum spare capacity of 25% above the design demand load as determined according to the *Canadian Electrical Code*.

8.4.1 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.

8.4.1.1 Primary Substation Transformers

PSPC-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: *Minimum Efficiency Values for Power Transformers*.

Ensure that transformer noise levels which will not cause interference in working areas.

8.4.1.2 Primary Substation Switchgear

PSPC-owned primary switchgear should be provided with draw-out type circuit breakers of the air, vacuum, or SF6 type, or with 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 the CSA C22.2 NO. 31: *Switchgear Assemblies* standard and meet the requirements of the local utility, including any metering requirement;
- include a mimic bus to show bussing, contacts, overcurrent devices, and instrumentation;
- all bussing must be copper; and
- include power monitors and advanced metering as per section 6.9, Advanced Metering System.

8.5 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 a secondary selective circuit arrangement must be provided if either of the following applies:

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

8.5.1 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;
- include hardware to lock out all breakers and switches;
- only use draw-out type breakers for breakers 800A and above;
- have an enclosure that is sprinkler-proof in areas protected with sprinklers;
- 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 6.9, Advanced Metering System.

8.5.2 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 6.9, Advanced Metering System.

8.5.3 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*.

Transformer should be selected based on the following requirements:

- secondary transformers supplying large nonlinear loads must be K-rated or oversized in order to prevent overheating due to harmonics;
- Dry type transformers are preferred for primary voltages of 5 KV or lower where insulation, coordination and protection satisfactory to the Power Supply Authority can be obtained;
- Liquid cooled transformers are preferred for voltages above 5 kV and for loads greater than400KVA at 600V/120-208V;
- Transformer noise levels must not cause interference in working areas; and
- Copper windings are preferred for liquid filled transformers.

8.5.4 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;
- be provided with metering and power monitoring as per section 6.9, Advanced Metering System*;*
- have operator controls as per section 8.10, Operator Controls;

- 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
- the MCC is elevated off the ground;
- the use of combination starters is preferred; and
- use motor control centres where they provide an economical and practical grouping of controls.

8.5.5 Motor Control

Electric motors control must meet the following criteria:

- The transient voltage drop from motor starting must be kept below utility limits, this can be done via soft starters, VFDs, or other means.
- Motors must be protected with thermal overload protection of the manual reset type. Built –in overloads in the motor are not acceptable.
- Three-phase motors must be provided with a manually operable disconnecting means which can be locked-out.
- The control scheme be coordinated with the mechanical consultant.

8.5.5.1 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 8.5.10, Power Quality. Data from VFDs for motors over 3.7 kW must be networked to the advanced metering system as per section 6.9, Advanced Metering System. VFDs, conductors, and motors must be coordinated in accordance with manufacturer's requirements.

8.5.6 Electrical Motors

Electric motors must meet the following criteria:

- the efficiency must comply with the *National Energy Code of Canada for Buildings*;
- electric motors 746W and over must be three-phase;
- motor windings preferred in copper when efficiency is superior and when smaller size is a factor.

8.5.7 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,* Part IV, Elevating Devices;
- CAN/CSA B44: *Safety Code for Elevators and Escalators*; and
- CAN/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.

8.5.8 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 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. Where practical, recessed panelboards should have additional spare, empty conduits extending to ceiling spaces.

8.5.9 Secondary Distribution Conductors

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

- motor windings; and
- distribution transformer windings.

Only copper conductors must be used for the following equipment:

- bus ducts;
- switchgear bussing;
- switchboard bussing; and
- cables and conductors.

8.5.10 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.

8.5.10.1 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.

8.5.10.2 Electromagnetic Interference

Take precautions to minimize extremely low frequency electromagnetic interference by avoiding the use of single conductor armored cables and taking into consideration potential impact of electromagnetic interference when locating transformer equipment.

8.5.10.3 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.

8.6 Branch Circuits

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

8.6.1 Lighting Branch Circuits

Lighting branch circuits must be 120 V, or Power Over Ethernet (POE) for new construction. Existing installation at 347 V may remain but conversion to 120 V or POE should be considered subject to life cycle costing including the cost of the conductors, equipment, maintenance, and operation.

8.6.2 Receptacle Branch Circuits

Standard receptacles must be duplex, CSA 5-15R, commercial 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 if an emergency power system 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.

8.7 Grounding and Lightning Protection

8.7.1 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 the Institute of Electrical and Electronics Engineers (IEEE) Standard 81: *IEEE 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. Each stack of electrical and telecom closets will have its own vertical dedicated ground riser conductor.

8.7.2 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 (UL) standard UL 1449: *Standard for 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).

8.8 Placement of Electrical Rooms

Electrical rooms must meet the architectural and interior design requirements listed in section 4.2.3.3, Mechanical and Electrical 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 6.2, Mechanical Environmental 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.

8.9 General Workmanship

Electrical installations must be of good workmanship, this requires electrical equipment to:

- be securely and permanently fastened and or supported;
- be installed level, and plumb;
- have cable and conduit be installed parallel to and perpendicular to building lines;
- have a neat and finished appearance; and
- have corrosion protection adequate for the environment.

8.9.1 Seismic Design

Electrical equipment must be laterally restrained for seismic load requirements as outlined in section 5, Structural Engineering, and the *National Building Code of Canada*.

8.9.2 Building Raceways

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

8.9.3 Wiring Methods

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. New bus ducts should be totally enclosed. Sprinklers must not aim water at ventilated or open bus ducts.

Conceal raceways for horizontal electrical distribution systems within the concrete slab, in the ceiling plenum, 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. The minimum conduit size for power and lighting circuits shall be 21 mm. Permanent tags should be provided to feeders at pull and junction boxes. For motors and equipment subject to vibrations or movement provide flexible connections.

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

8.10 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*. This standard applies to both physical operator controls and human-machine interfaces (HMIs) 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).

8.10.1 Colour Coding

Motor control and HMI colour coding must comply with the CAN/CSA Z431 standard.

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.

8.10.2 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.

8.11 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* and in accordance with the *Canadian Electrical Code*.

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

8.11.1 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 (ATSs). The emergency generator system must be provided in accordance with the latest version of the CSA C282: *Emergency Electrical Power Supply for Buildings* standard.

In addition to CAN/CSA C282, the fuel system must also meet the requirements of the latest version of the CAN/CSA B139 Series: *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 in an appropriately fire rated room; and

- be automatically refilled from a main storage tank with sufficient capacity to operate the engine for a minimum of 12 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.

8.11.2 Emergency Power Loads

At 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 loads

8.11.3 Automatic Transfer Switch (ATS)

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

- both automatic and manual operation;
- network connection to the building automation system;
- dedicated ATSs for:
    - life-safety loads;
    - essential buildings loads; and
- manual bypass isolation switch to permit electrical bypass and isolation of the ATS without interrupting the load (to either the normal or emergency power).

8.11.4 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 6.11.5, Service Areas. Hydrogen detection sensors must be installed in areas where hydrogen is most likely to accumulate. They must also 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 a maintenance bypass switch; and
- be interconnected to the building automation system for monitoring status, voltages, and currents.

8.12 Lighting

Lighting must be designed to assist in defining the overall building architecture, meet organizational safety and security requirements, as well as meet the multiple task requirements of individuals in different types of spaces within the building.

Anticipated and existing tasks must be determined with input from clients and PSPC. Default lighting levels are listed in Table 1 and Table 2 at the end of this section. The lighting design must also be in accordance with the *Government of Canada Workplace 2.0 Fit-up Standards*.

8.12.1 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 lighting system should also be energy efficient, complying with the *National Energy Code of Canada for Buildings* (NECB).

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

8.12.1.1 Illuminance and Luminance Ratio

Light levels must comply with the illuminance and luminance ratio requirements outlined in Table 1 and Table 2 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 Occupational Health and Safety Regulations of the *Canada Labour Code*, *the National Building Code of Canada*, and *The Lighting Handbook* published by the Illuminating Engineering Society (IES). When there are discrepancies between the three sources, the *Canada Labour Code* takes precedence.

8.12.1.2 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.

8.12.2 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). 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.

8.12.3 Day Lighting

To reduce energy consumption by the illumination system, 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 continuous dimming rather than simple on-off operation to minimize distraction to workers.

8.12.4 Flexibility and Servicing Accessibility

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

8.12.5 General Luminaires Criteria

Luminaires and associated fittings must be of standard commercial design, the use of LED lighting is recommended. Designers must use components that are proven (capable of demonstrating the required performance in relevant projects), readily available, technologically current, user-friendly, and 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 CAN/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 and 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 light-emitting diode (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*.

8.12.6 Specific Lighting Applications

Emergency lighting must be installed and meet the performance requirements of the *National Building Code of Canada* and Part VI of the *Canada Occupational Health and Safety Regulations*. 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.

8.12.7 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 (IES) and International Dark-Sky Association (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.

8.12.8 Lighting Controls

8.12.8.1 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, dimmable 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 factors. These include the frequency of use, available day lighting, normal or 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.

8.12.8.2 Microprocessor and Networked Lighting Controls

Lighting control systems must function on an open protocol to avoid vendor lock-in, and must be able to integrated with the with building automation, and/or security systems.

8.12.8.3 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. This energy saving measure should exclude security lighting within garages.

8.12.9 Base Building Light Levels

Base building light levels must meet the more stringent of the minimum levels outlined in the *Canada Occupational Health and Safety Regulations (COHSR)* of the *Canada Labour Code*, 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.

8.12.9.1 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: 1.0 (electronic ballast)
- 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: 80-50-20 (ceiling, walls, and floor respectively, assuming light colours)

8.12.9.2 Illumination Levels Interior Spaces

Illumination levels for interior spaces are listed in Table 1. It should be noted that COHSR requirements for illumination levels at task positions of 1000 lux for cartography, plan reading or difficult visual tasks and 500 lux for operating business machines, typing, reading or writing should be met during space fit-up, as per the Workplace 2.0 Fit-up Standards via task lighting.

Table 1: Base Building Interior Illumination Levels

Location	Minimum Average Illumination (lx)[a]	Maximum Uniformity Ratio (avg : min)[b]	Maximum Uniformity Ratio (max : min)[c]
General Office Spaces	425	2:1	5:1
Meeting rooms, boardrooms, conference rooms, file storage areas, training rooms, and reception areas	300	2:1	
Library, general lighting	300	2:1	
Common areas (public spaces, lounges, lobbies, atriums, washrooms, and 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, 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, measurement of lighting levels 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 space, except for general office spaces, food preparation areas, and meeting rooms where it is over the task area.

[c] Throughout entire work space comprising the task areas.

8.12.9.3 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 of Canada Secretariat and RCMP guidelines as outlined in section 10, Security.

Table 2: Exterior Illumination Levels

Location	Minimum Average Illumination (lx)[a]	Maximum Uniformity Ratio (avg : min)	Maximum Uniformity Ratio (max : min)
Grounds			
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	10:1
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 the usable area at pavement level.
To ensure a uniform approach and yield consistent results, measurement of lighting levels 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.

9 Telecommunications Systems

9.1 Telecommunication Spaces

Telecommunication spaces must meet the following requirements:

- be stacked vertically to the greatest extent possible;
- be serviced from electrical panels supplying only telecommunications systems;
- 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 the Telecommunications Industry Association (TIA) standard TIA 569: Telecommunications Pathways and Spaces, such as backboards, ceiling heights, and door sizes.

9.2 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 (PSPC 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.

9.3 Telecommunications/Distributor Room

Telecommunications 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 telecommunications room must be provided per building floor, with additional rooms 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 m.

9.4 Telecommunication Raceway System

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

9.5 Service Entrance Pathway

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

9.6 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 telecommunications room must be fitted with 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.

10 Security

10.1 Design Objectives

The security design must protect facilities and be flexible to allow integration of tenant-funded requirements, both baseline and enhanced. The security design must also comply with all applicable policies, standards and guidelines from Public Services Procurement Canada, Treasury Board Secretariat, Royal Canadian Mounted Police, and the Communications Security Establishment.

10.2 Threat and Risk Assessment

In order for a security system to be effective it needs to be developed based on an understanding of the actual threats and risks it is designed to control. Prior to developing the security elements on an office building project, a Threat and Risk Assessment (TRA) must be completed. The threat and risk assessment process is intended to evaluate a building, its assets, the tenants, the threats against the building and the occupants, and the performance of safeguards against these threats.

10.3 Security Site Brief & Security Design Brief

For new office building construction projects, develop a Security Site Brief (SSB). A Security Design Brief (SDB) must also be developed for all new construction projects and renovation projects which materially impact building security. Refer to G1-005: *Guide to the Preparation of Physical Security Briefs* for details on developing these two briefs. The two documents cover detailed security requirements for life safety and emergencies, site, building design, building layout, electronic access control, electronic intrusion detection, closed circuit television / video equipment, security control centre, secure rooms, vaults, sensitive discussion areas, telecom and data links.

Federal tenants may have specialized functional programs that will guide the fit-up of space within the base building. In this case, the specialized functions must be integrated into the base building systems and design.

11 Definitions

Advanced metering system	A system that collects time-stamped data from meters via a communications network, providing useful data for energy use management, procurement, and operations.
Advanced meters	Meters that have the capability of measuring and recording 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 International Organization for Standardization (ISO) global standard 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.
Base Building	The building shell including finished floors, structure, exterior envelope, interior core and demising walls, finished ceilings complete with lighting, and other building systems consistent with the designed function and planned general use of the building.
Building automation system	A modern building control system that optimizes the start-up and performance of a building's mechanical systems, including the alarm, lighting, security, energy monitoring, and heating, ventilation, and air-conditioning (HVAC) systems. The building automation system (BAS) greatly increases the interaction between the subsystems of a building and improves occupant comfort, lowers energy use, and allows off-site building control.
Commissioning	A process of ensuring that all systems in a building 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.
Fit-up	Alterations and improvements to the base building or base building systems in order to prepare the accommodation for occupancy by a department.

Handhole	A below-grade enclosure that allows personnel to reach in (but not enter) for the purpose of operating, installing, and maintaining electrical cables.
High voltage	Voltage above 750 V.
Low voltage	Voltage between 30 V and 750 V
Major Renovation	A renovation that involves substantial work to several base building elements at the same time or to an individual base building element at any given time.
Manhole	A below-grade enclosure that personnel may enter for the purpose of operating, installing, and maintaining electrical cables.
Office building	Structures predominantly used to offer office space categories such as general administrative, secure administrative, quasi-judicial office space, and call/contact centres.
Primary distribution	A power distribution system that consists of transformers, cables, switchgear, and associated equipment and operates at high voltage (over 750 V), used to distribute power in large buildings or at campus locations.
Project Team	Project Teams are an internal vehicle to PSPC for the communication of pertinent and essential information relative to the development, implementation and ongoing activities of a project. The size and make-up of project teams is determined by the Project Leader and based on the size, complexity and type of real property project. Refer to the roles and responsibilities for project teams in the NPMS for further details.
Secondary distribution	A power distribution system that consists of transformers, cables, switchgear, and associated equipment and operates at 600/347 V, 208/120 V, or for small buildings at single phase 240/120 V.

12 Acronyms and Abbreviations

AABC	Associated Air Balance Council
ADM	Assistant Deputy Minister
AHRI	Air-Conditioning, Heating, and Refrigeration Institute
AMCA	Air Movement and Control Association
ANSI	American National Standards Institute
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	ASTM International (formerly American Society for Testing and Materials)
ATS	automatic transfer switch
BAS	building automation system
BEP	best efficiency point
BHMA	Builders Hardware Manufacturers Association
BOMA	Building Owners and Managers Association
BUG	backlight, uplight, and glare
CCT	correlated colour temperature
CEC	*Canadian Electrical Code*
COE	centre of expertise
COHSR	Canada Occupational Health and Safety Regulations
CRI	Carpet and Rug Institute
CRI	colour rendering index
CRN	Canadian Registration Number
CSA	CSA Group (formerly Canadian Standards Association)
CTI	Cooling Technology Institute
DALI	digital addressable lighting interface
DCWS	domestic cold water supply
DDC	direct digital control
DHI	Door and Hardware Institute
DHWS	domestic hot water supply
EIA	Electronics Industries Alliance
EnMS	energy management system
FAR	floor-area ratio
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
IES	Illuminating Engineering Society of North America
IESNA	Illuminating Engineering Society of North America
IWCA	International Window Cleaning Association
LCC	life-cycle costing
LED	light emitting diode
NBC	*National Building Code of Canada*
NEBB	National Environmental Balancing Bureau
NECB	*National Energy Code of Canada for Buildings*
NPMS	National Project Management System
NFPA	National Fire Protection Association
NFRC	National Fenestration Rating Council
NIBS	National Institute of Building Sciences
NJC	National Joint Council
OPC	open protocol connectivity
OWS	operator work station
PWGSC	Public Works and Government Services Canada
RCMP	Royal Canadian Mounted Police
RPB	Real Property Branch
SDI	Steel Door Institute
SFI	Sustainability Forestry Initiative
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association
STC	sound transmission class
TAB	testing, adjusting balancing
TBS	Treasury Board of Canada Secretariat
THD	total harmonic distortion
TIA	Telecommunications Industry Association
UL	Underwriters Laboratories
ULC	Underwriters Laboratories of Canada

UPS	uninterruptible power supply
VFD	variable-frequency drive
VOC	volatile organic compound
WHMIS	Workplace Hazardous Materials Information System

13 General Codes, Standards, and Legislation

- *Canada Labour Code*
- *Canada Labour Code*, Part II, Canada Occupational Health and Safety Regulations
- *Canadian Environmental Protection Act*
- *Department of Public Works and Government Services Act*
- *Policy on Communications and Federal Identity*
    - *Federal Identity Program Manual*
- *Federal Real Property and Federal Immovables Act*
- *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*
- PWGSC *Sustainable Buildings Policy*
- Treasury Board *Fire Protection Standard*
- CAN/CSA Z-234.1-*Canadian Metric Practice Guide.*
- CAN/CSA B651: *Accessible Design for the Built Environment* standard;

13.1 Architectural Codes, Standards, and Legislation

- AAMA/CSA 101-A440 *North American Fenestration Standard / Specification for Windows, Doors, and Skylights*
- AAMA/WDMA:1600/I.S.7: Skylights and Space Enclosures
- ANSI/BOMA Z65.1: *Office Buildings: Standard Methods of Measurement*
- ASHRAE 160: *Criteria for Moisture-Control Design Analysis in Buildings*
- CAN/CSA B651: *Accessible Design for the Built Environment*
- City of Toronto *Bird-Friendly Development Guidelines* and *Bird-Friendly Development Rating System*
- CSA S478: *Guideline on Durability in Buildings*
- CSA Z809 *Sustainable Forest Management*
- NFRC 500: *Procedure for Determining Fenestration Product Condensation Resistance Values*
- *Real Property Branch Accessibility Procedure*
- Real Property Branch *Custodial Parking Policy and Custodial Parking Procedure*
- *RPB Policy on the Stewardship of Federal Heritage Buildings*
- *Standards and Guidelines for the Conservation of Historic Places in Canada*
- Treasury Board Secretariat *Accessibility Standard for Real Property*

13.2 Window Washing Standards

- ANSI A39.1: *Safety Requirements for Window Cleaning*
- ANSI/IWCA I-14.1: *Window Cleaning Safety Standard*

- ASME A120.1: *Safety Requirements for Powered Platforms and Traveling Ladders and Gantries for Building Maintenance*
- CAN/CSA Z91-02: *Health and Safety Code for Suspended Equipment Operations* (2002 most recent revision)
- CAN/CSA Z91-M90: *Safety Code for Window Cleaning Operations*

13.3 Structural Codes, Standards, and Legislation

- CAN/CSA S413: *Parking Structures*
- CAN/CSA S832: *Seismic Risk Reduction of Operational and Functional Components (OFCs) of Buildings*
- CSA S478: *Guideline on Durability in Buildings*
- PWGSC *Doing Business with Real Property Branch (RPB)*
- *Real Property Services Policy on Seismic Resistance of PWGSC Buildings*
- *Standards and Guidelines for the Conservation of Historic Places in Canada*

13.4 Civil Codes, Standards, and Legislation

- Site services follow provincial and municipal standards

13.5 Mechanical Codes, Standards, and Legislation

- AABC *National Standards for Total System Balance*
- AHRI 410: *Forced-Circulation Air-Cooling and Air-Heating Coil*
- ANSI/AHRI 880: *Performance Rating of Air Terminals*
- ANSI/AMCA 210: *Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating*
- ASHRAE Guideline 0: *The Commissioning Process*
- ASHRAE Guideline 4: *Preparation of Operating and Maintenance Documentation for Building Systems*
- ASHRAE handbooks:
    - *Handbook—HVAC Applications*
    - *Handbook—Fundamentals*
    - *Handbook—Refrigeration*
    - *Handbook—HVAC Systems and Equipment*
- ANSI/ASHRAE/IES 100: *Energy Efficiency in Existing Buildings*
- ANSI/ASHRAE 105: *Standard Methods of Determining, Expressing, and Comparing Building Energy Performance and Greenhouse Gas Emissions*
- ANSI/ASHRAE 111: Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems
- ANSI/ASHRAE 135: *BACnet - A Data Communication Protocol for Building Automation and Control Networks*
- ANSI/ASHRAE 15: *Safety Standard for Refrigeration Systems*
- ANSI/ASHRAE/ACCA 180: *Standard Practice for Inspection and Maintenance of Commercial Building HVAC Systems*

- ANSI/ASHRAE 189.1: Standard for the Design of High-Performance Green Buildings
- ANSI/ASHRAE 34: *Designation and Classification of Refrigerants*
- ANSI/ASHRAE 52.2: *Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size*
- ANSI/ASHRAE 55: *Thermal Environmental Conditions for Human Occupancy*
- ANSI/ASHRAE 62.1: *Ventilation for Acceptable Indoor Air Quality*
- ANSI/ASHRAE/IES 90.1: *Energy Standard for Buildings Except Low-Rise Residential Buildings*
- ANSI/BHMA A156 Series Standards
- ANSI/DHI A115-W: *Wood Door Hardware Standards, Hardware Preparation* the DHI industry association
- ANSI/SDI 250.4: *Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors*
- ANSI/WDMA I.S. 1A: *Interior Architectural Wood Flush Door*
- ASME UPV: *Code for Unfired Pressure Vessels*
- ASME BPVC: *Boiler and Pressure Vessel Code*
- ASTM E1827: *Standard Test Methods for Determining Airtightness of Buildings Using an Orifice Blower Door*
- ASTM E2813: *Standard Practice for Building Enclosure Commissioning*
- ASTM E779: *Standard Test Method for Determining Air Leakage Rate by Fan Pressurization*
- *Canadian Environmental Protection Act*, Ozone-Depleting Substances Regulations
- *Canadian Environmental Protection Act*, Federal Halocarbon Regulations
- CAN/CSA B139 Series: *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 B214: *Installation Code for Hydronic Heating Systems*
- CAN/CSA B355: *Lifts for Persons with Physical Disabilities*
- CAN/CSA B44: *Safety Code for Elevators and Escalators*
- CAN/CSA B52: *Mechanical Refrigeration Code*
- CAN/CSA B64: *Backflow Preventers and Vacuum Breakers*
- CAN/CSA C743: *Performance Standard for Rating Packaged Water Chillers*
- CAN/CSA Z204: *Guideline for Managing Indoor Air Quality in Office Buildings*
- CAN/CSA-ISO 50001: *Energy Management Systems*
- CSA standards for commissioning
- CTI STD-201: *Certified Cooling Towers*
- *Federal Halocarbon Regulations*
- MD 15000: *Mechanical Environmental Standard for Federal Office Buildings*
- MD 15161: *Control of Legionella in Mechanical Systems*
- NIBS Guideline 3: *Building Enclosure Commissioning Process*
- NJC *Occupational Health and Safety Directive*
- *PWGSC Commissioning Policy*

- *PWGSC Commissioning Manual* and PWGSC Commissioning Guidelines
- SMACNA HVAC Air Duct Leakage Test Manual

13.6 Fire Protection Engineering

- CAN/ULC S524: *Standard for the Installation of Fire Alarm Systems*
- CAN/ULC S536: *Standard for Inspection and Testing of Fire Alarm Systems*
- CAN/ULC S537: *Standard for Verification of Fire Alarm Systems*
- NFPA 1142: *Standard on Water Supplies for Suburban and Rural Fire Fighting*
- NFPA 13: *Standard for the Installation of Sprinkler Systems*
- NFPA 14: *Standard for the Installation of Standpipe and Hose Systems*
- NFPA 20: *Standard for the Installation of Stationary 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 24: *Standard for the Installation of Private Fire Service Mains and Their Appurtenances*
- NFPA 30: *Flammable and Combustible Liquids Code*
- NFPA 54 / ANSI Z223.1: *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*

13.7 Electrical Codes, Standards, and Legislation

- CAN/CSA C282: *Emergency Electrical Power Supply for Buildings*
- 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: *Minimum Efficiency Values for Power Transformers*
- CAN/CSA B72-M87: *Installation Code for Lightning Protection Systems*
- CAN/CSA C860: *Performance of Internally Lighted Exit Signs*
- CSA C22.1: *Canadian Electrical Code*, Part I
- CSA C22.2: *Canadian Electrical Code*, Part II
- CSA C22.3: *Canadian Electrical Code*, Part III
- CAN/CSA Z431: *Basic and Safety Principles for Man-Machine Interface, Marking and Identification – Coding Principles for Indicators and Actuators*
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- CSA Z462: *Workplace Electrical Safety*
- IEEE Standard 81: *Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System*
- IES: *The Lighting Handbook*
- *Measurement of Lighting Levels in the Workplace – Canada Occupational Health and Safety Regulations, Part VI, 928-1-IPG-039*

- Provincial electrical codes and regulations
- UL 1449: *Standard for Surge Protective Devices*

13.8 Telecommunication Codes, Standards, and Legislation

- ANSI/TIA 568.1: *Commercial Building Telecommunications Infrastructure Standard* (and addenda)
- ANSI/TIA 569: *Telecommunications Pathways and Spaces* (and addenda)
- ANSI/TIA 606: *Administration Standard for 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*

13.9 Security Codes Standards, and Legislation

- Public Services Procurement Canada
  - DP 051: *Departmental Security Program Policy*
  - DP 052: *Corporate Security Program Policy*
- Treasury Board of Canada Secretariat:
  - *Operational Security Standard on Physical Security*
  - *Operational Security Standard - Business Continuity Planning (BCP) Program*
  - *Operational Security Standard - Readiness Levels for Federal Government Facilities*
  - *Policy on Government Security*
  - *Security and Contracting Management Standard*
  - *Security Organization and Administration Standard*
  - *Standard for Fire Safety Planning and Fire Emergency Organization*
- Royal Canadian Mounted Police:
  - G1-005: *Guide to the Preparation of Physical Security Briefs*
  - G1-013: *Security Control Centre Space Requirements*
  - G1-028: *Security Use of Mobile Shelving*
  - *Harmonized Threat and Risk Assessment Methodology (hosted by Communications Security Establishment Canada [CSEC])*