PROJECT MANAGEMENT & DESIGN ADMINISTRATION MANUAL

Department of
Transportation & Works

Prepared By
Design & Construction Division
May 2012
Fifth Edition

Table of Contents

1 INTRODUCTION

1.1 VISION

The vision of the Department of Transportation & Works is of a sustainable public works and transportation infrastructure that meets the economic and social needs of the province.

1.2 MISSION

Transportation & Works will have improved the transportation and public works infrastructure and services to meet the economic and social requirements of Newfoundland and Labrador by 2012.

1.3 DEPARTMENTAL STRUCTURE

The Department is structured around two lines of business: Transportation & Works.

The Works Branch consists of the following divisions:

1. Design & Construction
2. Engineering Support Services
3. Planning & Accommodations
4. Realty Services
5. Regional Offices

The main responsibilities of the Branch include:

1. Management and maintenance of approximately 617,000 square metres of floor space, consisting of approximately 840 buildings, on 380 sites across the province.
2. Construction of new buildings (e.g. K-12 schools, courts, hospitals) and management of other capital projects for government departments and government-funded bodies with expenditures of $190.5 million during 2010-11 and a total multi-year construction value of over $1 billion.

3. Provision of space for government departments in government-owned buildings and leased accommodations.
4. Provision of environmental services for government buildings.
5. Provision of centralized mail and messenger services for government, which includes the processing and delivery of over 8.5 million pieces of correspondence annually.
6. Provision of telecommunications services to all government departments.
7. Management of tendering for construction of public works.

The Works Branch maintains a regional structure to deliver services to client departments across the Province and to administer various policies of the Branch.

1.4 PURPOSE OF THE PROJECT MANAGEMENT & DESIGN ADMINISTRATION MANUAL

The Project Management & Design Administration (PMDA) manual is developed and maintained by the Design & Construction Division with input from professional and technical staff of the Works Branch. It is provided for the purpose of presenting standards, guidelines and instructions for delivery of projects administered by Design and Construction Managers within the Works Branch of the Department of Transportation & Works.

The programming, design and construction of a major building is complex and requires a well defined process to achieve a positive result. The aim is to achieve high quality buildings delivered on time, within budget and to our client's satisfaction. "High quality" is defined as a building that is functional, affordable, comfortable and safe in which to live and work. Cultural and aesthetic appeal are also desirable attributes of a high quality building.

Without a documented process and defined accountabilities, projects can get out of control and/or compromises are made during construction that reduce the

effectiveness and overall value of the building. The procedures contained in this manual are not intended to limit the judgment and creativity of the Project Team.

The manual tries to reflect the difference in project management/design administration practices between major projects and minor capital/maintenance projects. The terms “major projects” and “minor projects” are used in specific articles to highlight a unique requirement for the project category. Otherwise, the guidelines and practices shall be applied universally on all projects.

This document describes the following project delivery procedures:

1. Design criteria applicable to DTW sponsored projects
2. Design administration
3. Documentation standards
4. Tendering and contract award
5. Construction contract administration
6. Project completion and handover
7. Facility commissioning
8. LEED® requirements

Since the inception of the “Build Better Building” document LEED® (Leadership for Energy Efficiency Design) has become a requirement for buildings which fall under the umbrella of the Transportation & Works, Design & Construction Division. This manual will briefly describe the role of the LEED®. The most current edition of LEED® Canada documents shall be used on TW projects.

2 ACRONYMS AND DEFINITIONS

2.1 ACRONYMS

AHJ – Authority Having Jurisdiction

BBB – Build Better Buildings (A Sustainable Building Policy for Government NL Funded Projects)

Cx – Commissioning

CO – Change Order

FCA – Facility Condition Assessment

LEED – Leadership for Energy Efficiency Design

NAA – Newfoundland Association of Architects

NBCC – National Building Code of Canada

PAD – Program Adjustment Document

PARTS – Project Analysis Reporting Tracking System

PCO – Proposed Change Order

PEGNL – Professional Engineers and Geoscientists of NL

PPE – Personal Protective Equipment

REOI – Request for Expression of Interest

RFI – Request for Information

SWP – Safe Work Procedure

TB – Treasury Board

TRIM – Tower Records and Information Management

TSI – Technical Services Inspector

TW – Department of Transportation & Works

2.2 DEFINITIONS

Client Partner – Representative of any client department (e.g. Department of Education, Department of Health & Community Services)

Construction Manager – The Construction Manager is TW's team leader during the construction phase.

Design Manager – The Design Manager is TW's project team leader during the design stages of the project, provides backup support to the Construction Manager during the construction stage, and may participate in certain commissioning and post completion activities.

Project Consultant – The Project Consultant delivers the design solution, provides contract administration services during construction, and as directed by the TW manager assists in the commissioning process, as required by the terms of the Prime Consultant Services Agreement and as directed by the TW manager.

TW Design Professionals – The TW design professionals are the authority on design standards, design quality and life cycle asset management principles and commissioning. They exercise their judgment in the development of the final design solution.

Commissioning – The process of preparing a building or system for its intended use. Commissioning is a management function with start-up and completion times; the act of statically and dynamically testing the operation of building systems (and equipment) to ensure operation through the entire range of operating conditions.

Commissioning Check – The forms used to tabulate the checks, tests, etc., performed during the commissioning procedures.

Commissioning Manual – The overall document, prepared by the commissioning authority that outlines the organization, documentation, etc., pertaining to the overall commissioning process.

Commissioning Team – Includes the commissioning coordinator, consultants, design manager, construction manager contractors, equipment suppliers, and the client representatives.

Commissioning Authority – TW's representative or designate charged with the responsibility to prepared the commissioning manual and ensure that the commissioning process is followed.

Design Concept – The operating conditions/parameters on which the designer has based his decision and the method by which the functional requirements are to be met. It is a master plan for the system in question.

Design Specification – The specific purpose/use for which the system/facility/equipment is intended to serve. It is a functional plan/program for the system and provides a complete description of the system's operation and performance.

Facility Start-up – The initial activation of all building systems, including start-up, verification, performance testing, and fine tuning activities.

Inspection – A service provided by the Owner's project team. It includes a review of the building systems and equipment, or part(s) thereof.

Performance Testing – The full range of checks and tests carried out to determine whether or not components, subsystems, systems, and interfaces between systems function. It includes modes and sequences of control operation, interlocks and conditional control responses, and specified responses to emergency conditions.

Start-up – A service normally provided by the contractor as part of the normal scope of work detailed in the construction contract. It includes building systems and equipment, or part(s) thereof.

3 GENERAL

3.1 BUILDINGS CAPITAL PROJECT DELIVERY

The project delivery process for building capital projects has four (4) distinct phases as follows:

1. Phase 1 – Programming / Pre-Design
2. Phase 2 – Design
3. Phase 3 – Construction
4. Phase 4 – Post Completion

Within each phase there are several steps in a logical sequence to achieve a quality end product.

3.1.1 PHASE 1 - PROGRAMMING/PRE-DESIGN PHASE

Step 1 Needs Assessment Study

Step 2 Master Program

Step 3 Site Evaluation and Selection

Step 4 Existing Facility Condition Assessment

Step 5 Master Plan

Step 6 Functional Program

Step 7 LEED® Score Card Evaluation

Step 8 Furniture and Equipment Selection

Step 9 Capital Budget Forecasts

3.1.2 PHASE 2 - DESIGN PHASE

Step 10 Concept Design

Step 11 LEED® Scorecard Review

Step 12 Design Development

Step 13 Contract Documents

Step 14 Tendering

Step 15 Contract Award

3.1.3 PHASE 3 - CONSTRUCTION PHASE

Step 16 Contract Administration

3.1.4 PHASE 4 - POST COMPLETION PHASE

Step 17 Commissioning – Equipment and Installation Verification

Step 18 Commissioning – Performance Verification

Step 19 Handover and Occupancy

Step 20 Warranty Service

Step 21 Post Occupancy Evaluations

Step 22 LEED® Submissions and Certification

The programming phase is often led by the facility end user, with input by the Department of Transportation & Works limited to certain topics such as site selection and development of project budget forecasts. Since this phase is generally managed by a client partner, this Manual only highlights some aspects of the programming process, and does not provide specific requirements and responsibilities by the Project Team.

TW is the lead partner during the design, construction and post completion phases of the project. This manual describes specific requirements and responsibilities by the Project Team during these phases of the project.

3.2 INTERNAL PROJECT DELIVERY

The internal project delivery model adopted by the Department of Transportation & Works (TW) includes both TW and Consultant team members. TW administers the project and exercises continuing control over the Consultant's work during all stages of development.

The project team consists of the (1) Design Manager, (2) Construction Manager, (3) Consultant, (4) TW Design Professionals, and (5) other TW personnel. The project team leader is either the Design Manager or the Construction Manager depending on the stage of the project.

3.2.1 DESIGN MANAGER

The Design Manager is the project team leader during the design stages of the project, provides backup support to the Construction Manager during the construction stage, and may participate in certain commissioning and post completion activities.

3.2.2 CONSTRUCTION MANAGER

The Construction Manager is the team leader during the construction phase.

3.2.3 PROJECT CONSULTANT

The Consultant acts as an agent or as an extension of the staff of the Department's project team in servicing its clients. The Project Consultant delivers the design solution, provides contract administration services during construction, and assists in the commissioning process, as required by the terms of the Consultant Services Agreement and as directed by the TW Project Manager.

3.2.4 TW DESIGN PROFESSIONALS

The TW design professionals (e.g. Design & Construction Division) are the authority on design standards, design quality and life cycle asset management principles and commissioning. They exercise their judgement in the development of the final design solution.

3.2.5 OTHER TW PERSONNEL

There are other TW personnel who typically provide backup support to the Construction Manager during the construction stage but may provide support during the design phase as well. These individuals include Technical Services Inspectors, Project Coordinators and the Commissioning Coordinator.

3.3 EXTERNAL ORGANIZATIONAL PARTNERSHIP

In most projects there are three partners; (1) the funding authority (e.g. Health, Education and Justice), (2) the operating agency (e.g. School Districts, Health Corporations) and (3) Department of Transportation & Works as the design and construction management authority. Each of these partners has a separate

mandate on the project and therefore a different focus when taking on new building construction or redevelopment of an existing building.

3.3.1 TRANSPORTATION & WORKS

The Department of Transportation & Works is the lead partner during the design, construction and post completion phases of the project.

3.3.2 CLIENT PARTNERS

Client partners provide their design requirements through a program or project scope document to the Design Manager who communicates them to the Consultant. Client partners are represented at briefing meetings, etc., to facilitate discussion on their requirements with the Consultant.

3.4 MEDIA COMMUNICATIONS

Generally, any inquiries from the media should be forwarded to the Director of Communications. Factual information (e.g. contract awards) may be provided to the media or public. If in doubt, refer the subject to the Director of Communications.

General inquiries from the public should be referred to the appropriate operating agency.

4 PROGRAMMING / PRE-DESIGN PHASE

1. Programming refers to master planning, and functional requirements to deliver the client's program. Programming is considered complete once specific floor area requirements are defined, along with proximity relationships, planned usage and physical characteristics of the individual spaces and specialized equipment requirements.
2. Programming services are often performed by specialist consultants, other than the project consultant team, and are completed in advance of the Consultant's engagement.
3. Pre-design site investigations and programming services are deemed to be additional services, outside the scope of the basic services fee. Pre-design site investigations are normally focused on investigating, assembling and evaluating existing building conditions and ancillary site infrastructure, where such information has not been compiled by TW.

4.1 PRE-DESIGN

1. The consulting team is to review the spatial and functional program, and other information given by the Department or the Client.
2. Advise the Design Manager of:
    a. additional professional service activities to be included beyond basic services
    b. delegation and authority respecting project design and quality assurance
3. Study the characteristics of the site, record the data including information on existing structures, and carry out the following:
    a. produce measured drawings (as-found) for structures that will be affected by the construction program
    b. provide advice on cost factors or risks in proceeding with the site as selected at this stage
    c. provide advice on potential environmental concerns affecting the project. The Department shall select an appropriate environmental

consultant to carry out environmental assessments, with emphasis on existing hazardous materials, and co-ordinate execution of the environmental review program with the consulting team

4.2 MASTER PROGRAM

4.2.1 SPATIAL PROGRAM

1. The Spatial Program contains the specific space requirements. Office standards are outlined in the Government's "Office Accommodations Guidelines" for government offices, and workstations.
2. Special areas and office support areas have to be designed to achieve the Client's needs, based on general design principles.

4.2.2 ROOM DATA SHEETS

1. Preparation of room data sheets is deemed to be a programming activity.
2. The data sheets are a method of recording decisions on the individual spaces. Each data sheet represents a typical space.
3. Where spaces differ slightly from one another it is sufficient to refer to the prototype space for typical requirements noting the special requirements of the space.
4. The Consultant is encouraged to develop their own data sheets for recording required performance criteria for both general systems and specified areas. Typical data sheets are also available from the Design Manager.

4.3 SITE EVALUATION AND SELECTION

Potential sites for a proposed facility are short listed and the merits of each are evaluated. The completed evaluation is used as a resource for the final site selection is process.

4.4 EXISTING FACILITY CONDITION ASSESSMENT

1. The redevelopment of an existing building may encounter physical plant concerns which will impact on the final project budget. To ensure all potential concerns are identified early in the project planning, a facility

condition assessment ought to be performed prior to the end of the concept phase.

2. Experience reveals that most public buildings have incurred a high value of deferred maintenance. The cost of this deferred maintenance needs to be identified as it applies to the project.
3. The completion of a facility condition assessment shall minimize surprises during construction. Unexpected conditions can lead to costly change orders, as well as the potential for legitimate delay claims from the Contractor.
4. A Facility Condition Assessment (FCA) report must be prepared describing defective building systems and components, providing recommendations for renewal, identifying the associated costs, and its timing.
5. It should be noted that for certain TW buildings an existing ReCAPP Facility Condition Assessment report may be available.

4.5 MASTER PLAN

The majority of activities in the programming phase is general led by the facility end user. The master plan is typically development by the client group and delivered to TW. In certain cases the master planning can be included as a deliverable in Consultant Service Agreement with the project consultant.

4.6 FUNCTIONAL PROGRAM

The Functional Program contains specific needs of the Client based on program delivery requirements. The functional program may be carried out by a consultant.

4.7 LEED® SCORE CARD EVALUATION

A preliminary LEED® Score Card shall be completed to assess the viability of committing the design and financial efforts required for a LEED® project as required by the Build Better Buildings Policy. In cases where LEED is deemed not be viable an exemption should be requested to exclude the project from the requirements of the BBB.

4.8 FURNITURE AND EQUIPMENT SELECTION

For major projects, furnishing and special equipment are normally included in the project budget. These may be included in the construction contract, a separate contract or supplied by the client group. Furniture and equipment selection is typically completed in consultation with the end user group. It is important to complete the furniture and equipment selection early in the design process to allow the project consultant to make any necessary design provisions to accommodate the selected equipment.

4.9 CAPITAL BUDGET FORECASTS

1. The Consultant shall carry out cost planning and control services to monitor the project during the facility design process. Cost planning and control services are included under the scope of basic design services in the consultant agreement.
2. Effective cost planning and control is of prime importance and requires use of a costing specialist in this discipline (e.g. Quantity Surveyor), either on the Consultant's staff or engaged as a sub-consultant.

4.9.1 INFRASTRUCTURE APPROVAL PROCESS

1. All projects require approvals according to the Departments Infrastructure Approval Process. The approvals include:

- Stage 1 – Approval in Principle
- Stage 2 – Approval to Design
- Stage 3 – Approval to Tender
- Stage 4 – Approval to Award

4.9.2 PROJECT ESTIMATES

1. Make the following submissions:
    a. Project Estimate – with design concept report
    b. Project Estimate – with design development report
    c. Final Project Estimate – updated at time of tender package submission
    d. Elemental Cost Breakdown – with all phases of submissions

2. The Construction Manager is responsible for Project Estimate submissions after award of the primary construction contract.
3. The Project Estimate must be within the authorized budget. Intermediate and final estimates shall remain within the Project Estimate, unless changes due to revised client requirements, etc., are authorized by TW. Advise TW immediately if such changes occur.
4. Submit project estimate information during the design process following recognized formats such as “Hanscomb Yardsticks for Costing” or “RS Means”.
5. The Final Project Estimate brings together all project costs, including construction, contingencies, separate contracts, land costs and consultants’ fees, to arrive at the ultimate cost of the entire project.
6. The Elemental Building Cost Breakdown provides a breakdown of cost by construction element for analysis purposes. Initially, elemental costs shall be based on assumption, historical data and calculation. Subsequent submissions must be based on quantity take-off as information becomes available during the development of design.

4.9.3 CONSTRUCTION COST BREAKDOWN

Construction cost will be supplied by the Contractor and approved by the Construction Manager applying TW’s construction cost template contained within TW’s PARTS application where appropriate.

5 DESIGN PHASE

5.1 CLIENT PARTNERS

1. Maintaining effective communication with the client department or agency is an essential part of the responsibilities of both the Design and Construction Managers. This includes regular reports, correspondence and meetings to provide information related to a project's financial and physical status and the identification of any areas of concern. It is crucial that a high level of client satisfaction is achieved.
2. Approval from the client shall be obtained in writing on any capital or maintenance projects affecting floor layouts, work disruptions, scheduling, or other relevant matters prior to start of work.

5.2 CONSULTANTS

5.2.1 CONSULTANT SELECTION PROCESS

1. Consultants are to be selected from a consultant registry maintained by the Works Branch or by a REOI process.
2. Consultants are selected by the Minister or by Cabinet Committee of Ministers in accordance with Treasury Board Guidelines.
3. A standard letter of appointment is sent to the Consultant by the ADM (Works) advising them to contact the Design Manager and prepare a proposal that would detail the scope of work, provide a design schedule, and produce a cost breakdown for a consulting services contract. Where possible, the Design Manager will assemble and provide the Consultant with a project brief.

5.2.2 PRIME CONSULTANT AGREEMENT

1. On agreement of scope and fees with the consultant, the Design Manger will prepare the “Standard Form of Agreement between Owner and Prime Consultant” for signature by the consultant.
2. After the signed agreement is returned from the consultant it will be sent to TW Executive for signature.

3. For consultant contracts, the Consultant's accepted proposal of fees and expenses shall form the basis of the "Standard Form of Agreement between Owner and Prime Consultant".
4. An original copy of the agreement is to be kept within TW Registry, an original copy is sent to the consultant and a scanned/electronic copy is kept with the Design & Construction Division. A copy may also be retained for Regional files.
5. The Design Manager will ensure that the necessary encumbrance for the consulting contract is prepared.

5.2.3 DETERMINATION OF CONSULTANT FEES

1. Consultant fees and rates may be based upon those published jointly by Newfoundland Association of Architects and the Professional Engineers and Geoscientists of NL, "Guidelines and Recommended Minimum Fees for Architectural and Engineering Projects", and "Guidelines for Professional Engineers Providing Prime Consultant Services" estimates of travel expenses are to be based upon the Government of Newfoundland & Labrador Treasury Board Travel Rules. Note that information backing up expenses must be available for audit by TW on request.
2. For projects less than $400,000, a fixed contract price may be negotiated with the Consultant to cover all fees and expenses associated with the investigation, design and contract administration of the project. This amount can only be changed upon the prior written authorization of the Design Manager. In general, such authorization shall be granted if it becomes necessary to substantially modify the scope of work from that outlined in the Consultant's proposal.
3. Payments based upon per diem rates or unit prices shall be only entertained when the preparation of a fixed price is not practical or deemed desirable.
4. For projects greater than $400,000, the percentage rate in the Fees Guideline normally would apply. Expenses and fees not covered by the percentage rate will be negotiated wherever possible as a fixed contract

amount. In the absence of a fixed contract amount, an allowance for the additional services is to be provided. Additional services, excluded from the percentage fee schedule, include:

a. redesign site investigations, including facility condition assessments
b. programming & advisory services, including preparation of room data sheets when required by the client
c. segregated construction contract packages
d. preparation of designs and construction for future implementation not incorporated in the construction contract
e. resident engineering services during construction
f. preparation of as-found drawings documents for remodeling and renovating
g. LEED®

5. The basic services fee for Consultant Services incorporates three design stages:
   a. Concept Design Stage
   b. Design Development Stage
   c. Contract Documents Stage
6. For further elaboration respecting these design stages refer to PEGNL Publications “Guidelines for Professional Engineers Providing Prime Consultant Services”, December 1998, and the “Guidelines and Recommended Minimum Fees for Architectural and Engineering Projects”.

5.2.4 PAYMENT OF CONSULTANT’S INVOICES

1. It is the Design Manager’s responsibility to ensure that the invoice charges are fair and reasonable for the work performed and are in accordance with the consulting services contract. Backup documentation for the invoice is to be provided if no fixed amount has been negotiated for the service to be provided.

2. Consultants are to be advised that their invoices must be presented in a format consistent with the breakdown of the consulting contract, identifying task and percentage complete to date, previous complete for each billing.
3. If deemed necessary to modify a Consultant's invoice, a copy of the modified invoice shall be sent back to the consultant for re-submittal. The modified invoice may continue to be processed without delay.
4. After handover of the project to the Construction Manager for the construction phase, the Construction Manager will normally assume responsibility for certification of further progress payments to the Consultant.

5.2.5 CONSULTANT CHANGE IN SCOPE

Revisions to the consulting services contract scope of work resulting in an increase or decrease in the contract amount will be documented by a Consulting Services Contract Change Order prior to payment. Change orders increasing the contract amount can only be approved on the basis of sufficient project funding being in place.

5.2.6 OTHER CONSULTANTS

1. Other consultants utilized on building projects are commonly land surveyors and geotechnical consultants. The Design Manager, or the consultant on behalf of the Design Manager, obtains proposals for these services.
2. Where legal property or topographical site surveys are required, the request for the surveying consultants will consider level of expertise, technical resources, and proximity to the work site. Further guidelines for procurement of surveying services and required deliverables are given in this manual.
3. Subsurface soils investigations are imperative for new buildings and extensions to existing buildings including the project site.
4. Further guidelines on geotechnical services are given in this manual.

5. The manner in which agreements are put in place will establish the liabilities between the parties.
    a. if TW engages a Consultant directly a contractual relationship is established between the Department and the Consultant, and
    b. if the Prime Consultant engages the Consultant, TW has no contractual relationship other than the agreement with the Prime Consultant.
6. The process of engaging and directing land surveys and geotechnical consultants are considered to be under the activity – pre-design site investigations. If the Prime Consultant is directed by the Design Manager to perform engagement and direction, the Prime Consultant is entitled to be paid for professional fees and expenses incurred. Along with such payment, the Prime Consultant assumes legal liability to TW for quality control of the work performed by other consultants under its direction.

5.2.7 SPECIALISTS

Project technical requirements may require the services of specialists, beyond the scope of experience and expertise of the project consultant team. Specialists have been used for:

a. acoustical considerations
b. food service design
c. high speed, high rise elevators
d. wind and snow modeling of the building and site configuration
e. hazardous material assessments (hazmat)
f. fire protection engineering
g. way finding
h. environmental impact assessment
i. historic construction and restoration
j. ergonomics
k. laboratory design
l. LEED®
m. durability

5.3 CONSULTANTS PERFORMANCE EVALUATION SYSTEM

5.3.1 GENERAL

1. The Consultants Performance Evaluation System is a process designed to maintain an acceptable level of performance from Contractor carrying out work for the Department of Transportation & Works.
2. Evaluations are to be completed for all design contracts. The evaluation will be started by the Design Manager after the construction contract is awarded and then it will be turned over to the Construction Manager for completion.

5.3.2 PERFORMANCE RATING METHODOLOGY

1. Consultant's performance will be evaluated on a points rating system based on a weighted score from following categories:
   a. Design Phase (75% of weighted average)
      - Knowledge of the clients need
      - Quality of documents
      - Providing oversight and coordination of the sub-consultants work
      - Ensuring code requirements are met and well documented
      - Maintaining budget during various design stages
      - Providing innovation in design
      - Schedules met for all deliverables

   b. Contract Administration (20% of weighted average)
      - Shop drawing review was thorough and timely
      - Change orders were issued with appropriate documentation
      - Regular attendance of job meeting
      - Responded in timely manner to requests for information
      - Provided solutions that were appropriate, creative and cost effective during conflict resolution

   c. Contract Close-out (5% of weighted average)

- Regularly checked construction progress and monitored the status of defective work
- Provided all required documentation at turn-over (shop drawings, LEED documentation etc.)

2. A copy of the completed evaluation will be forwarded to the Design & Construction Division to be incorporated into the Consultant Registry Database.

5.3.3 CONFIDENTIALITY OF INFORMATION

Information compiled through the Consultant Performance Evaluation System is intended solely for internal use by the Department of Transportation & Works. Evaluation information related to a particular contractor(s) will not be released to outside parties, such as reference checks from other tendering agencies, without the consent of the affected consultant.

5.4 DESIGN PERIOD PROCEDURES

5.4.1 GENERAL

1. The Consultant project team, accompanied by departmental professionals shall visit the site as soon as possible after receiving a project briefing from the Design Manager. The site visit is intended for the Consultant to appraise site characteristics and any external factors affecting the design.
2. A design briefing meeting is to be convened following the completion of the site visit and the Consultant's review of the client's functional program study and to introduce all parties involved in the project and facilitate group discussion of the program to ensure that all requirements in it are fully understood.
3. The redevelopment of an existing building will necessitate a detailed facility condition assessment be completed.
4. The Consultant is to establish a production schedule in consultation with the Design Manager following the design briefing meeting. The schedule shall establish the elapsed time from start of the design process to the award of the construction contract(s) and incorporate client design

reviews. This schedule shall also detail the expected deliverables for the project.

5. The Consultant is responsible for monitoring construction costs during preparation of contract documents and advising the Design Manager of any significant deviation as a result of client or departmental requested design changes. Ensure that the probable cost increases do not exceed the design contingency allowance provided for in the cost plan. The pretender estimates are to be provided in accordance with this manual.
6. The basic service fee for Consultant Services incorporates three design stages:
    a. Concept Design
    b. Design Development
    c. Contract Documents

5.4.2 DESIGN ERRORS AND OMISSIONS

1. An error is an item in the drawings and specifications that results in extra costs or delay due to the correction of a design or other deficiency (e.g. co-ordination). An omission is an item missing from the drawings and specifications which must be added outside the competitive bidding process.
2. Design errors and omissions can be minimized through the implementation of a design quality assurance plan by the Consultant team and complying with the design procedures and guidelines contained in this manual. The Consultant is to exercise the skill, care and diligence that may reasonably be expected of another professional of ordinary competence. The Design Manager and the Construction Manager also have key roles in reviewing design documents for accuracy and completeness prior to construction starting.
3. The Consultant shall complete all internal design checks and inter-discipline reviews prior to submitting to the Department's project team. Shall it become evident that this review has not been completed by the consultant; the document package will be returned with out comment and

the expectation that the consultant will complete the work prior to further submission.

4. The cost of design errors on the part of the project consultant team are the responsibility of the Consultant. The Consultant shall undertake immediately to correct the error, in consultation with the Construction Manager. The correction may include, but not necessarily be limited to, provision of design drawings and specifications, preparation of a change order for the Contractor, coordination of on site inspections, and payment to the Owner.
5. Corrected errors and omissions shall be completed in a reasonable time frame so that the overall project schedule is not affected. During construction phase this time shall be 10 days or less for non-critical items and 3 days or less for those deemed critical.
6. The cost of design omissions on the part of the project consultant team may be paid, in part or in full, by the Department provided:
    a. the cost of such omissions does not entail removing material or equipment already installed
    b. the costs of such omissions are within the construction contingency allowance provided for in the cost plan
7. The benchmarks for change orders arising from design errors and omissions are as follows, applicable for major projects:
    a. 2% of the original construction contract for new construction excluding health care facilities
    b. 3% for health care facilities
    c. 4% for renovations / alterations / redevelopment projects
8. In the event that the benchmarks are exceeded, the Construction Manager shall prepare a report for the Divisional Director reviewing each change order on the project. The Consultant shall be given the opportunity to reply to this report and offer explanation and options for mitigation of costs. Final cost recovery for omissions exceeding the benchmarks shall be established with TW's legal advisor.

5.4.3 APPROVAL REQUIREMENTS

5.4.3.1 General

The Design Manager is responsible for obtaining, or ensuring that the Consultant obtains all necessary approvals. This includes the approval of client partners and the approval of any regulatory agencies. The major regulatory agencies are noted in the following sections; however the specifics of the project may necessitate several other regulatory approvals.

5.4.3.2 Fire Commissioner's Office

Submissions for review should be made by the Consultant for any contracts related to the construction or alterations of buildings as defined in National Building Code of Canada (latest revision). This would generally include contracts involving changes to the layout of buildings or the installation of fire protection systems, but would not include maintenance related projects such as roof repairs.

5.4.3.3 Municipal Building Permits

1. Plans are to be submitted for approval and the contractor will be required to obtain and pay for a municipal building permit, in accordance with departmental policy, for new buildings and extensions to existing buildings. Discussions will be held during the preliminary design stage with municipal authorities to identify and resolve any concerns and maintain compliance with any applicable municipal regulations. This is intended to ensure that the contractor will not experience undue delay in obtaining a building permit.
2. Building alteration projects involving an occupancy classification change will be submitted to the municipality for agreement in principal to ensure any municipal zoning regulations, bylaws, and ordinances are incorporated into the design.

5.4.3.4 Electrical Permits

1. Contractors shall be obliged to obtain and pay electrical permits from the applicable regulatory Department.

2. The Construction Manager should advise contractors that electrical inspections by the applicable regulatory Department will be in addition to those conducted by TW staff.

5.4.3.5 Building Accessibility Regulations

1. Plans and specifications shall be submitted by the consultant to the Department of Government Services in accordance with the design registration procedures established under the “Building Accessibility Act and Regulations”.
2. The Contractor will be obliged to obtain and pay for any inspection permit fees levied by the Department of Government Services.

5.5 CONCEPT DESIGN

1. The concept design process documents and reports on the building systems proposed (or alternatives under evaluation), taking into consideration the client's program needs, economy, durability, capital cost, and requirements of relevant codes and authorities.
2. The concept design documentation shall be assembled in such a way to facilitate its updating and expansion to incorporate:
    a. the requirements of the project design report at the conclusion of the design development stage
    b. the systems description and operating principles required in the preparation of system operation manuals
    c. LEED® requirements or recommendations in order to achieve the certification level required for the project. Note, projects will require the LEED certification striving for LEED Silver unless otherwise notified. The LEED® score card shall be included in submittals
3. Provide 8 copies of Concept Design Reports. Report to be printed double sided.
4. Provide reduced drawings 11 x 17 format, bound separately from the report. Quantity of full scale drawings and graphic illustrations is to be determined on a project specific basis.

5. Review comments made by TW team and client partners will be assembled and consolidated by the Design Manager and forwarded to the Consultant, for incorporation into the facility design.
6. The Design Manager will confirm that the project is within the approved budget prior to proceeding with the design development stage.

5.5.1 SITE SURVEYS

5.5.1.1 Scope

Carry out existing conditions survey for proposed construction of installations and structures, and provide drawings depicting existing conditions for design and construction purposes.

5.5.1.2 Guidelines

The following guidelines will be adhered to:

1. Information provided shall be verified, except that a GSC monument providing benchmark information and exact latitude and longitude will be accepted as valid, and needs no verification. Information shown shall be sufficiently detailed to permit any point on any survey line to be accurately located in the field.
2. Building sites will be mapped at a scale of not less than 1:500. Corridors for access roads and utilities outside property limits are to be mapped at a scale of 1:500. Mapping for corridors to be 60m wide unless otherwise noted.
3. Place permanent monuments on the site as required, to enable the work ultimately designed to be sited and built.
4. A minimum of two (2) benchmarks and two (2) monuments are to be established at the project site as determined by the Design Manager.

5.5.1.3 Accuracies

5.5.1.3.1 Vertical

1. Benchmarks will be accurate to 5mm.

2. Building floor elevations and inverts, if any, will be accurate to within 25mm. Spot elevation on roadways and similar surfaces will be accurate to 25mm.
3. Contours on 1:500 mapping will be identified at 1m intervals, with intermediate contours of 0.5m also indicated.

5.5.1.3.2 Horizontal

Control traverses shall be such as to ensure a closure accuracy of 1 to 5000 or better. Plotting accuracy of identifiable features to be within 250mm.

5.5.1.4 Survey Requirements

1. Determine surface elevations on 5m grid patterns or by photogrammetry over the property and adjacent areas to tolerances compatible with usage of information for design and construction purposes. Grids may be smaller, as may be dictated by surface irregularities to give an accurate representation. Flag perimeter boundaries of the survey area.
2. Take surface elevations of lakes and water courses and observe on high-low level marks. Also measure depth of fresh water lakes and streams which impact the project site. Determine direction of flow for all watercourses.
3. Determine elevations and cross sections of existing drainage channels where such will be used for drainage of new work.
4. Take invert and top elevations as well as pipe sizes of existing culverts and drainage structures in areas affected by new work.
5. Take invert and top elevations of existing sanitary and stormwater manholes which may service the site. Obtain pipe size, and determine grade of sanitary/storm sewers.
6. Obtain information on water distribution mains, appurtenances, and fire hydrants available to service the site from field survey data and review of project record drawings.

7. Obtain information on and locate all overhead power utilities and underground power supply/distribution from field work and review of construction records.
8. Obtain road centreline, shoulder, and ditch elevations on existing public roads for a distance to be determined by the Project Manager on either side of proposed site access location(s).
9. Determine outline of rock outcrop and distinct terrain features. Outline wet or swampy areas. Record depths to firm bottom. Outline tree clusters as may be required by the Project Consultant for preservation during construction. Do not cut survey lines through tree cluster without prior authorization from the Design Manager.
10. Locate any test pits/borings.

5.5.1.5 Drawing Requirements

1. All drawings are to be completed in accordance with Section 8 - Documentation Standards.
2. Show all pipe sizes in mm.
3. Identify the exact longitude and latitude of each control monument to the nearest second.
4. Show all existing buildings, utilities, services and topographical details to accurately illustrate existing conditions on the site.
5. Drawings will be related to known survey benchmark which will be described.
6. Show the location and elevation of all soil test borings. Show and number, test pits or probe holes in accordance with that shown in soils report.
7. Place a North arrow in the upper right hand corner of the Site Plan. Draw the Site Plan so as to be viewed either in an East to West, or a South to North direction.
8. Stamped drawings with the seal of the respective professional engineer or licensed land surveyor supervising the survey work.

5.5.2 GEOTECHNICAL

During the conceptual planning of a project, a preliminary geotechnical investigation is to be carried out. The geotechnical sub-consultant is to attend periodic meetings with the Design Manager and the Consultant team to obtain the instructions regarding project requirements. In the preliminary investigation stage, provide the following:

5.5.2.1.1 Air Photo Interpretation

Where air photographs are available, map the site and surrounding area terrain to indicate some or all of the following:

a. general drainage patterns
b. general slopes and ranges or gradient
c. bedrock outcrops, where present
d. general surficial soil types
e. poorly drained or bog areas (peat or muskeg)
f. erosion features
g. old or potential slope failure areas

5.5.2.1.2 Literature Search

1. Review the geology of the area from known data, either to supplement the air photo interpretation, or to replace it where air photos are not available.
2. Search all available physiographical data and previous site investigation data, along with any available well water records.

5.5.2.1.3 Site Reconnaissance

Following air photo interpretation and/or literature search, carry out a preliminary site reconnaissance to physically examine land forms, drainage, erosion features, etc. In addition, hand auger holes or rod soundings may be put down, or shallow test pits excavated to confirm the general surficial soil, bedrock and groundwater conditions.

5.5.2.1.4 Preliminary Investigation Report

Present the findings of the work in the preliminary investigation report. Present the data in a form that enables the client to assess the economic effect which the soil, bedrock and groundwater may have on the viability of the project.

5.5.3 STRUCTURAL

1. Provide TW with the overall structural engineering design intent for the proposed facility.
2. Check applicable code, regulations, restrictions, insurance requirements and other factors affecting the design of the project.
3. Develop the structural scheme for the primary structural system detailing each significant component and material, and providing alternates where applicable.
4. Prepare a conceptual cost estimate or assisting in the completion of the project estimate.

5.5.4 ARCHITECTURAL

1. The Consultant shall:
    a. identify information required from the Department, client and other design disciplines before setting a design schedule
    b. review the building performance criteria, with the client
    c. review applicable, codes, and regulations, and review with authority having jurisdiction, as necessary
        i. meet with the Project Team to compile information concerning
        ii. mechanical and electrical requirements other than specified standard
    d. equipment and furnishings, including built-ins, for each space and the associated services required by the equipment and owner supplied items
    e. review the Department's project budget
2. Prepare concept design documents to describe:
    a. the general architectural design intent of the building

b. the massing, fenestration, and materials selected for the exterior
c. a description of the envelope system, illustrating the approach to meet energy performance requirements
d. the spatial plan and the functional relationships including:
    i. major program areas and spatial plans showing the functional relationships inside these areas
    ii. summary of deviations from the program areas, identifying the differences in net and gross building area
e. complete system performance outline with environmental requirements, equipment, furnishings and special considerations
f. provision of adequate space for layout and servicing of mechanical installations
g. enlarged concept layouts for circulation areas
h. proposed materials for interior finishes
i. a list of all regulatory authorities
j. a project cost plan including the Department's project services costs
k. a schedule for the preparation, and client and regulatory approvals of the project design

3. Review the spatial and functional program, and other information given by the Department or the Client.
4. Advise the Design Manager of:
    a. additional professional service activities to be included beyond basic services
    b. delegation and authority respecting project design and quality assurance
5. Study the characteristics of the site, record the data including information on existing structures, and carry out the following:
    a. produce measured drawings (as-found) for structures that will be affected by the construction program
    b. provide advice on cost factors or risks in proceeding with the site as selected at this stage

c. provide advice on potential environmental concerns affecting the project. The Department shall select an appropriate environmental consultant to carry out environmental assessments, with emphasis on existing hazardous materials, and co-ordinate execution of the environmental review program with the consulting team

5.5.5 CIVIL

1. Provide TW with the overall civil design intent for the proposed facility.
2. Describe each of the civil components of the project such as:
    a. site grading and layout
    b. domestic water supply
    c. sanitary sewers and existing capacity
    d. storm sewer and existing capacity
    e. traffic control
3. Check applicable codes, standards, regulations and restrictions, insurance requirements and other factors affecting the design.
4. Where appropriate, provide comparative information to be used in the selection of various systems for the project.
5. Provide or corporate in the completion of preliminary costs estimate for the civil work for the project.

5.5.6 MECHANICAL

1. Provide TW with the overall mechanical engineering design intent for the proposed facility.
2. Describe each of the proposed mechanical systems to be utilized in the facility including heating:
    a. HVAC and controls
    b. plumbing
    c. fire protection and any
    d. other required specialized mechanical systems
3. Describe viable alternative mechanical system concepts being considered. Criteria to be considered are:

a. energy conservation
b. efficiency
c. maintainability
d. reliable performance (local parts and service availability)
e. capital cost

4. Analyze the energy consumption of three alternative heating systems on a monthly and hourly basis for one year using total life cycle cost method.
5. Describe function of each mechanical system as it would operate in the proposed facility and its effect on the gross size of the building.
6. Identify the location of the service connections to the building for all mechanical services. Comment on the availability of these services and describe how these services will be provided.
7. Identify recommended locations for mechanical rooms in the building and their approximate size (area and height).
8. Provide an initial cost estimate for the mechanical systems.

5.5.7 ELECTRICAL

1. Provide TW with the overall electrical engineering design intent for the proposed facility.
2. Describe each of the proposed systems to be utilized in the facility.
3. Describe viable alternative electrical system concepts being considered. Criteria to be considered are: energy conservation, efficiency, maintainability, reliable performance, (local parts and service availability), and capital cost.
4. Describe function of each mechanical system as it would operate in the proposed facility and its effect on the gross size of the building.
5. Identify the location of the service connections to the building for all electrical services. Comment on the availability of these services and describe how these services will be provided.
6. Identify recommended locations for electrical and data rooms in the building and their approximate size (area and height).
7. Provide an initial cost estimate for the electrical systems.

5.5.8 LEED SCORECARD REVIEW

1. Provide TW with a preliminary LEED scorecard identifying points to be targeted, points which will not be pursued and those points which need to be explored further.
2. Describe each of the proposed systems to be utilized in the facility.
3. Describe viable alternative electrical system concepts being considered. Criteria to be considered are: energy conservation, efficiency, maintainability, reliable performance, (local parts and service availability), and capital cost.

5.5.9 COMMISSIONING

1. The Commissioning spec sections of the NL Master Specification Guide for Public Funded Buildings covers project aspects in detail. This section is an overview of the general process of Facility Commissioning.
2. The process of commissioning starts at the design phase and continues during construction phase. The following are commissioning activities carried out during the concept design stage of the project:
    a. identify building systems to be commissioned
    b. identify the documentation requirements
    c. review and sign off on design concept for identified building systems

5.5.10 PERFORMANCE TESTING

1. Performance testing includes: checks and tests to be carried out by the commissioning team assembled for the project. There may be, other Authorities Having Jurisdiction that may mandate third party verification.
2. The result of the testing can be expected to confirm the design intent as expressed in the contract documents has been met. However, the commissioning testing may identify variations between the design intent expectations and/or design specification and the system/equipment performance as outlined in the contract documents.
3. It is recognized that the contractor(s) are only responsible for work which they have contracted to perform or deliver.

4. For specific performance tests refer to the “issued” project specifications, as derived from the NL Master Specification Guide for Public Funded Buildings.

5.5.11 FACILITY START-UP

1. Equipment supplied under the construction contract is to remain the property of the contractor, until it is turned over to the owner.
2. Equipment supplied by the owner that is installed by the contractor remains the owner’s. In this case a specific agreement for the start up responsibilities of the contractor and the owner needs to be established between the contracting parties.
3. For specific performance tests refer to the “issued” project technical specifications, as derived from the NL Master Specification Guide for Public Funded Buildings.

5.5.12 COMMISSIONING DOCUMENTS

5.6 COMMISSIONING DOCUMENTS SHALL BE SUPPLIED BY TW’S COMMISSIONING AUTHORITY AND ARE TO BE INCLUDED IN THE TENDER DOCUMENTS INTEGRATED DESIGN TEAM (IDT)

5.6.1.1 LEED Coordinator

1. Facilitates LEED registration and certification process.
2. Stores and reviews all relevant submittal documents with regard to completeness and relevancy for the purposes of registration and certification.
3. Organizes and hosts various meetings between IDT members to discuss the environmental performance of the proposed building.
4. Generates LEED scorecard and sustainability goals with assistance from discipline consultants.

5.6.1.2 Commissioning Authority (CxA)

1. See Commissioning Section.
2. Provides input regarding owner’s requirements during design phase.

3. Reviews design, construction, installation and warranty documents for compliance with Owner's requirements and/or Specifications as appropriate.

5.6.1.3 Prime Consultant

1. All duties outlined under Discipline Consultant, listed below.
2. Maintains effective coordination and communication between Discipline Consultants and IDT members.
3. Ensures that the IDT maintains a focus on the environmental aspect of the building's design.

5.6.1.4 Discipline Consultant

1. Co-ordinates with other members of IDT to reduce redundancies present in design and promote credit synergies.
2. Assists the LEED coordinator to develop the LEED scorecard and suggests which credits may be applicable to the given project within their discipline.
3. Assists Commissioning Authority where required. (see Commissioning section)

5.6.1.5 Energy Consultant

1. Co-ordinates with other consultants to reduce system redundancies and improve credit synergies.
2. Works to improve the overall energy efficiency and environmental performance of the project while remaining within budget limits.
3. Advises design team to remove unnecessary, ineffective or detrimental green features.
4. Generates energy models as required for LEED certification.

5.6.1.6 Construction Expert

Suggests practical construction considerations & design alterations to mitigate cost and complexity of project construction.

5.6.1.7 Maintenance Representative

1. Suggests practical considerations & design alterations to mitigate cost and complexity of building operation and maintenance.
2. Works with IDT to ensure that building can reasonably be operated to achieve expected environmental results.

5.6.1.8 Design Manager

1. Ensures program and requirements are met by proposed design.
2. Ensures sustainability goals are understood and implemented in design process.
3. In concert with Prime Consultant, ensures effective communication between IDT members during design phases.

5.6.1.9 Construction Manager

1. Ensures sustainability goals and design features are implemented and met in all phases of construction.
2. In concert with General Contractor, ensures effective coordination, communication, and handling of information between appropriate IDT members during construction phase.

5.6.1.10 General Contractor

1. Ensures LEED requirements are met through all stages of construction.
2. Ensures material and construction practices used meet LEED criteria.
3. Communicates with Construction Manager regarding any LEED related concerns or inquiries.

5.6.1.11 Construction LEED Coordinator

1. Responsible for the construction documents required for LEED certification and for the compliance of project with LEED requirements and sustainability goals.
2. Communicates and cooperates with LEED coordinator to ensure all applicable documents are compiled and completed and submitted in a timely manner.

3. Assists contractor by ensuring LEED related features and requirements are being installed and implemented correctly.
4. Other tasks as detailed in NL Master Specification Guide for Public Funded Buildings Section 01 35 21 (LEED Requirements).

5.7 DESIGN DEVELOPMENT

5.7.1 GENERAL

1. The design development process is crucial to the long term success of the project. It is this stage that final design solutions become thoroughly defined and documented for acceptance by the client in achieving program requirements, and by the Department in relation to capital costs, long term maintenance and compliance with departmental design criteria.
2. The Design Manager is responsible for overall direction and co-ordination of the Consultant and ensuring client and departmental requirements are met prior to proceeding in earnest. Elements of the work which have been accepted may be released for the next stage of the design process, the contract document stage.
3. On minor capital and maintenance projects, concept design and design development often converge as a single activity, and culminates in the presentation of a brief technical design report. Design sketches are provided to clearly show the design intent. The report contents shall be analytical in its assessment of the problem, the options examined, and the reasons for the design solution selected.
4. A Final Design Report is to be prepared by the Consultant at the conclusion of this stage. Provide 8 copies, printed double sided (8½ x 11) of the Final Design Report, including reduced drawings (11 x 17) bound separately.
5. The required quantity of full scale drawings is to be determined on a project specific basis.

6. The Final Report will be assembled in hard copy within a 3-D binder and in electronic form on a CD Rom disk. The electronic copy shall be bound as one “pdf”, do not submit individual sections.
7. The Final Design Report may be considered as an extension of the Concept Design Report, and reuse of sections of the Concept Report is encouraged. However revisions and updating is anticipated to reflect the final design solutions selected for the project.
8. In addition the submission shall incorporate:
    a. a full listing of anticipated drawings
    b. a listing of departmental technical specifications applicable and new spec sections to be developed specifically for the project
    c. a listing of furnishings, furniture and client dedicated equipment to be procured under the capital cost of the project
    d. separate binders providing product/equipment literature respecting major components to be used in the project for client and departmental acceptance, organized and referenced by NMS divisional and sectional specification sections
    e. LEED® Scorecard revision and comments with respect to achievement of credits
9. Review comments by the Project Team partners will be assembled and consolidated by the Design Manager. The Divisional Director will resolve any conflicts on technical matters. The Consultant shall revise and resubmit the Final Design Report as required to obtain the final approval of the Project Team.
10. The Design Manager will arrange design review meetings or other communications as may be required to conclude this stage of the design process.
11. On major projects, a final perspective should be prepared on the project. At this stage only a sketch perspective is normally provided.

5.7.2 GEOTECHNICAL

Upon completion of the preliminary investigation, the geo-technical sub-consultant is to meet with the Design Manager and the Consultant team to review other relevant planning concept design information. The detailed geotechnical investigation shall include work as described in the following sections.

5.7.2.1 Field Exploration

1. The pattern of borehole drilling and/or test pit excavation should be agreed between the geotechnical consultant and the Consultant's design engineer. The nature of the project to be designed and the known subsurface conditions of the area usually dictate the location, spacing and depth of the test holes.
2. Carry out the drilling of boreholes by an experienced drill crew using the type of equipment best suited for the terrain and anticipated soil conditions. Boreholes may be advanced by wash boring, with or without driven casing, solid stem augers or hollow stem augers. Test pits may be hand or mechanically excavated.

5.7.2.2 Field Sampling

1. Carry out exploration and field sampling work in accordance with recognized practice, such as recommended in the latest edition of, the Canadian Foundation Engineering Manual and by ASTM.
2. The frequency and type of sampling may be varied by the requirements of the project, but should be under the control of the geotechnical consultant. Normally, standard sampling is carried out at 0.75m intervals initially, with a spacing often increased to 1.5m intervals below the 4.5m or 6m depth if conditions warrant such increase. Types of samples normally used include split spoons and thin wall Shelby tubes. Other types of samplers which may be required in certain types of soil are piston and Oesterberg samplers and foil samplers.
3. In test pit excavations, representative bulk samples may be recovered from the different stratigraphy units as necessary.

5.7.2.3 Field Testing

Carry out field testing in accordance with recognized practice such as recommended in the latest edition of, the Canadian Foundation Engineering Manual and by ASTM or in accordance with special instructions set out by the equipment manufacturers. Types of tests normally done include in-situ vane, standard penetration, dynamic cone penetration, pressure meter and pumping tests. Other tests depending on soil conditions may include static cone penetrometer, flat dilatometer, plate load tests, etc.

5.7.2.4 Groundwater Records

1. Fluctuations in the elevation of the groundwater occur over a period of time. The existing groundwater level shall be monitored by piezometers or other methods as a routine part of any investigation. The installation of such equipment shall be in accordance with recognized standards. Such installations usually require additional visits to the site to make field observations until conditions have reached equilibrium.
2. Record all observations of the encountering of seepage water or initial water percolation into test pits. Record the rate of inflow and rise of water levels at the time of the initial observations in order to assess correctly the apparent influence which the water condition may have on the design project as well as on construction procedures.

5.7.2.5 Laboratory Testing of Samples

Test representative samples from the detailed site investigation in the laboratory for the determination of soil properties essential to the preparation of the geotechnical report. Determine natural moisture content of samples at the time of the investigation. Base the report and recommendations on the laboratory results obtained.

5.7.2.6 Classification Tests

Classification testing of samples is frequently carried out to identify soil type. Such classification tests include grain size analysis, Atterberg limits, moisture

content determinations and is to be carried out in accordance with recognized practice such as recommended by ASTM.

5.7.2.7 Strength Tests

Strength and consolidation tests should be carried out on undisturbed samples if conditions warrant such testing. Such tests may be carried out in a variety of ways, depending upon the parameters required and the soil type being examined, but all such tests are to be carried out in accordance with recognized practice, such as recommended in relevant CSA Standards, the National Building Code of Canada, and by ASTM.

5.7.2.7.1 Geotechnical Report

The Geotechnical Report should outline the terms of reference of the investigation, should summarize the findings of the field investigation and the supplementary laboratory testing and should then present the conclusions and recommendations based on these findings.

5.7.2.8 Factual Data

The factual data comprises the terms of reference, the details of the field investigation procedures, the results of the field investigation, the results of the field testing, records of groundwater observations, laboratory test results, site plan and inferred soil stratigraphy, etc.

5.7.2.9 Report Recommendations

1. Recommendations may cover a variety of activities, such as alternative founding depths/elevations with recommended design bearing values, pile design considerations, estimates of potential settlements, recommended safe slopes of banks or excavation walls, earth pressures for shoring design, dewatering requirements, soil stabilization, etc.
2. Make the recommendations with due consideration to the construction proposed by the user, in order to provide the most economic viable alternatives available for consideration.

3. The report is a necessary tool for the, designer and for those contractors who specialize in dewatering, excavating and foundations. Incorporate the part of the report containing factual information in the contract documents.

5.7.3 STRUCTURAL

1. Prepare the preliminary structural analysis and design calculations.
2. Prepare preliminary foundation drawings based on recommendations from the geotechnical consultant.
3. Prepare preliminary framing design showing layout of typical areas.
4. Coordinate structural design with deflection and lateral movement criteria to meet the requirement of the other design disciplines.
5. Provide product catalogue cuts of specialized materials appended to the design development submission.
6. Provide a cost plan for the work appropriate for the level of information known at the design development stage.

5.7.4 ARCHITECTURAL

1. Finalize review of codes and standards applicable to the project, with regulatory authorities.
2. Prepare drawings and other documents from the approved concept design showing:
    a. fire separations and fire compartments and ratings
    b. occupant load and exit path (route) calculations
    c. architectural, mechanical, electrical and structural systems, and
    d. environmental and energy performance criteria
3. Provide color schemes for discussion with the client, including colors for special finishes.
4. Provide a design building area analysis comparing the designed area to the programmed area.
5. Provide furniture layouts for typical interior spaces.
6. Provide an ergonomic review of casework and mill work.
7. Provide drawings to show:

a. building floor to floor heights, identifying mechanical and other horizontal service space requirements
b. exterior wall performance criteria, and components including typical details of major interfaces such as: wall/roof, wall/foundation, wall/intermediate floors, wall/window
c. roof assembly, drainage provisions and waterproofing roof penetrations

8. Provide an updated cost plan for the work.

5.7.5 CIVIL

1. Provide detail on the selected systems to allow the start of the final design and construction documents.
2. Review the reports from specialty consultants and tests completes such as geotechnical, fire protection, flow rates, storm and sanitary capacity, etc.
3. Provide preliminary design drawings.
4. Provide product catalogue cuts of proposed materials, equipment and furnishings, appended to the concept design development submission.
5. Provide a cost plan for the work appropriate for the level of information known at each submission stage.

5.7.6 MECHANICAL

1. Update design synopsis describing the mechanical work with respect to the comments and discussion from the Concept Design Submission.
2. Update information on description of operation of mechanical systems, including flow diagrams, and system schematics.
3. Submit Design Development drawings showing:
    a. mechanical service connections indicating sizes and inverts
    b. location of major mechanical equipment
    c. ventilation distribution with preliminary sizing
    d. cooling and heating systems
    e. controls schematics

f. fire protection system, showing major components
g. plumbing layout, showing routing and sizing of major lines and location of pumping and other equipment as required

4. Provide catalogue cuts of proposed equipment.
5. Provide index of proposed mechanical Master specification sections to be used for the project.

5.7.7 ELECTRICAL

1. Update design synopsis describing the electrical work with respect to the comments and discussion from the Concept Design Submission.
2. Update information on description of operation of electrical systems, and system schematics.
3. Submit Design Development drawings showing:
   a. service connections indicating sizes
   b. location of major electrical equipment
   c. distribution with preliminary sizing
   d. lighting layouts
   e. fire alarm system, showing major components
4. Provide catalogue cuts of proposed equipment.
5. Provide index of proposed electrical Master specification sections to be used for the project.
6. Update initial cost estimate for the electrical systems.

5.7.8 LEED SCORECARD REVIEW

TO BE DEVELOPED

5.7.9 COMMISSIONING

1. Incorporate into the Final Design Report, a complete description of the design and system operation.
2. Include documentation on:
   a. building occupancy
   b. required physical areas for systems(s) and equipment
   c. air quality requirements

d. energy performance

3. Preliminary Commissioning Manual shall be prepared by the Commissioning agent at this time.

5.8 CONTRACT DOCUMENTS

1. During this stage of the design process the Consultant may be required to submit a tabular drawing list, indicating percentage complete achieved to date with respect to each working drawing. This schedule is to accompany any progress payment request.
2. On minor capital and maintenance projects, it is common to have only a single submission of the contract documents for review purposes at completion and prior to tendering. Review input by the inspection group is standard practice for all regional projects.
3. Working drawings are to be prepared and in accordance with this manual.
4. Technical specifications are to be prepared using the latest editions of the "NL Master Specification Guide for Public Funded Buildings" where applicable. If a required section does not exist, the consultant is responsible for creating that section in a format consistent with the Department of Transportation & Works specifications.
5. The pretender and final submissions are subject to review and approval of the Project Team and Regional Inspection group. The Design Manager shall ensure the necessary approvals are in place prior to calling tenders, and the tender documents accurately reflect the revisions and changes arising from the review/approval process.
6. The Consultant is responsible for design quality assurance to ensure accurate, coordinated and complete contract documents are prepared for construction purposes. TW requires a formalized interference design check, and a constructability review performed by consultant's staff who was not directly involved in design preparation.
7. Under certain authorized project delivery schedules there is no alternative but to conduct the design checks and constructability review during the tendering period. The Design Manager, in consultation with the

Construction Manager, will direct the Consultant on how the conflict between the project schedule and quality control will be addressed. Addenda is not an avenue for completion of design tasks. The use of addenda to complete the design process will be reflected poorly in the consultant review process.

8. Contract drawings and specifications will be provided by the Consultant for calling tenders in accordance with this manual.
9. Where requested by the Design Manager, the Consultant will arrange for the preparation and submittal of a final, colored rendering of the project.
10. The Final Design Report is to be updated by the Consultant to reflect material changes and revisions in the facility systems design, which occurred during the production of contract documents.
11. The contract documents are to fully address commissioning requirements appropriate for the project and departmental requirements. Edit the NL Master Specification Guide for Public Funded Buildings on Commissioning to suit the project.
12. The contract documents are to fully address LEED® requirements appropriate for the project and TW requirements.

5.8.1 STANDARD FRONT END DOCUMENTS

1. Standard front end documents consist of the Instructions to Bidders, Supplementary Instructions to Bidders, General Conditions, Supplementary General Conditions, Certificate of Insurance, the Tender Form and the Agreement Between Owner and Contractor Form. These documents are available from the Department's Intranet site.
2. Modifications to the standard front end documents are not permitted for legislative reasons, without the prior approval of the Deputy Minister. Project specific requirements are to be accommodated in the Technical Specifications.

5.8.2 SPECIFICATION OF EQUIPMENT & PRODUCTS

1. Through the application of generic product specifications the use of local manufactured products of equivalent quality is to be promoted.
2. Material and equipment shall be specified by:
    a. reference to a relevant Standard
    b. by reference to an accepted product evaluation publication
    c. by prescriptive or performance criteria
3. Trade names may be used if the foregoing methods cannot be reasonably or fully applied. In case of named products, where possible specify at least three “Acceptable Products”.

5.8.3 SCHEDULING OF CONSTRUCTION WORK

1. Projects involving renovations while remaining occupied or multi phased projects require a project implementation strategy. This strategy shall be clearly presented in the technical specifications to guide the Contractor in planning and scheduling his work methods. Key milestone dates shall also be identified. Typical issues which shall be addressed are:
    a. normal business hours for work and exceptions such as noise or dust producing work
    b. payment for extended security costs
    c. responsibility and sequencing for furniture moving and relocation
    d. maintenance of fully functional entrances and exits at all times
    e. specific client requirements to ensure continuity of operations
2. The number of weeks permitted for completion of construction must be stipulated directly on the Tender Form or the Tender/Contract Form.
3. A reasonable substantial completion date shall be stipulated in the tender documents with a clause outlining any late completion assessments. The Design Manager will ensure that the completion date submitted with the contractor’s tender is within the stipulated completion time.

5.8.4 LIQUIDATED DAMAGES

1. The standard clause for liquidated damages forms part of the Supplementary General Conditions.

2. Liquidated damages are intended to cover reasonable costs estimated to be incurred by the Owner due to late completion by the contractor. This would normally include such items as additional leasing costs, consulting fees and expenses, salary and traveling costs of the Construction Manager, and Inspectors, resident project staff, etc.
3. In addition to late completion, the Department has incurred extra expense arising from untimely requests for inspection by the Contractor. If the Contractor requests for inspection or special testing, and the work is not ready upon arrival of the Inspection Team, then the Contractor is to be held responsible for the cost of future inspections for the same purpose.

5.8.5 SEPARATE CONTRACTS

1. TW promotes separate contract packages for certain facility installations based on life cycle principles. Standardized contract documents are currently available for:
    a. passenger elevators
    b. controls
    c. intrusion alarm systems
2. The Design Manager shall co-ordinate Division 1 - General Requirements regarding the Contractor's responsibilities in dealing with other contractors engaged by the Department.
3. Life cycle contracts require the initial capital cost and the maintenance service cost to be identified. It is common practice to assign the capital portion of the separate contract to the General Contractor, while the Department enters into a direct contract with the successful sub-contractor for the maintenance service portion.

5.8.6 FURNISHINGS & SPECIAL EQUIPMENT

For major projects, furnishings and special equipment are normally included in the project budget. The Design Manager, in consultation with the client, shall decide if such furnishings and equipment shall be included in the construction contract, a separate contract, or supplied by other means.

5.8.7 PROJECT RECORDS SYSTEM

1. On major projects it is important that a standardized project records system be set up and maintained at the location of the Design Manager, the Construction Manager, and the Field Office on the construction site.
2. With rapid advancement in technology and communications, and computer equipped field offices, a fully interactive high speed communications, project document control, and records system is possible.
3. An electronic document management system has been set up and is in use by the Design & Construction Division for the management, storage and retrieval of divisional and project communications. This system is available for implementation on a project specific basis or regional office operations.

5.8.8 TENDER DOCUMENTS

1. The Design Manager shall submit final documents to the Tendering & Contracts Division.
2. Final documents shall be a single print ready Adobe ".pdf" document containing the cover page, index, front end, technical specifications and drawings.

5.8.9 CASH ALLOWANCES

1. When Cash Allowances are required they are to be identified in the Tender Price Table – Appendix-C of the Tender Form and shall be clearly identified in section 01 21 00 – Allowances of the specifications.
2. Cash allowances may be used, at the discretion of the Design Manager, to cover specific materials, work or services that cannot reasonably be quantified in the tender documents.
3. Cash allowances shall be kept to a minimum, and applied to specified items of work such as testing and inspection, door hardware.
4. Cash allowances shall not be used for contingency provisions or unspecified uses such as unforeseen site conditions.

5. Contingency allowances shall be budgeted and allocated in the project budget, and not the construction tender.

5.8.10 SEPARATE PRICES

1. Separate Prices are included in the total value of tender. They identify the premiums for optional quality of materials, systems, etc.
2. Tender to be awarded for full bid price and change orders issued during the construction period for separate price items.
3. Separate prices shall be used cautiously.

5.8.11 UNIT PRICES

1. Unit Prices are used when there are elements of work that have unknown quantities and therefore cannot be reality priced with a lump sum contract. Examples include excavation, rock removal and disposal of contaminated soil.
2. Estimates of quantities and unit shall be listed in Appendix C of the Tender Form in the Unit Price section. Bidders are expected to fill in their unit prices in that table and include this pricing in their total value of their tender.

5.8.12 ARCHITECTURAL

1. This submission comprises complete contract documents ready for tender call, with all corrections and comments from previous submissions included. Provide contract drawings and specifications in accordance with this manual.
2. Incorporate into the contract documents product colors in accordance with the approved color scheme.
3. List status of submissions to regulatory authorities, and include regulatory forms submitted for the project. Pay all application fees charged by the regulatory authority.
4. Provide a pretender estimate and updated cost plan for the work.

5. Provide edited Master Specification with track changes on at pre-tender submission. Make changes required by TW and resubmit with the accept changes to be included in the tender documents.

5.8.13 CIVIL

1. This submission comprises complete contract documents ready for tender call, with all corrections and comments from previous submissions included. Provide contract drawings and specifications in accordance with this manual.
2. Provide edited Master Specification with track changes on at pre-tender submission. Make changes made required by TW and accept changes for tender documents.
3. Coordinate with Authorities Having Jurisdiction as required and provide copies of correspondence respecting regulatory approvals of the proposed work.
4. In conjunction with the Transportation & Works staff, establish testing and inspection requirements.
5. Provide a pretender estimate and updated cost plan for the work.

5.8.14 STRUCTURAL

1. This submission comprises complete contract documents ready for tender call, with all corrections and comments from previous submissions included. Provide contract drawings and specifications in accordance with this manual.
2. Tender documents should shall be completed and include the following:
    a. structural notes
    b. typical details
    c. foundation plans and schedules
    d. floor and roofing plans and details
    e. schedules and details for columns, beams and walls
    f. connections

g. sequence of construction if critical to the function of the finished structure

3. Provide product catalogue cuts of specialized materials appended to the design development submission.
4. Provide a pretender estimate and updated cost plan for the work.

5.8.15 MECHANICAL

1. Working drawings should shall be completed and include the following:
    a. floor plans showing detailed system layout of all mechanical systems, showing sizes, locations, and flow quantities
    b. all equipment locations
    c. relevant details and sections
    d. schedules
    e. detailed control schematics including sequence of operation
2. Provide final cost estimate.
3. Provide edited Master Specification with track changes on at pre-tender submission. Make changes made required by TW and accept changes for tender documents.
4. Provided detailed equipment list with the following information:
    a. identification number
    b. location
    c. type, proposed manufacturer, make, model
    d. operating parameter (max, normal, min)
    e. electrical requirements
    f. control comments
    g. other pertinent information

5.8.16 ELECTRICAL

1. Working drawings shall be completed and include the following:
    a. floor plans showing detailed system layout of all electrical systems, showing sizes, locations, and quantities
    b. all equipment locations

c. relevant details and sections
d. schedules
e. detailed control schematics including sequence of operation

2. Provide final cost estimate.
3. Provide edited Master Specification with track changes on at pre-tender submission. Make changes required by TW and accept changes for tender documents.
4. Provide a cost plan for the work appropriate for the level of information known at each submission stage.

5.8.17 CONSTRUCTABILITY REVIEW

1. In an effort to reduce the incidence of change orders due to errors or omissions exceeding stated benchmarks, the following is a guide for a constructability review to be completed by the Consultant prior to issue of tender documents.
2. This guide should be used for reviews of both in-house design and work contract to external consultants.
3. Review the front end documents regarding:
    a. contract award conditions
    b. project duration and progress requirements
    c. measurements for payment clauses as applicable
    d. site operations, safety and security
    e. exculpatory language
    f. confirm that the Tender Form includes:
        i. correct project number
        ii. correct project title
        iii. correct mailing address
        iv. Article 2 – reasonable period of time for substantial completion: (X months from award)
        v. Article 9 – indicate if the Bid Depository is to be used
    g. Check Certificate of Insurance, add Environmental Impairment Liability ($2M) if required (e.g. Abatement Projects)

4. Review the drawings for:
    a. discrepancies
    b. poor or vague details
    c. insufficient as built information reflecting existing conditions
    d. differences between specified and actual dimensions of specified equipment
    e. conflicting dimensions
    f. undersized mechanical rooms
    g. access for moving equipment around during installation of equipment
    h. LEED® requirements where applicable
    i. safety in constructability and operation of the facility
5. Review technical specifications for:
    a. non- specificity of references
    b. missing or duplicated drawing notes and specification sections
    c. conflict between drawing and technical specifications
    d. subsurface conditions report
    e. clarity in scope and payment of site works and services
6. Review Utilities in relation to:
    a. availability of temporary utilities
    b. relocation of utilities by others
    c. description and location of existing utilities
    d. deteriorated condition of existing utilities
    e. unmarked existing utility lines
7. Perform an interdisciplinary interference check to identify:
    a. insufficient space to accommodate systems
    b. inadequate ceiling space particularly to accommodate HVAC ductwork
    c. inadequate mechanical rooms
    d. inadequate structural support
    e. conflict between sewer lines and other items
    f. conflict in reflected ceiling plans

5.8.18 COMMISSIONING

1. The consultant shall provide to the Commissioning Agent a complete list of equipment with the following information:
    a. identification number
    b. location
    c. type, proposed manufacturer, make, model
    d. operating parameter (max, normal, min)
    e. electrical requirements
    f. control comments
    g. other pertinent information
2. Finalized Commissioning manual will be prepared and issued with the contract documents.

5.9 TENDERING

5.9.1 PUBLIC TENDERS

1. Procedures covering tenders are covered under the “Public Tender Act”, “Public Tender Regulations”, and “The Atlantic Procurement Agreement”.
2. A Public Tender is required for work estimated to cost $20,000 or greater.
3. Tenders that are advertised shall allow reasonable time for industry to respond. It is suggested the period be a minimum of 15 calendar days depending on the complexity and if a site briefing is required.

5.9.2 INVITED PRICES

1. Contracts for work costing less than $20,000 may be awarded using the Department’s standard Work order form:
    a. written quotations should be obtained where practical. Where, for good reason, written quotations cannot be obtained, telephone quotations may be used
    b. a minimum of three companies must be invited to submit pricing
    c. invited prices are to be written in sufficient detail to precisely identify the requirements of the contract and permit the work to be

independently inspected. Specifications, scope of work and drawings shall be attached to invite letter as required

d. the letter of invite shall indicate, the following documentation is required to be submitted prior to the start of work
    i. Letter of good standing with the Newfoundland and Labrador Construction Safety Association's Certificate of Recognition Program
    ii. Certificate of good standing with Workplace Health, Safety and Compensation Commission
    iii. Certificate of Insurance
e. required completion date to be clearly specified

5.9.3 SITE BRIEFINGS

Normally, site briefings shall used when the preparation of detailed plans and specifications will adversely affect the schedule of the work, or site clarification is required.

5.9.4 INQUIRIES FROM PROSPECTIVE BIDDERS

1. Inquiries may be received by the Tendering & Contracts Division, who will then forward to the appropriate person for review, usually the Design Manager.
2. Inquiries may also be received directly by the Design Manager or others involved in the project, including the Consultant. The Design Manager is responsible for ensuring appropriate responses are provided.
3. Reponses to inquiries may result in the requirement to issue an addenda. No directions or changes to the tender documents shall be made verbally.
4. Responses to any inquiry shall be disseminated to all prospective bidders.

5.9.5 PREPARATION OF ADDENDA

1. Addenda shall be issued to notify bidders of changes to the tender documents, to clarify and/or correct portions of the tender documents, and to identify products as acceptable substitutes.
2. Addenda shall be issued no later than 5 days prior to tender closing.

5.9.6 BID DEPOSITORY

1. Contracts which include substantial amounts of subtrade work may use the Bid Depository operated by Newfoundland and Labrador Construction Association.
2. Where the Bid Depository is being used, the Design Manager will:
    a. Notify the Consultant and Tendering & Contracts Division accordingly
    b. Ensure appropriate Appendix is listed in Article 9, USE OF BID DEPOSITORY, in Instructions to Bidders

5.9.7 LISTING OF MAJOR SUBCONTRACTORS AND SUPPLIERS

1. The Design Manager and the Consultant may establish a listing of all major subcontractors, and equipment suppliers required for the work.
2. The finalization of who the major subcontractors and suppliers will be on the project is important:
    a. to discourage shopping of prices indefinitely
    b. to facilitate early shop drawing submissions
    c. to avoid construction delays due to late arrival of major equipment or product items
3. The listing shall form part of Appendix-A to the Tender Form, and be completed prior to the contract award.
4. As per the Supplementary Instructions to Bidders Item 6, Appendix A does not have to be completed at time of tender close. Bidders are given 72 hours following request by Owner to submit completed appendices.

5.9.8 REQUESTS FOR TENDER WITHDRAWAL

1. Approval for a Contractor to withdraw their tender will be, subject to the approval of the Executive, based on recommendation of the Design Manager.
2. Approval may be granted without prejudice, if the Contractor can demonstrate that an error was made in the preparation of the bid arising from errors or contradictions within the tender documents. Errors made by the bidder in the preparation of the bid may not be an acceptable cause to grant withdrawal.

3. If a request is denied, a contract may be awarded and immediate action will be taken by the Construction Manager to obtain the bonding and insurance. If the necessary documents are not submitted, the Construction Manager will cause the contract to be terminated and Tendering & Contracts will be notified to make the necessary claim against the bid bond.

5.9.9 TENDER ANALYSIS

1. Once Tendering & Contracts Division confirm that the tenders from eligible bidders are submitted in accordance with the requirements (signed, salad, bid security in order etc.) they forward the tender docket to the designated Design Manager for analysis and recommendation.
2. The Design Manager prepares a recommendation in PARTS, initials the docket and returns it to Tendering & Contracts.
3. A copy of the low bid is retained by the Design Manager. The second and lowest bid may also be retained for regional files.

5.9.10 TENDER EXCEEDING PROJECT BUDGET

1. Changes in the project scope related to negotiations aimed at reducing the amount of the tender to meet a predetermined budget are not permitted. In such instances the reduced contract amount would be equivalent to an untendered contract, as defined by the “Public Tender Act”.
2. If the tender is not awarded at the price submitted by low bidder, the tender documents may be revised to reflect a change in the scope of work to comply with the predetermined budget. A new tender call may be issued.
3. The Consultant is responsible for the preparation of contract documents within the predetermined budget. If the tender exceeds the project budget for reasons within the control of the Consultant, the Consultant shall provide redesign services at no additional expense.

5.9.11 TENDER APPROVAL AND AWARD

1. If the work is to proceed (funding in place, and with client approval), the design manager will recommend that the tender be awarded to the low bidder. The recommendation in PARTS, includes the Review of Tender Form, Contractor Evaluation, Cost Comparison and Project Budget.
2. If the contract value is less than $100,000, the Regional Director may approve the contract award. Request for approval to award the contract for bids greater than $100,000 are forwarded to TW executive for approval, as well as client executive as applicable.
3. Tendering & Contracts Division prepares the contract award letter following notification of approval.

5.9.12 CONTRACT AGREEMENT

1. Tendering & Contracts Division shall prepare the Agreement Between Owner and Contractor.
2. The signed agreement is sent to the Contractor with an original retained by the Tendering & Contracts Division. A copy is sent to the Construction Manager.

6 CONSTRUCTION PHASE

6.1 DESIGN TO CONSTRUCTION MANAGER HANDOVER

1. Once the construction contract is awarded, the Construction Manager assumes responsibility for the implementation of the project, and administration of the contract(s) in the construction phase.
2. The Design Manager is to ensure the Construction Manager has all necessary documentation for a smooth transition to the construction phase including the Prime Consultant Agreement with associated change orders and payment certificates, commissioning manual, LEED® scorecard and consultant evaluation.

6.2 GEOTECHNICAL SERVICES DURING CONSTRUCTION

Further to the carrying out of a geotechnical investigation and report, various additional activities to be performed by the geotechnical consultant shall be considered during the construction phase.

6.2.1 FOUNDATION SUBGRADE INSPECTION

1. The geotechnical engineer responsible for the original site investigation shall visit the site during construction and conduct an inspection of the foundation bearing material.
2. The geotechnical engineer shall be given the opportunity to verify the conditions at the bottom of the excavated site are consistent with what was expected during the design stage; and that no part of the excavation shows soil conditions which are substantially different than those which were anticipated.

6.2.2 LOAD TEST SUPERVISION

1. Where load tests of foundations are deemed necessary, the details of the load application and settlement under each increment are to be recorded as the work proceeds.

2. Load tests are to be carried out in accordance with recognized practice such as recommended by ASTM.
3. A report is to be submitted providing details of the work and the results obtained. Include graphs representing the Load/Time/Settlement curves for the footing tested.

6.2.3 FILL COMPACTION TESTING

Where fill placement is a requirement of the contract, the geotechnical consultant shall conduct inspection and testing for approval of soils (site borrow material or granular fills). Report indicating acceptance or rejection of the work are to be submitted as the work is performed.

6.2.4 PAVEMENT SUBGRADE TESTING

Road subgrades shall be tested for the eventual pavement design. Such tests may involve laboratory testing of samples recovered from the site or may involve in-situ testing of the subgrade in its prepared condition.

6.2.5 SLOPE STABILITY MONITORING

The installation of, and the monitoring of, slope indicators prior to, during and following construction of civil engineering works may be essential to the safety of the facility.

6.3 CONSULTANTS ROLE IN CONTRACT ADMINISTRATION

6.3.1 CONSULTANT SERVICES CONTRACT ADMINISTRATION (BASIC SERVICES)

1. Normally the negotiated basic service fee includes contract administration services as follows:
    a. prepare construction review reports, and attend monthly construction meetings commenting on compliance with design and status of deficiencies
    b. perform shop drawing reviews for compliance with technical specifications
    c. provide additional instructions as per “GC-3 Additional Instructions and Schedule of Work”, as required

d. comment on the contractor's applications for progress payments, including evaluation of materials on site
e. comment on requested changes to the contract and prepare appropriate change orders
f. review reports from testing/inspection agencies and initiate any required corrective action
g. review operation and maintenance data manuals compiled by Contractor
h. attend start up of systems and report on any operational difficulties
i. provide advice during the normal construction 1 year warranty period
j. provide record drawings to the Department in AutoCAD.dwg and Adobe.pdf formats

6.3.2 CONSULTANT SERVICES - ADDITIONAL SERVICES

1. The following additional services are outside the basic services fees recommended by PEGNL & NAA Joint Fee Guideline:
   a. field services other than monthly construction review and meeting
   b. provision of full time or part time inspection
   c. facility commissioning services
   d. extended construction administration costs arising from circumstances outside the control of the Consultant
   e. provision of contract administration and advisory services to the Construction Manager in the case of contractual default by the Contractor
   f. provision of record drawings showing Owner requested changes
2. The Consultant Agreement shall specify the services to be provided, and the applicable fee.
3. LEED® certification duties as required for the project.
4. All documentation shall be completed, complied, and submitted in a timely manner. A copy of the final submittal shall be supplied to TW in paper and adobe .pdf formats. The .pdf copy shall be bound so that only one file is to be transmitted.

5. The consultant shall provide updates to TW on a bi-weekly basis, which shall include at a minimum:
    a. status of credits/points achieved
    b. factors limiting the achievement of any points planned for the project
    c. issues with documentation submittal from all parties

6.4 REQUIREMENTS PRIOR TO START OF WORK

1. Insurances, bonding and other documents in accordance with the contract documents and contract award letter are required to be in place prior to start of construction.
2. A complete Health and Safety Risk Assessment and Management Plan, including a Site Specific Health and Safety Plan must be submitted at least 5 working days prior to commencing any work on site. Refer to Section 01 35 29.06 Health and Safety Requirements for further details.
3. Submission requirements for Consultants are outlines in the Prime Consultant's Agreement.
4. For projects in existing buildings, confirmation of a hazardous materials survey / management plan is required. This should be identified in the design stage and checked again prior to the start of construction. Contractors and consultants will require access to relevant portions of the hazardous materials management plan.

6.5 PRE-CONSTRUCTION MEETING

1. Pre-construction meeting should occur before any work starts on the project convened by the Construction Manager. The designated building representative and inspectors shall attend the meeting. Client partners should be extended an invitation to attend.
2. A typical format for the meeting includes:
    a. present the administrative requirements for the project and contact authorities of the Department
    b. discuss roles of Department's Inspectors

c. discuss requirements for any special inspections or testing and authority of inspections, etc.
d. the schedule/frequency for project meetings
e. review change order management procedures
f. review construction cost reporting procedures
g. review scheduling reporting procedures, including scheduling coordination, delays are to be recorded and the schedule adjusted with client partners
h. review site specific construction hazards and safety measures
i. review requirements for temporary facilities on site (e.g. materials storage, temporary power, water & sanitary sewer)
j. review project documentation management procedures such as project record drawings and shop drawings
k. location of project signs
l. review environmental considerations applicable during construction
m. timely co-ordination and scheduling for performing tests, inspections and commissioning activities by the Owner and their agents
n. review listing of approved subcontractors and major suppliers
o. review LEED requirements for construction process and documentation

6.6 QUALITY CONTROL & INSPECTION SERVICES

6.6.1 CONSTRUCTION SAFETY

1. The entire project team shall ensure that safe work practices are followed and deficiencies in safe work practices will be immediately reported to the Contractor's designated representative and TW's Construction Manager.
2. Requirements for site safety are described in the NL Master Specification Guide for Public Funded Buildings.
3. The Construction Manager is to provide the project coordinator and the Inspector with a copy of the Contactor's Site Specific Health and Safety Plan.

4. All TW staff are to be familiar with TW's Occupational Health and Safety Program Manual.
5. Safety is to be included on the agenda of all construction progress meetings, both to review any incidents or changes and hi-lite safety concerns on the site.
6. Project coordinator shall take a lead role in monitoring compliance with safe work practices in accordance with the principal contractor's safety manual.

6.6.2 BUILDING IN QUALITY

1. TW is in the business of building and managing quality public buildings on behalf of its clients. During the design process, the Consultant plays a key role in establishing the quality of the building systems selected, as well as the quality of design drawings and specifications prepared for the project. The Contractor is responsible for the quality of the construction and to ensure the standards and specifications presented in the contract documents are achieved.
2. The goal should be to achieve "zero" recalls during the statutory warranty period, arising either from the design of the systems or its installation. While such a goal is particularly difficult to achieve in practice, substantial strides towards the reduction of warranty period defects can be achieved by:
    a. a cohesive teamwork approach to design and construction
    b. advance planning during construction
    c. timely inspections of workmanship and material (prior to being covered up)
    d. a thorough facility commissioning program

6.6.3 INSPECTION SERVICES

1. The Construction Manager will discuss the inspection requirements on the contract with the Inspectors Group and ensure a sufficient number of inspections are undertaken. On major projects such inspections should be

performed at least twice monthly, with one inspection scheduled at the monthly construction review meeting.

2. Where consultants perform monthly construction reviews, joint inspections with the inspection group shall be arranged where practical. In particular, a single deficiency list should be issued at the Substantial Completion stage. This list shall be managed by the construction manager.
3. A final inspection should be completed before a Total Performance Certificate is issued and the Contractor's final invoice is processed.
4. A warranty inspection should be conducted in the 11th month of the 12th month warranty period and reported to the Construction Manager for appropriate action.
5. Field inspections are intended to assess the quality of work and report in writing to the Construction Manager all defects and deficiencies observed at time of such inspection. Where applicable use predefined test inspection reports as contained in Commissioning Manuals.
6. Inspection reports are to be filed electronically with the Construction Manager within 3 days of the inspection. It is recommended that the Inspection Report be copied to the full inspection team and the project manager.
7. Progress photographs should be taken and appended to the inspection report. Photographs are to be dated, along with a description of the photograph.
8. Where applicable, code and specification references are to be included in the inspection report.
9. Report on the status of materials delivered to the site, and the value of work performed when requested. Typically, each inspector will receive a copy of the applicable portion of the monthly progress claim and will identify whether they are in agreement that the contractor is entitled to receive the amounts claimed for each item.

10. The Construction Manager will review with the Consultant prior to issuing clarifications or changes to the contract documents to ensure the design intent and quality is not compromised.
11. The Inspector is to report on observations regarding construction safety and take appropriate action as necessary which may include stop work directions where necessary.

6.6.4 CONSULTANT DESIGN TEAM SERVICES

1. The responsibility for design intent interpretation and design integrity rests with the Consultant. The Construction Manager may contact the Consultant to obtain an opinion whenever a variance observed on the project requires professional judgment with respect to design intent or interpretation. The Construction Manager as Engineer/Architect has the authority to make design, quality and cost decisions, independent of the Consultant, and assumes the liability of such professional authority.
2. The Consultant is expected to provide a timely service to the Construction Manager whenever a clarification regarding design intent or interpretation is needed. An initial response to a Construction Manager request should be acknowledged within 48 hours by the Consultant. A time frame provided by the Construction Manager to resolve an issue or concern shall be met, otherwise the Construction Manager may refer the matter to another professional for direction and decision. The additional costs for such professional services may be charged to the Consultant.
3. Reviews by the Consultant during key stages of construction may be established by the Construction Manager.

6.6.5 PROJECT COORDINATORS

1. A Project Coordinator may be engaged based on an assessment of the project by the Regional Office.
2. The duties of the Project Coordinator include:
    a. inspection, co-ordination, and administration of construction within the limits of authority assigned by the Construction Manager

b. monitoring compliance with the site safety plan and regulatory requirements
c. ensuring that the intent of the plans and specifications are carried out
d. ensuring adherence to contract terms
e. maintenance of complete job site records (e.g. shop drawings, change orders, inventory of materials on site, contract progress claims, quantity measurements for unit price work)
f. initiation of action and required follow up to ensure prompt decision making to permit normal progress of work
g. preparation of daily construction reports or daily journal in a format required by the Construction Manager
h. preparation of reports and other documents as established by the Construction Manager specific for the project
i. co-ordination of the client's and department's activities on the work site during construction

6.6.6 INSPECTIONS BY REGULATORY AGENCIES

1. The Contractor is obliged to have the work inspected by regulatory agencies as required by law and/or the contract technical specifications on a timely basis.
2. The Construction Manager should obtain a copy of the inspection report, prepared by regulatory agencies, from the Contractor.

6.6.7 DEFICIENCIES

Construction manager when considering deficiencies shall include in addition to construction items the following:

a. O&M Manuals
b. LEED®
c. Commissioning
d. Permits
e. As-Builts
f. Warranties

6.7 PAYMENT OF CONTRACTOR'S INVOICES

6.7.1 PAYMENT OF INVOICES

1. Contractor's invoices shall to be processed expeditiously and in accordance with Contract General Conditions GC-21 Certificates and Payments.
2. The Construction Manager is to check that required contract documentation is in place and sufficient funding is encumbered before recommending certification of contractor payments. The recommendations shall within their signing authority limits. Note: Two different signatures are required.
3. Once certified by the Construction Manager that the claim represents the true value of work completed, the claim is entered into PARTS and sent to the Director for approval.
4. Prior to issuance of final payments, the Construction Manager will confirm that all commissioning documentation and project record drawings have been received.

6.7.2 CONTRACT PRICE BREAKDOWN

1. Review of the Contractor's submitted contract cost breakdown by each discipline is recommended prior to acceptance by the Construction Manager.
2. Once accepted, a contract price breakdown shall be prepared, and entered into PARTS. Care is to be exercised to ensure reasonable costs are allocated to Division 1 - General Requirements, commissioning and LEED®.

6.7.3 MATERIALS ON SITE PAYMENT

1. The contract provides for payment of materials delivered to the site, but not yet incorporated into the work.
2. The Construction Manager shall ensure the following conditions are met with respect to such certification of payment:
    a. the material is secured

b. supporting invoices from the supply source are provided pertaining to the inventory on hand
c. no markups for Contractor's overhead and profit are included in the payment request

6.7.4 MATERIALS OFF SITE PAYMENT

1. In exceptional circumstances, a payment request for materials stored off site may be considered.
2. In order for such a request to be entertained, the Contractor shall provide satisfactory evidence of meeting the following conditions:
   a. all the conditions for a "Materials On Site Payment" request are to be met
   b. a letter from the Contractor's surety acknowledging its agreement to allow payment for materials stored offsite
   c. proof of insurance against material loss or damage

6.7.5 CONSTRUCTION COST BREAKDOWN

Construction cost will be supplied by the Contractor and approved by the Construction Manager applying TW's construction cost template contained within TW's PARTS application.

6.8 CHANGE ORDERS

6.8.1 GENERAL

During the performance of a contract, it may be necessary to deviate from the drawings or specifications. Any change from the original contract documents will constitute a cause for the initiation of a change order.

6.8.2 REQUEST FOR INFORMATION

1. The Contractor may request interpretation or clarification of the design intent. This Request For Information (RFI) shall be made in writing, and appropriately identified.

2. A response to the Request For Information (RFI) shall be documented in writing by the Engineer/Architect, following the same identification system or as otherwise agreed by the contracting parties.
3. Urgent work considered as a change to the contract may be authorized by the Construction Manager using a Field Instruction. This procedure shall be used where the value of the change order can not be readily established, and the work must be performed on an urgent basis. A written Change Order will be issued as soon as practical. For discussion. "Field Instructions" not recognized in the GC's refer to CG 19.5.
4. A Field Instruction may also be used to instruct the Contractor to comply with a particular aspect of the construction contract. The Contractor's response to the Instruction will be noted regarding whether or not acceptable performance has been attained. Refer to GC7 Engineer/Architect's Decisions.

6.8.3 REQUIREMENTS

1. Any change in the contract amount shall be documented with a change order in accordance with the Contract General Conditions, GC 18 Changes in the Work, and GC 19 Valuation and Certification of Changes in the Work.
2. Change orders cannot be approved unless sufficient contract funding is available. Once approved, an encumbrance adjustment is required to add the value of the change to the contract.
3. Change orders should only be issued for necessary work within the established scope of the project. The Construction Manager should be satisfied that the issuance of a change order is the preferable method of having the work completed, that the price for the additional work is reasonable, and in accordance with the contract.
4. Change orders required are typically recommended by the Project Manager in PARTS and approved by either the Regional Engineer or Regional or Divisional Director. TW signatures are not required, however

the change order is sent to the contractor or consultant for signature prior to processing.

5. Approval to exceed the Public Tender change order limit is to be submitted to the Director for referral to the Executive. Approval should be requested when the Construction Manager anticipates that the limit will be exceeded.
6. A Proposed Change Order form may be used to initiate the need and reason for a change order. The approved Change Order form is required to modify the contract amount and process payment on change order work. Copies of the approved Change Order will be distributed to the Contractor and Consultant.
7. In the case of a change which has no cost impact, a change order will be issued to document the occurrence of the change, and what, if any impact, the change will have on the construction schedule. These changes shall also be recorded by the Contractor for inclusion in the project record drawings.

6.8.4 CHANGE ORDER CATEGORY

1. Category of change for each change order line item is to be identified under one of the following:
2. Category “A” - Additional Requirements
3. Category “B” - Design Related
4. Category “C” - Site Conditions
5. Category “D” - Regulatory Requirements
6. Category “E” - Additional Requirements - TW

6.9 SUBSTITUTION OF MATERIAL

Material may be substituted during a the tender period or after acceptance of the tendered price, in accordance with the procedures as outlined in the NL Master Specification Guide for Public Funded Buildings, Section 01 61 00 – Common Product Requirements.

6.10 OWNER'S RIGHT TO DO WORK

1. In the event of unacceptable performance or default by the Contractor, the Construction Manager should apply Contract General Condition "GC9 – Owner's Right to Do Work".
2. A copy of all relevant correspondence should be forwarded to the bonding company.
3. Notice shall be sent by registered mail, request signature on delivery.

6.11 OWNER'S RIGHT TO TERMINATE THE CONTRACT

1. The Owner's right to terminate or stop work is described in General Contract Condition GC 10 – "Owner's Right to Stop or Terminate Contract".
2. Notice shall be sent by registered mail, request signature on delivery.
3. The Director upon the advice of legal counsel will write the bonding company to invoke the terms of the bond and begin negotiations to have them complete the contract.
4. A copy of relevant correspondence should be forwarded to the bonding company.

6.12 ISSUED FOR CONSTRUCTION (IFC) DOCUMENTS

1. The issuance of IFC documents to reflect revisions made to the contract drawings and specifications by addenda is a requirement and is to be included in the Consultant basic services.
2. Drawings are to be reissued with the appropriate revisions noted in accordance with documentation standards outlined in this manual in reproducible, full size paper copy and electronic Adobe Acrobat ".pdf" format as well as Autocad ".dwg" file format.
3. Specifications are to be re-issued incorporating addenda changes in each specification section.
4. Specifications are to be provided in reproducible paper copy (unbound) as well as electronically in Adobe Acrobat ".pdf" and WORD ".doc". formats.

6.13 SHOP DRAWINGS

1. The Consultant is to review and stamp shop drawings to assess that the technical requirements and intent of the contract documents have been met and no substitution is to be considered without TW's approval.
2. TW may review shop drawings submitted by the Consultant and require changes to be made.
3. The Consultant may issue acceptances of shop drawings directly to the Contractor, the Department has the right to alter such acceptances if they are contrary to the contract at the discretion of the Construction Manager.

6.14 PROJECT STATUS REPORTING

1. On major projects the Construction Manager will prepare Project status reports in the prescribed format (at least quarterly).
2. Monthly updates to the capital project status report are required to be submitted in the prescribed format. This submission is lead by the Design & Construction Division.

6.15 ENVIRONMENTAL CONSIDERATIONS DURING CONSTRUCTION

1. Common environmental issues include:
    a. surface water runoff control and silt sediment transport
    b. soil erosion of embankments and siltation impacts
    c. site fires
    d. construction debris collection, storage and disposal
    e. sanitation facilities
    f. excavation and disposal of oil stained soils
    g. accidental fuel spills
    h. storage, handling and disposal of hazardous substances
    i. dust control
    j. fuel fired temporary heat and ventilation requirements
2. The Construction Manager will liaise with environmental authorities as may be required to identify environmental concerns.

3. The Construction Manager will issue instructions to the Contractor to mitigate environmental impacts which may arise during construction.

6.16 DISPUTE RESOLUTION AND MANAGEMENT

1. Disputes may arise between the contracting parties on the project. The Design and Construction Managers are expected to manage the resolution of disputes and claims in an equitable and professional manner.
2. A cooperative approach is encouraged whereby the contractor's position is clearly understood, preferably in writing. Design and Construction Managers should recognize the overall objective of sound project management is to complete the work in a quality and timely manner.
3. If the dispute cannot be resolved, it is to be documented by the Design or Construction Manager, with reference to the specific sections of the relevant construction contract or consultant agreement, and forwarded to the applicable Director.
4. In conjunction with the Assistant Deputy Minister (Works) and the Department's legal counsel, a final settlement offer may be developed.
5. If the final offer is rejected, three options remain for settlement:
    a. Mediation (mutual settlement negotiated with assistance of an independent party)
    b. litigation
    c. arbitration (decision rendered by an independent party)
6. In general, the preferred option is the mediation conference. A mediation conference would normally proceed with:
    a. the selection of a mutually acceptable mediator
    b. agreement on the sharing and payment of the mediation costs, including those associated with witness travel and accommodations.
    c. agreement on representation by legal counsel
    d. both the Department and the disputing party shall be represented by a member with sufficient authority to sign a binding agreement, should the mediation conference result in a settlement being reached.

6.17 SUBSTANTIAL COMPLETION

1. Substantial Completion is defined in Contract General Condition GC12 GC21-Certificates and Payments. Substantial completion milestone represents the beneficial occupancy of the facility and the start of the 1 (one) year warranty period.
2. Client partners may be involved with the determination of substantial completion.
3. The Construction Manager shall issue a Certificate of Substantial Completion with a listing of incomplete work and deficiencies. The Construction Manager may withhold issuance of a certificate if facility commissioning as defined by the Contract is incomplete. A copy of the listing of incomplete work and deficiencies will be forwarded to the client partners.
4. In order to beneficially occupy a facility, most critical systems must be performance tested, verified and fully operational, for example:
    a. fire alarm system
    b. fire protection system
    c. emergency & exit lighting
    d. heating systems
    e. mechanical ventilation systems
    f. accessibility requirements including power assist door openers
    g. Government services accessibilities inspection.
5. Payment due to the Contractor at Substantial Completion shall be final contract value at that date less an amount to cover uncompleted or defective work, which shall be calculated as twice the cost of completing the work as estimated by the Construction Manager.
6. Tendering & Contracts Division shall be notified of the Contactor's date of Substantial Completion.

6.18 COMMISSIONING & PERFORMANCE VERIFICATION

1. The contractor shall be responsible for completion of all commissioning and performance verification activities, proving that the installed

equipment and systems are correctly installed and operate according to project specifications.

2. The Commissioning Agent shall be called to site when the contractor is ready to provide Performance Verification.
3. The Contractor shall ensure that all systems are ready to be verified prior to the Commissioning Agent arriving on site. It is not intended that the Commissioning Agent observe the contractor "working out the bugs".
4. The contractor may be penalized for extra costs associated with calling the Commissioning Agent and related commissioning team members to site prior to all systems and equipment being ready for Performance Verification.
5. The Contractor shall utilize the Commissioning Manual provided by the Commissioning Agent. The intent is that all projects be treated as if they should achieve the intentions of the "Enhanced Commissioning Credit" in the LEED® rating system.
6. Performance testing includes: checks and tests to be carried out by the commissioning team assembled for the project. There may be, other Authorities Having Jurisdiction that may mandate third party verification.
7. The result of the testing can be expected to confirm the design intent as expressed in the contract documents has been met. However, the commissioning testing may identify variations between the design intent expectations and/or design specification and the system/equipment performance as outlined in the contract documents.
8. It is recognized that the contractor(s) are only responsible for work which they have contracted to perform or deliver.

***Note**: Recent projects have had a number of concerns with structural failures with the connections of various finish items. As such, the connections for the following items need to be reviewed during the commissioning process:

- Gym Diffusers
- Gym Light Grilles
- Gym Heathers
- Basketball Backstops

- Stage Lighting
- Curtain and Tracks
- Scoreclocks
- Cord Reels
- Uni-Strut Track Systems
- Speakers
- Intercom Equipment
- De-Stratification Fans
- TV Monitors
- Stair Lift System
- Light Pole Bases
- Flagpoles
- Chimney Supports
- Ladders/Alternating Stairs
- Folding Partitions
- Light Fixtures (Clipped or Chained)
- Overbed Lighting
- Examination Lighting
- Surgical Lighting
- Patient Lift Systems
- Patient Monitor Mounts
- Ceiling Mounted Diagnostic Equipment
- Bariatric Equipment
- Cantilevered Diagnostic Equipment
- Washroom Grab Bars
- Ceiling Hung Washroom Partitions
- Wall Mounted Baby Change Tables

Special care needs to be exercised during the design, construction and the commissioning of these items. Final documentation of the checks will be completed as part the "Architectural Installation Verification Checklist" found in Appendix A of the commissioning manual.

6.19 TRAINING AND EDUCATION

Refer to the "issued" project specifications forming part of the Contract Documents.

6.20 FINAL COMPLETION

6.20.1 ISSUANCE OF TOTAL PERFORMANCE CERTIFICATE

The Total Performance milestone represents the completion of the construction contract period and is covered under Contract General Condition GC 21-Certificates and Payment.

6.20.2 PROJECT RECORD DRAWINGS

1. Preparation of Record Drawings is part of the Consultant's basic service fee and shall be submitted in three formats:

   a. full size reproducible copies
   b. AutoCAD .dwg
   c. Adobe .pdf

2. Where the Consultant is not contracted to provide contract administration services, Record Drawings will be checked by Construction Managers and transferred to AutoCAD files. Record Drawings will be forwarded electronically to the Design & Construction Division for inclusion into the Departmental Drawing Management System.
3. Project Record Drawings are to be prepared by the Consultant to reflect changes in the contract drawings arising from:
   a. the issuance of tender addenda
   b. the issuance of design clarification drawings during construction
   c. the issuance of change orders to the construction contract
   d. field changes performed as-built drawings as completed by the contractor and marked on the Contractor's set of project record drawings
4. The Consultant shall clearly identify the revisions on the drawings in order to facilitate checking and review by the Construction Manager.
5. Project Record Drawings are to be prepared in accordance documentation standards outlined in this manual.
6. Preparation of Record Drawings is part of the Consultant's basic service fee. Additional compensation will be made to those changes classified other than Category "B" – Design Related.
7. On regional projects, where the Consultant is not contracted to provide contract administration services, Record Drawings will be checked by Construction Managers and transferred to AutoCAD files by the regional drafting technician. Record Drawings will be forwarded electronically to the Design & Construction Division for inclusion into the Departmental Drawing Management System.

6.20.3 PROJECT RECORD DISTRIBUTION

1. Prior to issuance of final payments, the Construction Manager will confirm that all commissioning documentation, LEED documentation and project record drawings have been received.
2. The Construction Manager will send a copy of commissioning documentation and project record drawings to the facility's management for placement in the affected building or other appropriate location, and a copy to be retained by the Region.

7 POST COMPLETION PHASE

7.1 CONTRACTOR PERFORMANCE EVALUATION SYSTEM

7.1.1 GENERAL

1. The Contractor Performance Evaluation System is a process designed to maintain an acceptable level of performance from Contractors carrying out work for the Department of Transportation & Works. It will also provide a means to identify contractors with above average performance records and assist in the management of projects by contractors with poor performance records.
2. A record of the performance of Contractors will be maintained to identify the following:
    a. Those Contractors who by virtue of satisfactory performance will continue to be eligible to submit tenders for work with the Department
    b. Those Contractors whose record of unacceptable performance may render their tenders for work with the Department to be rejected
    c. During the execution of the work, the Contractor is to be notified immediately if the work is not proceeding in a satisfactory manner. This notification would normally be confirmed in job meeting records or correspondence to the Contractor. The Contractor Performance Evaluation System is not intended to interfere with, or substitute for, the normal written communication that a concerned Construction Manager would initiate when confronted with unsatisfactory performance.

7.1.2 PERFORMANCE RATING METHODOLOGY

1. Contractor's performance will be evaluated on a points rating system relative to quality of work performed, timeliness in completing work, and management/administration of contracts/work.
2. Quality of Work Performed (30 points)

3. The quality of the Contractor's work in conformance with contract documents and industry standards will form the basis for points awarded in this category.
4. Timeliness in Completing Work (30 points)
5. Conformance to the specified schedule in the contract in relation to circumstances within the Contractors' control will form the basis of points awarded in this category.
6. If time is of special significance on a particular project, the Contractor's performance should be adjusted to reflect this. For example if timely completion is critical, the unacceptable time performance rating should be defined as zero overrun whereas an equivalent overrun on a non critical project would normally be rated less severely.
7. The time requirement should have been clearly identified in the contract documents and should have been emphasized to the Contractor as the work progressed.
8. The normal risks associated with contracting are not to be considered as causes beyond the Contractor's control.
9. Delays caused by sub-Contractors are the prime Contractor's responsibility. However, if the prime Contractor has taken all possible actions to expedite a sub-Contractor's work, the effectiveness of this effort should be considered when evaluating the Contractor's performance.
10. Timeliness deals with the Contractor's performance from the date of award to the date of substantial completion. The Contractor's performance on post completion activities, such as the clean up of deficiencies, should be taken into account under the Management rating.
11. Management/Administration of Contract (40 points)
12. This category evaluates the extent to which the Contractor takes charge of and effectively manages/administers a project without undue effort required by TW staff or Consultants. Items to be considered include:
    a. superintendence, work site coordination
    b. scheduling of work

c. ordering of materials
d. shop drawings submission
e. completion of deficiencies
f. interpretation of contract documents
g. clean up of the work area
h. administration of change orders, progress claims and other pertinent documentation
i. responsiveness to direction and instructions of owner, cooperation with Construction Manager
j. quotation reasonableness on change orders
k. payment of accounts to suppliers, sub-Contractors, employees, etc.
l. adherence to safety and environmental regulations.

7.1.3 INTERPRETATION OF RATING

Interpretation of points rating will be as follows:

a. 60-100 Satisfactory Performance
b. 30 - 60 Unsatisfactory Performance - Contractor to be put on notice that their level of performance needs to be improved. Bidding privileges may be suspended pending review on previous contracts. See Art. 4.05 (3).
c. 0 - 30 Unacceptable Performance - Contractor will be reviewed for possible suspension of bidding privileges.

7.1.4 COMPLETION OF THE EVALUATION REPORT

A Contractor Performance Evaluation Report is required for all publicly tendered construction and maintenance/service contracts. The report will be completed in PARTS by the Construction Manager upon completion of the contract, reviewed by the Regional Engineer (if applicable) and approved by the Director, and distributed to the Contractor with the Final Completion Certificate. A copy of the form will also be forwarded to the Tendering & Contracts office.

7.1.5 SUSPENSION OF BIDDING PRIVILEGES

1. Tendering and Contracts will record the Contractor's rating on each contract and compile an overall rating based upon the Contractor's assessment on previous contracts.
2. Contractors receiving an "unsatisfactory" rating will be notified in writing by Tendering and Contracts that their performance needs to be improved and failure to improve on future contracts may lead to a suspension of the Contractor's bidding privileges.
3. Contractors receiving an "unsatisfactory" rating on three contracts or one "unacceptable" rating may be identified for possible suspension of bidding privileges. The review will be based upon the Contractor's overall performance on previous contracts and, if necessary, a more detailed report from the Construction Manager on the current contract. The results of the review will be communicated to the Contractor in writing by Tendering & Contracts.
4. If a suspension of bidding privileges is approved by the Department, then all future bids from the Contractor will be rejected prior to tender opening. Alternatively, any tenders from a Contractor under suspension, discovered after tender opening, will be marked "disqualified". [PT Act Regulations 3. (4)]
5. Suspensions apply to all TW tendered projects. Attempts by suspended companies to submit tenders under a new company name or structure (successor corporations) are to be rejected. It is incumbent on the "new" company to establish the merits of having the opportunity to tender.

7.1.6 REINSTATEMENT OF BIDDING PRIVILEGES

1. The duration of suspensions may vary depending upon individual circumstances. In general, first time suspensions will be a maximum of one year provided the contractor can satisfy the requirements of Art. 4.05.06(2).
2. A Contractor's suspension may be lifted upon written request from the Contractor and successful demonstration of their ability to perform

satisfactorily in future: for instance, successful completion of comparable projects for others since the time of suspension, identification and correction of problems that led to the suspension, etc.

3. In the event of reinstatement, the Contractor must achieve a “satisfactory” rating on the first subsequent contract in order to retain eligibility to continue bidding TW projects.

7.1.7 CONTRACTOR’S APPEAL

A Contractor may appeal a particular evaluation by submitting a written request, with supporting documentation, to Tendering & Contracts. Appeals will be investigated by a committee established by the Assistant Deputy Minister.

7.1.8 CONFIDENTIALITY OF INFORMATION

Information compiled through the Contractor Performance Evaluation System is intended solely for internal use by the Department of Transportation & Works. Evaluation information related to a particular contractor(s) will not be released to outside parties, such as reference checks from other tendering agencies, without the consent of the affected contractor(s).

7.2 HANDOVER

1. The Construction Manager shall record the handover of keys to all new facilities to appropriate client representatives at time of occupancy.
2. The Construction Manager shall record maintenance materials, spare parts and tools required by contract turned over to the facility management.
3. The Construction Manager will send a copy of commissioning documentation and project record drawings to the facility’s management for placement in the affected building or other appropriate location, and a copy to be retained by the Region.

7.3 COMPLETION OF WORK UNDER WARRANTY

1. As outlined in Contract General Condition GC-13 31 Warranty, the Contractor is responsible to make good any defect or fault appearing in the work during the 1 year warranty period.
2. The Construction Manager shall advise the Contractor in writing of any observed defects and shall stipulate a reasonable time frame for the Contractor to undertake repairs.
3. If the Contractor fails to undertake the repair or adjustment in the stipulated period, the Construction Manager shall advise the Contractor in writing giving the Contractor the standard five (5) day period to undertake the work.
4. Should the Contractor fail to execute follow the obligations above, the repair, under the five (5) day notice, the Construction Manager shall undertake the repair by the most expedient method and arrange to have the cost deducted from other contracts held with TW or make a claim against the contract performance bond.
5. Refer to the project commissioning documentation for warranties and guarantees for segments of the work in excess of the normal one year period.
6. Refer to the “issued” project specifications forming part of the Contract Documents.

7.4 PROJECT FACTSHEET

1. The Design Manager shall prepare a project factsheet for reference by departmental staff.
2. The factsheet should be no more than a single page, and incorporate an external (and optional internal) view of the completed facility.
3. Provide a concise summary of:
    d. facility function
    e. building floor area(s)
    f. major building systems provided
    g. duration of planning and construction

h. project budget forecast vs. actual costs incurred
i. recognition of Client partners, Consultant and Contractor
j. any special unique characteristics

4. The factsheet will be updated at the conclusion of the project.

7.5 BUILDING INVENTORY DATA SHEET

7.5.1 INSURANCE PREAMBLE

1. Department of Finance, Insurance Division of the Government of Newfoundland & Labrador requires the Department of Transportation & Works compile and maintain a Building Inventory Record of Government owned facilities for insurance purposes.
2. In general, most Government owned facilities are under the jurisdiction of the Department which has title to these facilities and are responsible for their maintenance. The Department of Finance is responsible for administering property insurance on all these facilities. However, there are cases that require special consideration, which are noted below.
3. Schools (K to 12): these facilities are under the jurisdiction of the Department of Education, who provide information directly to Department of Finance.
4. Facilities owned and maintained by Health Care Corporations: These facilities may be insured directly by the Corporation however, the Department is still required to include this information, with qualification as necessary, in the Government Building Inventory Report.
5. Build - Lease Facilities: These facilities are generally constructed by private owners and when completed, they are leased back to Government. Regardless of who insures, the Department is still required to include the information, with qualification as necessary, in the Government Building Inventory Report.

7.5.2 GOVERNMENT BUILDING DATA SHEET

1. The Design Manager shall prepare a Government Building Data Sheet for insurance and historical record.

2. Complete the standard form entitled “Government Building Data Sheet” and distribute as follows:
3. For all facilities except K to 12 schools:
    a. to Engineering Support Services Division
    b. Department of Transportation & Works
    c. Department of Finance, Insurance Division
4. For Schools K to 12:
    a. to the Department of Education, School Services & Facilities Branch
    b. Department of Finance, Insurance Division

8 DOCUMENTATION STANDARDS

8.1 COPYRIGHT

1. The “Standard Form of Agreement Between Owner and Prime Consultant” outlines the ownership of intellectual property dealing with the project and copyright.
2. TW has the copyright for all documents prepared for or by the department.

8.2 SEALING AND SIGNING OF DOCUMENTS

1. The Consultant or Sub-Consultant shall individually seal, sign and date technical documents contained in accordance with their respective Acts and Regulations. Electronic signatures are not acceptable, all documents shall be individually signed by the professional person(s) of record for the design and technical contents.
2. Where the contract documents have not been prepared in whole by the Consultant, and have been specifically directed by the Department, the Consultant is not required to affix their seal, but shall indicate by their signature which parts of the documents have been prepared or amended under their direction or supervision.

8.3 SYSTEMS MEASUREMENT AND METRIC CONTENT

1. The SI system of measurement is referred to in the following documents, the latest issues, amendments and supplements of which apply:
    a. Standard of the Canadian Standards Association (CSA) - CAN/CSA-Z234.1 Canadian Metric Practice Guide
    b. National Building Code of Canada (NBCC)
2. Units for linear dimensioning are restricted to, meter (m) and millimeter (mm).

8.4 DRAWING NUMBER AND SIGNATURE PROCEDURES

1. Consultants are to use the Department of Transportation & Works, standard drawing sheet which must be down loaded from the Department's Web Site. The title block shall be completed as follows:
    i. The space under "Drawn by" shall be used for the name of the person responsible for drawing preparation
    ii. The space marked "Checked by" shall be used for the name of the individual responsible for drawing accuracy and co-ordination (Drawn by and checked by should not be the same person)
    iii. The space under "Approved by" shall be used for the name of the design professional accepting responsibility for design and quality assurance
    iv. The space under "Project No" shall contain the Department of Transportation & Works project number
    v. The space under "Date" shall contain the date that the drawing is issued in the format mm/dd/yyyy
    vi. The space under "Scale" shall contain the words "AS NOTED". Insert the appropriate bar scale from the provided bar scale list on the standard drawing sheet
    vii. In the revisions column, revision "0" shall be entered and dated, "0" indicating "Issued for Tender" or the appropriate stage. Submissions prior to tender shall be alphabetically numbered, and numerically numbered thereafter
    a. The Consultant's professional stamp, must be affixed to each drawing in the space provided
    b. The revision being issued must have wet ink signatures in all locations. Previous revision information may be electronically entered
2. The Department utilizes the following series designation system to identify drawings by discipline, and provide a standard sequence within the final

drawing package. A drawing number example is A1 which identifies the discipline series "A" as an architectural drawing, and "1" as the drawing number one in that series.

Series	Discipline
A	Architectural
C	Civil/Site/Utilities/Landscaping
E	Electrical
M	Mechanical
S	Structural

8.5 COVER SHEETS

The standard cover sheet shall be downloaded from the Department's website. The Consultant shall add the Consultants' name and logo, and the Client, and a list of all drawings bound under that cover.

8.6 PRODUCTION OF DRAWINGS

8.6.1 DRAWING SHEETS

1. The standard drawing sheets will be DTW-SHT, size 535mm x 840mm (21 x 33).
2. A B1 size drawing sheet may be used with Departmental approval, B1 size 707mm x 1000mm.
3. DTW-SHT and B1 have a preset scale of 1:1. Drawings produced within the drawing area are to use the drafting scales as per 7.08 (1).
4. DTW-SHT size drawings are to use a plot scale of 1:2. This will produce a 280mm x 430mm (11 x 17 inch) drawing.

8.6.2 LINES AND LETTERING BY OBJECT LINEWEIGHT

1. For AutoCAD version 2006 and higher, line work delineation can use lineweights assigned to specific objects rather than by color.
2. Line thickness shall be as follows:

Line Style Full Scale	Dwg (22 x 34)	Half Scale Dwg (11 x 17)
Very Thin	0.18mm	0.09mm
Thin	0.25mm	0.13mm
Medium	0.35mm	0.18mm
Heavy	0.50mm	0.25mm
Very Heavy	0.70mm	0.35mm
Thick	0.85mm	0.42mm

3. Drawings are to be produced using line weights for half scale drawings as indicated above. Full scale drawing line weights are to be used with Departmental approval.
4. Line styles for line types shall be as follows:

Line Types	Style
Grid line	very thin
Phantom line	very thin
Hidden line	thin
Center line	thin
Dimension line	thin
Extension line	thin
Break line	thin
Object line	thin
Border line	very heavy
Outline (New)	heavy
Leader	thin
Outline (Existing)	thin

5. Lettering styles and sizes listed are for the standard DTW-SHT and B1 drawing sheets. Lineweights for drawing text may be assigned to specific text objects. Only standard AutoCAD fonts are to be used as follows:

Text Type / Location	Size
Text on drawings	RomanS - 2.5mm - 0.35mm
Titles under drawings	RomanS - 4.0mm - 0.70mm
Title Block	Small RomanS - 2.5mm - 0.35mm Large RomanS - 4.0mm - 0.50mm

8.6.3 DRAFTING SCALES

Scale selection shall be based on of CSA B78.5-93 Table 10.1 “Preferred Scales commonly used for different types of Drawings” and as follows:

Stage	Type of Drawing	Scale
Design	Sketch and preliminary drawings	Scales may vary, but it is recommended that preference be given to those used in the working drawing phase.
	Location drawings	Scale will vary according to maps used as reference.
Contract Drawings	Key plan	1:2000 1:1000
	Site Plan	1:500 1:200
	General location drawings	1:200 1:100 1:50
	Component range drawings	1:100 1:50 1:20
	Assembly drawings	1:20 1:10 1:5

	Component details drawings	1:20 1:10 1:5

Note: Scales listed above apply to individual plans or details produced within the drawing of the standard drawing sheet. Standard drawing sheet is not to be rescaled.

8.6.4 DIMENSIONING

Use the DTW DIM dimension style which is assigned to the DTW-SHT.

8.6.5 CAD LAYERS

1. The following layers are pre-established on the standard drawing sheets.

Layer	Line Color
0	White (Not to be used)
ASHTT	White (Not to be used)
Dim	Cyan
Stamp	White
Text	White
Title	Magenta

2. Create new layers as required with names as clear and descriptive as possible.
3. For layers that are impossible to purge and have no use a rename is suggested, such as: Rename with letter “X”.

8.6.6 X-REFS AND PURGING

1. External referenced drawings or blocks (X-REF’S) contained within the drawings submitted to the Department are to be bound using the “External Reference Bind” command.
2. All final drawings are to be “purged” prior to being submitted to the Department.

8.7 DRAWINGS SUBMITTAL

1. Submit all final drawings on disk and hard copy.
2. Label disk by Project Number, Project Name, and Date.
3. Provide drawing files in Adobe Acrobat ".pdf" format and AutoCAD ".dwg" latest version.
4. Plot finished final drawings full size on bond paper. Using a pen plotter, direct imaging plotter, laser printer, etc. Finished final drawing will be original contract documents for tender.
5. Each drawing is to be in its own ".dwg" file and named with the Drawing File Number as referenced in Section 8.4 The file should not contain any external references and should be bound and purged as per section 8.6.6.

8.8 SPECIFICATION

1. Prepare specifications using the latest edition of the NL Master Specification Guide for Public Funded Buildings. The Master Specification is available on the website http://www.tw.gov.nl.ca/works .
2. The specification shall be downloaded and edited for each individual project. Specifications shall not be re-used from previous projects.
3. Submit specifications on disk in Adobe Acrobat ".pdf" format, and Word ".doc" format as well as hard copy.
4. Emailed submittals are not acceptable.

8.9 ELECTRONIC TENDERING

1. In addition to the final finished plotted copy of the drawings and hard copy of specifications, Consultants are to provide to the Design Manager the following documents on disk:
2. All drawings preferred in AutoCAD ".dwg" and Adobe Acrobat ".pdf" format latest version, drawings will be accepted in the two previous AutoCAD versions.
3. All specifications in Word .doc format and Adobe Acrobat .pdf format, latest version.

8.10 DRAWING CHANGES DURING/AFTER TENDERING

1. All changes to the drawings during or after tendering are to be shown in the Revisions Column of the original drawing indicating revision number, description, date and by whom. Also, indicate the latest revision number in the Revision Suffix Box of the title block.
2. Highlight the changed area on the drawing using a “Cloud” outline (Color # 61) accompanied by the appropriate revision number.
3. During the Tender Period, all revised drawings are to be indicated in an addendum.

9 CIVIL - TECHNICAL

9.1 SITE INVESTIGATION

1. Visit the site and evaluate its characteristics.
2. Review and assemble existing conditions information on:
    a. stormwater surface runoff
    b. sanitary sewage collection system and wastewater treatment
    c. water supply and distribution system
    d. underground electrical
3. Review and assemble land use planning and development regulations pertaining to the site.
4. Assess location for vehicular entrance/exit to the site.
5. Solicit geotechnical consultant services on behalf of the TW in conformance with, and manage the execution of the geotechnical program.
6. Solicit site surveying consultant on behalf of TW, and manage the execution of the program.

9.2 CODES AND STANDARDS

Provide a listing of codes and standards applicable to the work in accordance with PEGNL “Guidelines for Municipal Engineering Services, Latest Edition”.

9.3 SUBMISSIONS

Submissions are to follow Guidelines published by PEGNL, June 1996.

9.4 DESIGN FLOW

1. Domestic average design flow will be based on flows recommended in Department of Environment & Conservation’s Guidelines, and take into consideration water efficiency measures to be deployed at the facility.
2. Make allowances for domestic peak flow of five times average design flow, for maximum daily flow of three times average design flow and for any special industrial type needs unless otherwise established by tests or reliable records.

3. Make allowance for internal water requirements for sprinkler or standpipe systems where appropriate. Consider supply to hydrants when sizing building connections and supply mains.
4. Desirable pressure for domestic purposes is 400 to 500kPa under average conditions.
5. Determine fire flows overall for building and site from the Fire Underwriters' Survey "Water Supply for Public Fire Protection, A Guide to Recommended Practice".
6. Mains and supply facilities are to be capable of supplying simultaneously the maximum daily domestic flow and the maximum fire flow requirement.
7. Limit maximum flow velocity in pipes to 1.5m/s.

9.5 PIPES

Specify pipe materials in accordance with NL Master Specification Guide for Public Funded Buildings.

9.6 SANITARY & STORM SEWERS

9.6.1 GENERAL

1. Provide separate sanitary and storm sewers.
2. Determine required design capacity of the new sanitary and storm connections for the Department's review.

9.6.2 DESIGN OF SANITARY SEWERS

1. Design sewers to be flowing 75% full when carrying maximum flow anticipated.
2. Base maximum flow in sanitary sewer mains on peak domestic flow, taking into consideration water efficiency measures.
3. Minimum velocity shall be 0.6 m/s at average flows and not less than 0.3m/s at minimum flow. The latter requirement may be modified only if the maximum daily velocity exceeds 0.9 m/s and the sewer is self-cleansing. In general, the maximum velocity for sewers should be 3m/s. The preferred grade is 2%, with a minimum grade of 1%.

9.6.3 DESIGN OF STORM SEWER SYSTEM

1. Drain all roofs and parking areas, roads, foundation drains, etc. to the storm sewer system.
2. Design for worst storm likely to be encountered in ten (10) years, based on local rainfall intensity records.
3. Design for minimum velocity of 0.6 m/s in sewers under average conditions.

9.6.4 MANHOLES AND CATCHBASINS

1. Where the ground water level is above the sewer, special attention must be given to selection and waterproofing of manholes.
2. Safety landings are required when manholes exceed 5 meters in depth.
3. Manholes and inlet spacing in paved surfaces should not exceed 100m.
4. In parking areas, catchbasin manholes should be used.

9.6.5 SEWAGE FORCEMAINS

1. Design velocity shall be not less 0.8m/s or greater than 1.5m/s based on range of installed pumping capacity.
2. Provide uniform grade where possible.
3. Deflection of piping within allowable bending radius is preferred to accomplish changes in direction.
4. Consider automatic air relief valves at all high points.

9.6.6 SEWAGE LIFT STATIONS

1. Design sewage lift stations in accordance with Environment & Conservations' publication of "Guidelines for the Design, Construction & Operation of Water & Sewerage Systems", latest edition.
2. Use wet well design with duplex installation of submersible pumps.

9.7 SITE GRADING AND SURFACE DRAINAGE

9.7.1 GENERAL REQUIREMENTS

1. To the greatest extent possible, design surface grades to preserve the natural character of the site while ensuring efficient treatment, retention and final disposal of surface water with a minimum of ground disturbance.

2. Site grading should produce a useable and easily maintainable ground surface not subject to flooding or erosion. Through initial rough grading and final site grading adhere to the following to the maximum extent as possible:
3. Preserve existing vegetation, and topsoil, particularly trees.
4. Provide final road and site grades that ensure suitable pedestrian and vehicular access to buildings and permit adequate drainage of the site.
5. Balance cut and fill as much as possible to localize the movement of earth. Ensure new grades merge smoothly with existing grades without causing low areas which pond water.
6. Establish building floor elevations so that ground floor of the building will not flood if storm sewer system becomes blocked.
7. Provide on site storm water management to mitigate stormwater discharge to the receiving environment. Achieve best stormwater management practice respecting stormwater treatment and retention.
8. Provide information on the impact of the proposed drainage system affecting the quantity and quality of runoff to receiving water bodies.
9. Provide positive drainage for the total site that is away from buildings with gradients of at least 2% (optimum 4%) for grass covered areas and 1% for hard surfaces.

9.7.2 SIDE SLOPES, DITCHES AND BACK SLOPES

1. On slopes to be maintained and for long term slope stability of side slopes use no less than 1 vertical to 3 horizontal to facilitate maintenance operations, especially grass cutting.
2. Design ditch cross section to have adequate hydraulic capacity and to keep water velocities below scour limits.
3. Ditches adjacent to pavements should be 150mm deeper than pavement structure to avoid saturated foundations.
4. Ditches and swales are to be sodded or lined with crushed, clean rock, 100 mm minus.
5. Gradients for ditches:
    a. minimum 2%

   b. maximum 5%
6. Gradients for culverts:
   a. Slope culverts: minimum 0.5%, maximum 6%
7. Provide minimum cover of 400 mm from top of pipe to top of pavement or in accordance with the pipe manufacturer's recommendations.

9.7.3 DRAINAGE APPURTENANCES

1. Depth of catchbasin leaders should be adequate to prevent freezing.
2. Maximum run to catchbasins in surface drainage to be approximately 45m. Aim at achieving a surface grade to catch basins of 1% to 2% with an absolute minimum of 0.4%.

9.8 SUBSURFACE DRAINAGE

1. Subsurface drainage systems will generally include foundation drains, underslab drains, retaining wall drains, and general site subdrains. Systems may typically include such components as perforated and non-perforated pipe and fittings, graded fine and coarse aggregate filter material, geotextile fabrics, prefabricated drainage mats, and associated structures such as manholes, outfall structures, and sump pits.
2. Provide subsurface drainage systems as may be necessary to maintain site groundwater levels at least 400mm (1000mm preferred) below lowest floor slab or finished grade elevations, and to prevent hydrostatic pressure against basement walls or other earth retaining walls.
3. Provide filter medium surrounding and extending above pipe to highest groundwater elevation, or to floor slab sub-base elevation. Filter medium shall be fine aggregate, or coarse aggregate with surrounding geotextile fabric.
4. Perforated pipe 100mm minimum diameter, shall be placed with perforations in the bottom half of the pipe. Minimum slope of perforated pipe shall be 0.2%.
5. Geotextile fabric is to be selected to suit soil characteristics for separation and filtration function. Equivalent or Effective Opening Size (EOS) will normally range between 150 um - 212 um.

9.9 PAVEMENTS - ROADS, PARKING LOTS AND SIDEWALKS

9.9.1 INTERSECTIONS

1. Ensure clear lines of sight at all intersections.
2. Avoid junctions near the crest of hills or where driver's vision is likely to be obstructed.
3. Design intersections to TAC standards.

9.9.2 ROADS DESIGN CRITERIA AND REQUIREMENTS

1. Design roads to incorporate the following parameters:
2. Minimum lane width 3.5m.
3. Minimum should width 1.2m.
4. Minimum radius of horizontal curvature is 15m inside edge for roads. Widen the inside lane by 0.6m when minimum radius is used. For semi-trailers use compound curves for edge.
5. Optimum horizontal road radii are 50m. Radius used should accommodate critical vehicle.
6. Minimum turning radius for cul-de-sac edge of pavement: 14m.
7. Minimum longitudinal gradient at centerline: 0.5% (absolute minimum is 0.35% if curbs provided).
8. Provide 2% cross slope.
9. Grades on hills not to exceed 5% where possible.
    a. Shoulder slopes
    b. gravel or crushed stone 5%
    c. earth or turf 6%
10. Where surface runoff water flows across more than one continuous lane (travelling or parking) use a minimum cross slope for the lane at the high point on the transverse profile.
11. T-shaped terminus used at dead-ends is to allow good driver visibility while backing. The wings of the terminus to be the vehicle length and 4m minimum width.
12. Provide for the following minimum radii inside edge:
    a. At T-shaped terminus, 9m

b. At road intersection, 10.5m
c. At parking lots, 6m
d. At driveways, 4.5m
e. Maximum grade within 30m radius of intersection: 5%
f. Minimum grade for adequate drainage: 0.5%

13. Pavement structure: 50mm asphaltic concrete over 100mm granular base and 150mm granular subbase, except where site conditions require a different structure.

9.9.3 PARKING LOTS

1. Maximum gradient and cross slope 5%.
2. Minimum gradient and cross slope 0.5%.
3. Optimum gradient and cross slope:
   a. on paved areas 2%
   b. on gravel 3%
4. Locate entrances at least 60m or as far as practical from street intersections. Left turn stacking should be checked.
5. Minimum set back for parking areas, 8m from street right of ways and from buildings.
6. Set parking spaces at 90^{o} where possible.
7. Parking stall dimensions: standard - 2.75m wide, 6m deep. Handicapped - 3.6m wide, 6m deep.
8. Aisle width: 7.5m.
9. Inside corners with parking areas to be rounded 1.5m to facilitate turning in and out of parking spaces.
10. Where strip parking is to be provided, the access way may be widened and spaces designed as though the street were the access aisle. Provide an additional 1.0m clearance from road edge to stall.
11. Pavement structure, same as roadways.
12. Provide low back curb unless otherwise directed.
13. Provide a large single parking lot where practical to facilitate ease of snow clearing and related maintenance. Large grassed landscaped islands to

visually break up parking lot may be appropriate for major building complexes.

14. Provide grassed, snow dump area at each end of parking lot.

9.9.4 SIDEWALKS

9.9.5 MAXIMUM GRADIENT, 5% PREFERRED

1. Maximum local cross slope, 5%.
2. Minimum gradient, 2%.
3. Barrier free ramps gradient, 5% preferred.
4. Minimum width: 1.5m for walks accessed by wheelchairs and pedestrians, 1.3m for service entrances.
5. Avoid steps in walks but where unavoidable, provide at least three risers, and a handrail. Otherwise, follow natural grade up to 10% gradient.

9.10 PLANTING DESIGN

9.10.1 GENERAL REQUIREMENTS

1. The planting design should reflect and preserve the natural character of the site.
2. Materials, trees and shrubs, where required, should be selected for characteristics of sturdiness, low maintenance and tolerance to specific site condition. Generally, planting should be native and indigenous to site.
3. Plant material may be used to stabilize both existing and proposed grades.

9.10.2 TREES & SHRUBS

1. Select trees and shrubs sufficiently large to guarantee quick establishment and vigorous growth.
2. Avoid trees and shrubs within 1.5m of curb.

9.10.3 TOPSOIL, LAWNS AND PLANT MATERIALS

1. Sodding should be used where the lawn must be established immediately or where grading results in steep slopes.

2. Consider compost from local supply sources in lieu of importing topsoil. Application of recycled materials is to be encouraged in the development of the new site.
3. Introduce mowing strips adjacent to all buildings, 300 mm wide paved or crushed stone strips.
4. Specify planting to be performed as soon as practical and in stages where necessary in order to stabilize the site and limit soil erosion and sediment transport.

9.11 FENCING AND GUIDE RAILS

9.11.1 FENCING

Provide fencing details as applicable.

9.11.2 GUIDE RAILS

1. Place guide rails in accordance with recommendations of the Transportation Association of Canada.
2. Guide rails may be utilized as building or site structure protection.

9.12 SUPPLY AND WASTE HANDLING

1. Provide service areas large enough to maneuver trucks, minimizing the need for backing up.
2. Consider requirements for and siting of waste storage containers including recyclable waste.
3. Avoid locating truck parking areas near building air intake louvres.

9.13 SITE FURNISHINGS

1. Where site furnishings are being provided, the design is to be vandal proof, assure easy maintenance and be adequately secured to prevent quick removal.
2. Site structures include kiosks, transformer enclosures, storage bins, and ground maintenance storage facilities.
3. Assess with facility manager site furniture requirements for seating facilities and litter collection.

4. Planters may be considered near entrances and in courtyards.

9.14 SIGNS

9.14.1 TRAFFIC CONTROL SIGNS

Traffic control signs required to ensure safe movement about the site are to be based on the “Canadian Uniform Sign Manual”, published by the Transportation Association of Canada.

9.15 EXTERIOR WAY FINDING AND INFORMATIONAL SIGNS

1. The way finding and informational needs of both vehicle and pedestrian traffic are to be addressed in the design. These signs are to provide direction information to the possible needs and services not otherwise obvious, such as parking areas, restricted areas, shipping and receiving.
2. The primary identification signs are to be free standing and sited according to Departmental direction.

9.15.1 PROJECT SIGNS

Refer to the NL Master Specification Guide for Public Funded Buildings.

9.16 FLAGPOLES

1. Provide freestanding corrosion resistant flagpoles with lockable internal halyard with hard landscaping about their bases.
2. Quantity of flagpoles will be project specific however, three (3) are common at major government buildings.

9.17 DRAWING CONTENTS

9.17.1 EXISTING CONDITIONS DRAWINGS

1. Refer to Site Surveys for drawing contents information to be prepared.
2. Provide soils information on existing conditions drawing comprised of location and logs of boreholes and test pits provided in the soils report.

9.17.2 GRADING DRAWINGS

1. The grading plan shall show sufficient grades and gradient arrows to indicate the site is adequately drained. The contour interval shall be:

2. every 0.50m for average site slopes up to 1:5.
3. every 1.00m for average site slopes more than 1:5.
4. Show ground floor entrance elevations of proposed buildings and finished elevations of grade at building corners and entrances.
5. Show proposed finished grades in relation to existing grades on grading plan.

9.17.3 SITE SERVICES DRAWINGS

1. Dimension water, sanitary and storm services to existing buildings, features or survey lines to permit accurate setting out in the field during the construction stage and to facilitate location when repairs are necessary. Provide design grades to facilitate determining height of manholes and depth of watermain installation.
2. Drawings must cover:
    a. length, size, material and grade of sanitary and storm sewers between manholes
    b. inlet and outlet pipe elevations for each manhole
    c. watermain pipe material, size, bends and location of valves, connections, hydrant installations and drainage, and thrust restraint requirements
    d. normal bedding and backfilling of pipes, special backfill under roads, parking areas and driveways
    e. special bedding in rock trenches or poor ground
    f. dimensioned location of all adjacent services and method of crossing under or over, support etc. Check locations of all adjacent underground services including telephone cables
    g. typical details including manholes and catchbasins, manhole ladders, any modification to typical structures, water service connections, service lateral details, trench bedding and backfilling details

9.17.4 LANDSCAPING DRAWINGS

1. Intent is all landscaping features, such as surface cover, planting schedule and details are to be shown.

2. Provide planting schedule showing both botanical and common names of all plants, shrubs and trees. Show required plant size, height and planting spacing.

9.17.5 PAVEMENT PLAN

1. Show pavement extent and types with finished elevations, if not on grading plan.
2. Provide details for typical pavement section, curb, sidewalk, road and ditch section, and marking details.

9.18 DEMOLITION

9.18.1 GENERAL REQUIREMENTS

1. Prior to demolition the current status of environmental and health hazardous materials must be investigated and documented.
2. Subsequent to or in-conjunction with the environment abatement, two methods for demolition may be employed.
3. Systematic demolition - to demolish a structure piece by piece in an orderly manner, which is normally carried out in the reverse order of construction.
4. Demolition by rapid progressive failure - used to collapse a structure or a section thereof by the dismantling of the vital supporting members.
5. Systematic demolition is preferred where possible resale and/or reuse of construction materials will achieve environmental benefits.

9.18.2 DEMOLITION PLAN

1. Prior to demolition, an engineering survey should be carried out to determine the types of construction, condition of the structure to be demolished and the site conditions.
2. Utilizing the information obtained in the engineering survey, prepare a detailed demolition plan.

9.18.3 PUBLIC PROTECTION

1. Special requirements for the protection of vehicular and public thoroughfares or pedestrian traffic are to be indicated.

2. Show any site hoarding deemed necessary on site grading plan.

10 STRUCTURAL - TECHNICAL

10.1 REGULATIONS

10.1.1 CODES AND STANDARDS

Provide a listing of codes and standards applicable to work in accordance with PEGNL “Guidelines for Structural Engineering Services, Latest Edition”.

10.1.2 AUTHORITIES HAVING JURISDICTION

1. Office of the Fire Commissioner
2. Service NL
3. Workplace Health, Safety and Compensation Commission
4. Municipality

10.2 SUBMISSION

Submissions are to follow Guidelines published by PEGNL, August 1995.

11 ARCHITECTURAL - TECHNICAL

11.1 REGULATIONS

11.1.1 CODES AND STANDARDS

Comply with:

a. National Building Code of Canada (NBCC)
b. NFPA-101 Life Safety Code
c. Building Accessibility Act
d. Other legislated codes, and standards, that will affect the design of the project

11.1.2 AUTHORITIES HAVING JURISDICTION

1. Office of the Fire Commissioner
2. Service NL
3. Department of Environment & Conservation
4. Child, Youth & Family Services
5. Workplace Health, Safety and Compensation Commission
6. Municipality

11.2 FACILITY PLANNING

11.2.1 NET AREA

Includes the area measured from the interior walls including the interior face of surface of the exterior walls and is expressed as net square metres (NSM).

11.2.2 BUILDING GROSS AREA MEASUREMENT

1. The Building Gross is defined as the area, within the outside walls, as computed by measuring from the outside of the finished exterior walls, and is expressed as building gross square metres (BGSM).
2. Measure in square metres from outside to outside of walls at floor level for the area of each floor without any deductions for openings which occur within the floor area, except as noted later.

3. Where auditorium, swimming pool, gymnasium, foyers, etc., extend through two or more floors, include them by using the largest area at one level only.
4. Include the following areas in computing the gross area:
    a. crawl spaces with concrete floors
    b. future basement areas where the concrete slab only is required for structural completion
    c. floor areas which are structurally completed and where the finishing work will be executed at a later date
    d. tunnels, trenches, etc., which have a roof or slab over 2 metres or more from the floor
    e. rooms below grade or sidewalk (e.g. transformer rooms)
    f. true area of columns and other projections beyond the face of exterior walls, providing they extend vertically for the full floor height
    g. dormers, bay windows, etc., providing they extend vertically for the full floor height
    h. penthouses
    i. elevator machine floors within penthouses
    j. connecting links or walkways providing they are enclosed
    k. finished rooms in roofs and attics
    l. attached or isolated garages above and/or below ground level
    m. fully enclosed exterior staircases and fire escapes
    n. fully enclosed porches.
5. Exclude the following area in computing the gross area:
    a. crawl spaces which do not have concrete floors
    b. tunnels, trenches, etc., with less than 2.0m head room
    c. exterior balconies
    d. canopies
    e. projections beyond the exterior wall face which do not extend vertically for a full floor height
    f. fanhousings, etc.
    g. areaways

h. unenclosed connecting links
i. covered walkways
j. unfinished roof and attic areas
k. carports
l. unenclosed exterior staircases and fire escapes
m. isolated chimneys and that portion of chimneys above the roof line
n. interior open court yards, light wells, etc.
o. unenclosed porches
p. exterior steps and landings
q. exterior paving, patios and terraces
r. unenclosed areas which are roofed over
s. enclosed areas which are not roofed over
t. roof overhangs and cornices.

6. If certain conditions warrant the inclusion of some of these items, list them separately from the gross area.

11.2.3 DEPARTMENT GROSS AREA

Includes the area measured from the interior face of the exterior wall to the centre of the demising wall for all adjacent departments including the gross area within and is expressed as Department gross square metres (DGSM).

11.2.4 SPACE AUDIT

1. The space audit is a check of the program gross and net areas.
2. The audit will be completed at the end of each design submission.
3. Any changes agreed to by the Project Team will be recorded.
4. Changes, which have not been agreed, will be corrected by the Consultant.

11.2.1 NET TO GROSS RATIO

1. The Department Net Gross to Building Gross Ratio for the building shall be between 1:1.20 and 1.30, where 1 represents the sum of the departmental net gross area for the building. This figure may vary depending on building classification.

2. The Net to Department Gross Ratio, for a department shall be between 1:10 to 1:15. This may vary depending on building classification.
3. Increase in an approved area, unless agreed, will not be allowed even, when the allowable gross building has not been met.
4. Gross area ratios will be decided at the program stage.

11.2.2 FLEXIBILITY

1. Government activities change periodically. It must be possible to accommodate these changes without undue disruption.
2. Design flexibility for immediate and future use of the space.
3. Pay particular attention to the location and arrangement of entrances, core areas, permanent corridors, elevator shafts and other fixed facilities.
4. In most Government facilities the open office concept is considered standard practice. Develop a building grid with column spacing and fenestration and service runs suited to flexible interior space requirements.
5. Locate plumbing and duct shafts to maximize consolidation of service space.

11.2.3 APPROPRIATE SPACES

1. Every function shall be provided with the appropriate amount of space for the function of the work to be performed within that space.
2. Government maintains office space standards to accommodate office staff and their furniture requirements.
3. Space not covered by the standards and the facility program shall be adequately provided for using the NBCC, and NFPA-101 Life Safety Code.

11.2.4 CIRCULATION

1. The space required to get from one work area to another.
2. Circulation space as a spatial program item is described as a building factor between the net programmed and ancillary areas for the building.

11.2.5 CIRCULATION ROUTES

1. Circulation routes shall be simple, practical, and as short as possible.

2. The width of corridors shall be sufficient for the purpose required and designed to meet NBCC and NFPA-101 Life Safety Code for exiting, handicap accessibility, and movement of furniture and equipment.
3. Circulation routes need to pay attention to access to exits, as opposed to exits.
4. Circulation routes need to pay attention to public corridors versus corridors used by the public.

11.2.6 VERTICAL CIRCULATION

1. Provide vertical circulation for with sufficient width in the stairwells.
2. Provide elevators in buildings with more than two stories, including basements that need to be accessible by the occupants in their daily routine. Handicap lifts may be used in buildings not more than two storey.
3. Elevators are required to facilitate the movement of patients in a health care facility regardless of the number of storeys.
4. Plan elevators and exit stairs for evacuation of the occupants in case of emergency.
5. Elevators and lifts are not required for access to mechanical or electrical rooms.

11.2.7 HORIZONTAL CIRCULATION

1. Plan horizontal circulation in individual rooms or suites to maximize the usable space.
2. The space within doorways and glazed units shall be planned to give the best use of the floor and walls for furniture and fittings.

11.2.8 ENTRANCES AND EXITS

1. Provide entrances and exits to the requirements of the NBCC and NFPA -101 Life Safety Code sufficient to handle the occupant load, and accessibility requirements.
2. Provide entrances to suit the function and not the aesthetics. Major access points shall be visible, accessible, and identifiable as the major access point without the need of signs.

3. Provide entrances (and exits used as entrances) with vestibules, and with adequate protection from the wind, rain, snow and ice.
4. Provide heat for all vestibules.

11.2.9 BARRIER FREE DESIGN

Design all buildings and sites with barrier free access in mind, except as permitted by law, using the Buildings Accessibility Act.

11.2.10 SUSTAINABLE DEVELOPMENT

1. In general, provincial government buildings are bound by the Build Better Buildings (BBB) Policy. The BBB policy provides a framework on inclusion/exclusion and how it is implemented. The BBB policy can be found at the following link:
2. http://www.nr.gov.nl.ca/nr/publications/energy/betterbuildingspolicy.pdf
3. The Design Manager will give direction in consultation with the Client group as to the specific application of the BBB policy for each individual project.
4. Select materials that are cost-effective over the life of the product.
5. Consider in material selection the embedded hazards with its incorporation into the facility and future disposal.
6. Promote the use of materials that are recyclable at the end of their life.
7. Consider materials manufactured with recycled material.
8. Consider relocation of client provided material and incorporate salvaged materials into the project where practical.

11.2.11 ENVIRONMENTAL HEALTH

1. Concerns about the impact of the built environment on the occupants are increasing. In designing a healthy building a holistic approach to the occupants' health shall be taken.
2. Consider background factors including: light, noise and color in the building design.
3. Incorporate good design practice for ergonomics as outlined in CSA -Z412-00 "Guideline on Office Ergonomics".

11.3 BUILDING ENVELOPE

11.3.1 FLAT ROOFS

1. Generally, flat roofs shall be sloped to drains with a minimum of two (2)% slope.
2. The slope shall be incorporated into the structure wherever possible. Otherwise use sloped insulation incorporating the following guidelines with:
    a. a minimum RSI of 1.3 thickness at any point opening to be 50mm
    b. minimum butt thickness to be 50mm
3. RSI to be averaged over the whole roof (minimum average RSI of 4)
4. The preferred roofing membrane is a two-ply modified bitumen.

11.3.2 SLOPED ROOFS

1. Where sloped roofs are incorporated into the design, the roof shall be a minimum 4:12 slope. The method of insulation and finish covering may vary depending on the occupancy of the room below.
2. The preferred covering is asphalt shingles over ice and water shield.
3. The roof is to be designed to shelter exits and entrances from snowfall and rain water runoff.
4. Rain gutters are to be provided.
5. Where snowslide is a problem, the roof shall incorporate snow/ice guards fencing.
6. Sloped roofs are to incorporate eave protection. Extended 1200mm up the rood measured form the inside face of the exterior wall.
7. Eaves are to be fire-stopped in order to protect the attic space from the spread of fire.
8. Facias are to be covered with prefinished metal flashing. Flashings are to be minimum of two bent sections where facias are over 150mm in depth.
9. Sloped roofs are to be ventilated in accordance with NBCC and ridge venting is to be incorporated into the venting system.

11.3.3 ROOF REPAIR - REPLACEMENT

1. The TW maintains a database record of all roofs in a roofing management program (Microroofer).
2. Any inspections or investigations carried out to determine the condition of a roof shall be recorded in the Microroofer format.
3. Data sheets and sample roofing reports are available upon request.
4. Completed data sheets, inspection reports, AutoCad drawings, and photos of roof conditions are to be submitted on CD Rom to the Department for incorporation into the database.
5. Procedures for repairs and replacement and materials to be used for roofing projects are to follow the latest edition of the NL Master Specification Guide for Public Funded Buildings.
6. Flat roofing systems are not to be covered over by a replacement roof system consisting of a truss system unless the original roof covering is removed.
7. Provide details for roofs incorporating:
    a. vapor barrier continuity
    b. insulation thickness and slope
    c. securement of wood blocking and cants, with size of fasteners and depth of penetration
    d. continuation of roofing membranes
    e. built-up curbs at roof penetrations
    f. membranes flashings at roof drains, vents, curbs, etc.
8. Provide calculations for wind uplift requirements in accordance with Factory Mutual. Provide calculations of fasteners per square meter for field, perimeter and corner areas with details of fastener pattern for each.
9. Where repairs are determined as the appropriate option, the repair technology will depend on the existing roof. If the repair program requires a large segment to be replaced, subdivide the roof area section, and then carry out a replacement on this roof area only.

11.3.4 SKYLIGHTS

1. Skylights are to be doubled shelled pre-molded plastic.
2. Doubled glazed sloped wall skylights are an acceptable alternate.
3. Skylights shall have internal condensation drains, connected to the internal roof drains.
4. Skylights are to be mounted on pre-moulded insulated curbs, with the skylight mounted a minimum 1000 mm above the top of the insulated roof, except otherwise recommended by wind-snow specialists.
5. Skylights should not be positioned on the roof areas, which are subject to the accumulation of snowdrifts

11.3.5 THERMAL INSULATION

1. The building envelope shall be wrapped with continuous insulation from the footing to the roof with interruptions as necessary for windows, doors and service entrances. Also refer to Model Energy Code for Buildings.
2. The thermal resistance of the roof shall be RSI-7 for attic type roofs and average RSI-4 for flat type roofs, for exterior walls RSI-3.5 including developed basements.
3. The below grade insulation must be sloped away at 2% grade from the foundation wall when shallow footings are being used. The purpose of this technique is to deflect frost penetration and shed water coming into contact with the insulation. The foundation insulation must be supported on fill that will be unaffected by frost heaving.
4. At exposed exterior wall areas, the insulation shall be protected against damage to 200mm below finish grade.
5. Fiberglass batt insulation should be used in stud walls in combination with rigid batt insulation on the exterior sheathing. Refer to NBCC for further information.

11.3.6 AIR BARRIERS

1. The function of the air barrier is to eliminate air leakage from inside the building to the outside and vice versa. It is an important feature of the envelope performance, above and below grade.

2. Clearly identify and detail the barrier on all drawing details.
3. The air barrier, unlike the vapor barrier, occurs at various locations in the assembly. The barrier must be properly tied to the air barriers of the different elements of the envelope. Where materials differ in the various elements of the building envelope, ensure continuity of the air barrier and compatibility of the materials used.
4. The barrier must be structurally supported and virtually impermeable to the passage of air.
5. It is desirable to place the barrier on the warm side of the insulation.
6. Where the air and vapor barrier is the same material, then the material must meet the structural and design requirements of both barriers.

11.3.7 VAPOR BARRIERS

1. The function of the vapour barrier is to eliminate moisture leakage from inside the building to the outside and vice versa. It is an important function of the envelope detail, above and below grade.
2. Clearly identify and detail the barrier on all drawing details.
3. The barrier is to be structurally supported.
4. The barrier is to be positioned on the warm side of the wall.
5. The vapour barrier is to be continuous and be connected with the barrier for the other elements that make up the building envelope.

11.3.8 RAIN SCREEN WALLS

1. Exterior wall cladding shall follow the rain screen principle, that is recognizing that the exterior face is the first line of defense against rain and wind. Knowing that water will penetrate the first line of defense, it must be shown that the water has an efficient entry exit out of the wall assembly before it can do any damage. This principle points out the importance of a good air barrier or sheathing membrane behind the cladding and an air path that will let the water out to the exterior.
2. Air chambers in masonry veneer exterior walls shall not be less than 25mm to ensure water that enters the assembly will not bridge the chamber.

3. The assembly is to provide a drainage route to the exterior, allowing in air and water out. All external vents should be at the same level, but must be above all obstructions in the wall assembly. Flashings that bridge the chamber are to provide positive drainage to the exterior and shall have a sloped bottom to the exterior.
4. The design of air chambers is to include the concept of compartmentalization. Compartment height should not exceed 6m. Compartments shall not exceed a width of 6m, and a width of 1.2m at building corners.

11.3.9 WOOD CLADDING

1. Wood siding is to be finished on all sides. The preference is for a factory finish, with a factory finish on all architectural accessories such as corner boards, trims etc.
2. The application of wood has to incorporate the rain screen principle with a minimum air chamber of 19mm.

11.3.10 VINYL CLADDING

1. Attention must be given to the use of proper accessories, trims and starter strips. Wood trims are acceptable with vinyl siding, and should be prefinished on all sides.
2. Vinyl siding is not acceptable in cold climates such as Labrador where vinyl becomes brittle.

11.3.11 METAL CLADDING

1. It is important to pay particular attention to the detailing of all trims and flashings.
2. The application of metal siding has to incorporate the rain screen principle with a minimum air chamber of 25mm, where horizontal flute or flat metal sidings are proposed. When vertical fluted sidings are used, air circulation is achieved on the back of 50% of the siding and therefore additional air space is not required. This type of siding should not be connected in direct contact with the air barrier.

11.3.12 MASONRY VENEER CLADDING

1. Masonry veneers include brick, concrete block and stone.
2. Special attention should be given to the air barrier details, and the securement of the cavity insulation to ensure the cavity is kept clear.
3. Masonry walls also require provision of movement both in vertical and horizontal direction. Masonry expansion and construction joints are to be clear of mortar, and sealed with sealant supported with a backer rod.
4. Masonry cladding shall incorporate weep holes to allow moisture to exit the cavity. Weep holes shall be free and clear of mortar and debris.
5. Flashings at the parapet of all masonry veneer walls shall be supported on 19mm blocking and extend 100mm below the upper most masonry unit. Vertical joints shall not be more than 9.0m apart. All fastening of flashings shall be by concealed fasteners.

11.3.13 SEALANTS

1. Sealants are not to be used as the first line of defense for preventing water entry.
2. If the caulked joint is too shallow or too narrow, the sealant may fail. Joints should not be less than 6mm or more than 13mm wide. The depth of the joint should not be less than half the width.
3. Sealants should not adhere to more than two sides. For a deep joint, a backer rod is to be used, which also acts as a bond breaker.
4. Backer rods are to be between 25-50% larger in diameter than the joint width. Use open-cell polyurethane or closed-cell polyethylene backer rods.
5. The sealant should be tooled to give a concave surface.
6. When selecting a sealant, select one that is compatible with adjacent materials. Do not paint the sealant.
7. Use high performance silicone sealants where possible.
8. Detail each typical joint such as expansion joint, or construction joint.

11.3.14 EXTERIOR WALL FRAMING

1. The inclusion of the material in a particular assembly must be compatible with the other assembly members and be cost effective.

2. The required asset life, the location of the project, the construction schedule, and the project budget are factors to be considered when making the design decision.

11.3.15 CURTAIN WALLS

1. The three main components of a curtain wall are glazing units, spandrel panel and frame.
2. Both glazing and spandrel panel units can be constructed to design RSI value with a limiting factor of the thickness of insulation being depended on the frame thickness. Where preferred RSI values can not be achieved within the frame thickness, a secondary wall may be constructed.
3. To achieve adequate thermal performance, the performance of the frame is critical. Thermally broken frames are essential.
4. To maintain a low air flow, and maintain energy efficiency and eliminate drafts and internal under section problems, particular attention to detailing joints is important. Joint sealing should be done with EPDM gaskets.
5. To ensure no air flow through the spandrel panel area, the panel should be provided with a factory installed metal back pan sealed to the interim frame member, and act as an air-vapor barrier.
6. A properly designed frame will incorporate the rain screen principle, allowing water that gets behind the main frame to drain out. Caulking should not be depended on as a line of defense for water penetration.
7. All fasteners and brackets should be corrosion resistant.
8. Allowances must be made to allow for movement that results from expansion and contraction as well as from building structure.
9. Joints between the curtain wall and adjacent components of the envelope such as the roof are important to detail.
10. Continuity of the insulation and the air vapour barrier over the envelope are important.

11.3.16 EXTERIOR DOORS

1. Exterior doors can be classified into three sections:

   a. entrance doors
   b. exits and service entrances
   c. overhead doors
2. Design entrances doors for public entry to a building to meet the “Building Accessibility Act” and its Regulations.
3. Entrances should be easily recognized from the approach to the building and from the parking area.
4. Entrances should be screened from the prevailing winds, protecting the public entering and leaving, and protecting the integrity of the entry from the elements. Design the entry to shed snow and rain away from the path of travel.
5. Design for security.
6. The entrance forms a major architectural part of a building. Acceptable systems are:
   a. extruded aluminum framing, with tempered insulating glass frame, glazing colors may vary
   b. hollow metal insulated door with tempered insulating glass in both top and bottom sections, thermally broken, exterior insulated metal door frames
7. Design the vestibule to avoid any hidden corners.
8. Design exits for the evacuation of a building. Exits should not be designed for other purposes.
9. As points of evacuation, exits should lead directly away from the building, be easily accessible, highly visible and well lighted.
10. Exit doors should be hollow metal insulated units in thermally broken, hollow metal, insulated frames.
11. Design doors used for staff or service entrance with:
   a. wire glass in upper half of door only
   b. heavy duty commercial grade hardware
12. Overhead doors are not to be designed as exit doors.

13. Where possible there should be an air curtain in front of the overhead door opening, providing pressurization to the space.
14. Design the sill detail of the overhead door to avoid any sticking due to freezing.

11.3.17 WINDOWS

1. With the exception of temporary structures or rented facilities, wood windows are not acceptable.
2. Fiberglass, metal, and vinyl windows are acceptable frame materials. All windows must have CCMC designation and be tested for CSA-A440-M90AAMA/WDMA/CSA 101/I.S.2/A440-08.
3. The province has several distinct climatic conditions that affect CSA- A440.
4. The design of all windows should allow for a top opening vent, with a maximum clear opening of 200mm. The windows are to be located minimum 400mm from the ceiling.
5. The minimum width of any operable window unit is 600mm, maximum width is 900mm.
6. The maximum height of sill above the floor is 750mm in areas occupied by children under the age of eight (8) and in areas specially designed for persons in wheelchairs. The sill height for all other applications shall be 900mm, except where privacy is a requirement.
7. No windows are allowed within the restricted pathway of an exit as determined by the NFPA-101 – Life Safety Code, unless protected accordingly.

11.3.18 BUILDING FORM

Heat loss or gain is proportional to the total surface exposed to the outside environment. Economic building forms retain heat energy by having a low surface-to-volume ratio. Perimeter-to-area ratio are also an indication of economic form, with the lower the ratio, the greater the energy savings.

11.3.19 SNOW DRIFTING

1. Where feasible model testing shall be conducted to determine orientation of the building on site and the placement of entrance, exits and windows in an effort to mitigate snow drifting impacts.
2. Where testing is not possible, the following is suggested as a minimum guideline:
3. Where the building is rectangular, align the long axis parallel to the prevailing winter wind.
4. Where the building is square, align the diagonal axis parallel to the prevailing winter wind.
5. Where deep snow exists consider elevating building above ground to allow air flow beneath the structure. If the building is rectangular align the short axis parallel to the prevailing winter wind. Shape the ground below the structure so that air flow accelerates most at the edge of the building.
6. Streamline the slope of the building keeping the roof profile low, or align the ridge parallel to the prevailing winter winds.
7. Place the plane of the entrance ways and exits parallel to the prevailing winter winds.

11.4 ARCHITECTURAL INTERIOR FINISHES

11.4.1 WALL COVERINGS

1. Wall coverings are an option in highly visible areas such as public waiting areas where appearance is important.
2. Vinyl wall coverings are quite acceptable for use in the senior executive offices and executive level meeting rooms.
3. Where movable walls are the prime interior partition construction, vinyl wall coverings are the preferred finish.

11.4.2 CERAMIC WALL TILES

1. Use ceramic tiles where maintenance is a concern, and where it is shown that the advantages outweigh the disadvantages.

2. Use ceramic tiles in commercial kitchens, and public washrooms as a wainscoting.
3. Ceramic tile should be full height in showers and around tubs. Reconstituted marble panels may be used as an alternate in these areas.
4. Use ceramic tile around urinals and around janitor sinks.
5. In wet or moist areas, use a water-resistant substrate.
6. Grout should not be white.

11.4.3 PAINTS

1. The use of latex paints is strongly recommended.
2. Oil base paints are restricted to areas where surfaces require constant cleaning and ceramic tile cannot be used.
3. Special coatings are restricted to areas that require highly resistant finishes and are to be applied to very stable substrate such as concrete block or plywood.
4. Stain selected for wood finishes should be selected with the long term facility maintenance in mind.

11.4.4 OTHER WALL FINISHES

In areas where appearance is not important, concrete block or cast in place concrete may be used.

11.4.5 CARPETS

1. Durability, appearance, and cost are factors affecting carpet selection.
2. Provide level loop carpet product for all general areas. Plain colour carpets should not be used.

11.4.6 CERAMIC FLOOR TILES

1. Use ceramic tile flooring in areas that remain wet for several hours at a time, such as washrooms, shower rooms, and vestibules.
2. Durability, cost, and appearance are factors affecting the selection.
3. Specialty products should be selected for special areas, which require nonslip surfaces.

11.4.7 QUARRY TILES

Use quarry tile flooring in areas that remain wet for several hours at a time, such as washrooms, shower rooms, vestibules and commercial kitchens as an alternative to ceramic tile.

11.4.8 VINYL COMPOSITE TILES

1. Do not use vinyl tiles in areas where exposure to cold or prolonged wetness will cause problems.
2. Vinyl tile should not be used in areas where daily maintenance is a concern. Sheet flooring products are more suitable.
3. Sheet flooring is to be used in health center corridors, and patient areas.
4. When choosing color, plain colors should be avoided.

11.4.9 RESILIENT SHEET TILE FLOORING

1. Resilient sheet flooring may be used in areas that remain wet for several hours at a time. (e.g. washrooms, shower rooms, and vestibules)
2. Resilient sheet flooring should be used in areas that require constant cleaning such as high traffic areas, health care centers and school corridors.
3. Avoid solid colors and patterns. Select tiles with marbleized patterns.

11.4.10 RUBBER FLOORING

1. Rubber flooring is expensive, and certain types are difficult to maintain.
2. Rubber flooring may be a better choice for limited applications, such as wet areas, stair threads, landings and heavy traffic areas.

11.4.11 LINOLEUM

1. Linoleum flooring may be used where there is high traffic in areas that require constant maintenance e.g. health care facilities, elevator cabs. Initial cost may be a concern.
2. Avoid solid colors and patterns.

11.4.12 VINYL BASE

1. Use vinyl base with all flooring products except where the base is integral with the flooring material. (e.g. ceramic tile)

2. Rubber base is an acceptable alternative to vinyl.

11.4.13 NATURAL STONE

1. Natural stone flooring may be used in areas of high traffic and in public areas which the designer may emphasize such as main corridors, lobbies and vestibules.
2. Use natural stone tile base with all natural stone flooring, except where the function of the space does not require the base to be an integral part of the floor. Vinyl base would be acceptable in this instance.

11.4.14 SPORT FLOORING

1. Gym and multi-purpose rooms often serve different functions and floors are rarely protected from a variety of footwear.
2. Multipurpose rooms are defined for the purpose of the section as rooms that have space activity to facilitate a physical education program, but cannot accommodate basketball, volleyball or badminton due to height and floor size restrictions.
3. Game lines are specified for color and width in accordance with International and National Sport Standards.
4. Background colors in general and colors in other areas are to be co-ordinated with Client.

11.4.15 GYPSUM BOARD CEILING FINISHES

1. Painted ceilings may have textured finish in public areas or where acoustic treatment is desirable.
2. The use of gypsum board ceilings is recommended in the following areas:
    a. vestibules
    b. areas that require secure storage
    c. areas that require fire ratings
    d. areas in a high moisture area

11.4.16 ACOUSTICAL TILE CEILINGS

1. Finished ceilings in normal work areas are to be exposed suspended T-bar construction and acoustic tile.

2. Lay-in tiles, 610 x 610mm or 610 x 1219mm, with square edges are acceptable.

11.4.17 FINISH SCHEDULE

1. The following is a guide for interior finishes in the normal workplace environment:

ROOMS	CEILING	WALLS	FLOORS
Main Lobby	Acoustic Tile	Paint Vinyl Wall Coverings	Linoleum Resilient Sheet Flooring Carpet Natural Stone Ceramic Tile
Corridors	Acoustic Tile	Paint	Linoleum Resilient Sheet Flooring Carpet
Exit Stairs	Gypsum Bd. Painted	Paint	Rubber Thread and Nosing
Vestibules	Gypsum Bd. Painted	Paint Vinyl Wall Coverings	Quarry Tile Resilient Sheet Flooring
Office and Support areas	Gypsum Bd. Painted Acoustic Tile	Paint	Vinyl Tile Carpet Resilient Sheet Flooring
Washrooms	Paint	Paint Ceramic Tile Dado	Resilient Sheet Flooring Ceramic Tile Vinyl Tile

ROOMS	CEILING	WALLS	FLOORS
Storage	Paint	Paint	Vinyl Tile Paint
Stairs other than exit	Paint	Paint Vinyl Wall Coverings	Vinyl Tile Granite
Meeting	Paint Acoustic Tile	Paint Vinyl Wall Coverings	Carpet

11.4.18 INTERIOR DOORS

1. In general, interior doors are to be commercial/industrial grade with the finish to be project specific.
2. Veneers may be paint grade generally.
3. Standard stain grade doors shall be birch veneer, book matched.

11.5 INTERIOR DESIGN

11.5.1 FIT-UP LAYOUTS

Develop office layouts using Departmental space guidelines to achieve the best use of the space.

11.5.2 COLOR SCHEMES

The Consultant may use an interior designer, or interior decorator to develop the color scheme.

11.5.3 SYSTEMS FURNITURE

1. Systems furniture consisting of panels and components has been accepted as an alternative to free standing furniture.
2. The NL Master Specification Guide for Public Funded Buildings contains a section for systems furniture.

11.5.4 OFFICE FURNISHINGS

1. Clients may supply some of the office furnishings. Unlike systems furniture the Department does not have fixed specifications for all levels of furnishings. The allocation for private office furniture is left up to the client department.
2. The furniture required for any complex should be tendered separately from the building structure.
3. Items not on standing offer shall be tendered with an appropriate specification, stating the material quality, performance standards and other information.
4. It is not acceptable to list a single manufacturer's product in the specification.
5. Similar items should be grouped when tendering, i.e. chairs, tables or office suites, where a desk, side table, and credenza must match. Some groups may be subdivided, e.g. desk chairs, lounge chairs.

11.5.5 WINDOW TREATMENTS

1. Window treatments may be required for all exterior glazing where sun shading and privacy are required. Clerestory windows are not required to have window treatments.
2. When selecting exterior window treatments, both the interior and exterior appearance should be considered. The exterior appearance should be compatible and present a unified design.
3. Where draperies may be hung, liners should be used.
4. Where feasible, select one product for exterior window treatment, throughout the project.

11.5.6 PLANTERS AND PLANTS

1. Planters may be used in open areas as space dividers where a degree of privacy and enclosure is required.
2. Artificial plants materials are to be inherent flame retardant.
3. Provide information on the type and number of planters and plants for consideration at the design development stage, and updated at the contract documents stage.

4. A two (2) year renewable maintenance agreement may be included at the time of tender. The maintenance agreement is to run from the end of the warranty period.

11.5.7 ARTWORK

Artwork may be provided to Government buildings under the Government Art Procurement program.

11.5.8 BARRIER FREE DESIGN

1. The Building Accessibility Act applies to more than wheelchair challenged persons.
2. Where the Consultant finds conflict between the “Building Accessibility Act” and the NBCC the Act will govern, except where directed as part of the facility functional program, or by the Design Manager.
3. The Consultant will be responsible for any applications to the regulatory authority for the “Building Accessibility Act”.
4. Attention should be paid to clearances. Typical clearances should be detailed on the drawings.
5. Attention is required for handrails, provide details on the drawings.

12 MECHANICAL - TECHNICAL

12.1 REGULATIONS

12.1.1 CODES AND STANDARDS

1. National Building Code of Canada
2. National Plumbing Code of Canada
3. National Fire Code of Canada
4. Model National Energy Code of Canada for Buildings
5. Applicable CSA Standards
6. ASHRAE Standards and Guidelines
7. SMACNA Manuals
8. Provincial Fire Prevention Regulations
9. National Fire Protection Association Standards
10. ASTM and ASME standards
11. Other applicable international standards

12.1.2 AUTHORITIES HAVING JURISDICTION

1. Office of the Fire Commissioner
2. Government Services & Lands
3. Department of Environment & Conservation
4. Mechanical & Building Inspections, Department of Government Services
5. Department of Health & Community Services
6. Workplace Health, Safety and Compensation Commission
7. Municipality

12.2 SUBMISSION REQUIREMENTS

12.2.1 SUBMISSION REQUIREMENTS

Submissions are to follow PEGNL publication “Guidelines for Mechanical Engineering Services”, August 1995.

12.3 PLUMBING

12.3.1 DOMESTIC WATER SUPPLY (HOT AND COLD)

1. Water meter is to be installed if required by municipality. If water meter is not required, provision for future installation should be shown on water service entrance detail. Water meter complete with output signal to the building EMCS.
2. Hot water circulation systems shall be in accordance to ASHRAE “HVAC Applications”. Hot water circulation systems shall not be used where the distance of the hot water piping from the heater to the farthest fixture or appliance is less than 30m. Attempt to locate hot water tanks close to the areas of highest use.
3. Hot water service to fixtures and appliances shall be delivered at a temperature in accordance with ASHRAE 90.1 Energy Standards for Buildings Except Low-Rise Residential Buildings. Booster heaters may be used at locations where fixtures or appliances require a higher water temperature than being generated by the hot water heater. Maintain stored water temperature at 60°C to prevent bacteria growth.
4. All showers are to be protected by scald proof devices. Central thermostatic mixing valves are an acceptable means of controlling water temperature.

12.3.2 DRAINAGE, WASTE AND VENTING

1. Do not locate drain lines in exterior walls.
2. If a drain will only be used occasionally, a trap seal primer is required.
3. In Labrador, insulate vent piping at a distance of 3m down from roof penetration.
4. Do not run horizontal vent pipe in vented attic space.
5. Invert elevations shall be shown for sanitary and storm sewer lines where they are to connect to site services outside building.
6. Pipe penetrating roof shall be next size up from pipe below.

12.3.3 PLUMBING FIXTURES

12.3.3.1 Water Closets

1. Generally, water closets are to be wall hung type, open seat, and complete with flush valve (where sufficient water pressure exists). Provide elongated rim bowl syphon jet flush action water closets.
2. Water closets in public washrooms, schools and recreation facilities to be fitted with extra heavy seat ring only.
3. Use low water consumption toilet fixtures.
4. Electronic flush valve complete with manual override and hardwired with battery backup.

12.3.3.2 Hand Basins

1. Vitreous china fixtures normally are preferred. Stainless steel fixtures may be appropriate for high public use areas, security related facilities, and schools. Enamel covered steel, plastic, and fiberglass fixtures are not permitted.
2. Spring loaded faucets are not acceptable.
3. Use infra-red sensing faucets in public washrooms, with battery back-up.
4. Dual flush may be used in limited applications on approval of TW.

12.3.3.3 Sinks

1. All sinks shall be stainless steel.
2. Janitors' mop sinks should be as per the master specification. One janitors' sink per 1400m^2, with at least one per floor, shall be provided.

12.3.3.4 Drinking Fountains

1. Drinking fountains shall be stainless steel.
2. If refrigerated units are required they must be the self contained type. Remote refrigeration units are not acceptable.
3. Hydration Stations are preferable.

12.4 FIRE PROTECTION

12.4.1 SPRINKLER AND STANDPIPE SYSTEMS

1. Provide sprinkler systems where required designed to NFPA 13-Installation of Sprinkler Systems. Consultant shall provide sprinkler layout. The fire protection contractor is responsible for the final hydraulic design, calculations and detail layout with pipe sizes indicated, according to applicable codes and standards.
2. Sprinkler systems shall be electrically supervised.
3. Dry pendant heads should be used in areas where there is a possibility of freezing. A glycol loop is necessary where sprinkler piping may be exposed to freezing temperatures.
4. Where standpipe systems are used, they are to be taken off sprinkler systems unless otherwise directed.
5. Standpipe cabinets to be of sufficient size to accommodate a 9 kilogram dry chemical fire extinguisher.
6. Standpipe hose and nozzle fittings to be internal lug quick-connect couplings conforming to ULC S543–Standard for Internal Lug Quick Connect Couplings for Fire Hose.
7. Siamese fire department connection and caps shall have internal lug quick-connect couplings conforming to ULC S543. Siamese connection is to be in vicinity of the fire alarm panel.

12.4.2 CLEAN AGENT EXTINGUISHING SYSTEM

A clean agent extinguishing system should only be considered for highly valued spaces which are not occupied designed to NFPA 2001 Clean Agent Fire Extinguishing Systems.

12.4.3 WET CHEMICAL EXTINGUISHING SYSTEMS

Environmentally friendly, wet chemical extinguishing systems shall be installed over fryers and ranges, when required, designed to NFPA 17A Wet Chemical Extinguishing Systems.

12.4.4 PORTABLE FIRE EXTINGUISHERS

Portable fire extinguishers shall be specified ULC approved, rechargeable type extinguishers are acceptable for buildings which are occupied on a daily basis. Extinguishers selection and installation shall meet NFPA 10 Portable Fire Extinguishing Systems. CO^2 shall be used in electrical and data rooms.

12.5 HEATING

12.5.1 GENERAL

Ensure heating system provides uniform distribution of heat. In particular, perimeter heating shall be designed to avoid potential for occupant discomfort by drafts from exterior wall.

12.5.2 DESIGN TEMPERATURES (HEATING LOAD)

Use 1% January outside temperatures for critical spaces, otherwise use 2½% as listed in the Appendix C of the National Building Code, latest edition for the outside design temperature. Indoor design temperatures shall typically be set as per table below. Minimum temperature at floor level shall be 18^oC.

	Occupied Hours	Unoccupied Hours
Office Areas	21°C	15°C
Warehouse, storage space, etc. With transient occupancy	15°C	10°C
Industrial areas such as kitchen, laundry, shops, etc.	18°C	12°C
Institutional	22°C	15°C
Laboratory	21°C	15°C
Health Care Facilities	to CSA Z317.2	to CSA Z317.2
Correctional (Administration)	21°C	15°C
Correctional (Inmates)	21°C	15°C
Correctional (Industrial areas)	20°C	12°C

12.5.3 ZONING

1. Spaces with similar thermal load profiles and/or occupancy shall be grouped into thermal control zones such as:
    a. perimeter and interior spaces zoned separately
    b. perimeter spaces, normally zoned by exposure
    c. the maximum size of perimeter zones for heating is the entire exposure
2. Each occupied space shall have its own heater and temperature control unless otherwise approved by TW.

12.5.4 FORCED AIR SYSTEMS

1. Forced air heating systems are only applicable to buildings where multiple zone control is not required.
2. The furnace shall have two fan speeds where the furnace supplies ventilation air. Where a separate ventilation system is installed one fan speed is sufficient.
3. Adequate outside air shall be introduced into the mechanical room for combustion.
4. Generally, ducts for air heating systems shall be run under the floor with distribution grilles located in the floor. In certain circumstances (such as a garage bay), overhead exposed ducting may be acceptable.

12.5.5 HYDRONIC HEATING SYSTEMS

12.5.5.1 General

Design to CSA B214 Installation Code for Hydronic Heating Systems

12.5.5.2 Boilers

1. The boiler plant shall consist of a minimum of 2 oil-fired boilers, each sized at a minimum of two thirds of the total load where economically justifiable. Three (3) boilers each sized for 33% of the total load is preferable. In critical applications, three (3) boilers each sized for 50% of the total load is preferable (TW approval required).

2. Establish the type of boilers to be used. Multiple pass forced draft fire-tube boilers are preferred in larger buildings where boiler size required exceeds 250kW.
3. Use retention head burners.

12.5.5.3 Chimneys

1. A separate chimney for each oil burning device is preferred.
2. Pressure rated chimneys are required for all forced draft appliances.
3. Chimney lengths should be minimized and kept within the heated building envelope as much as possible with the exposed exterior length kept to a minimum.
4. Cleanouts are to be provided at each change of direction. Cleanout covers shall be insulated.

12.5.5.4 Heating Fluids

1. Normally, the heating fluid will be 100% water.
2. Glycol mixture for colder climate regions such as Labrador in secondary heating loops to be determined on a project by project basis. Glycol is to be ethylene glycol premixed with inhibitors. A 100mm air gap must be provided between water supply line and the top of the glycol make-up tank in glycol-water mixtures.

12.5.5.5 Circulation

1. Primary/secondary piping loops to allow constant or variable flow based on life cycle cost analysis on both loops under varying load demands are preferred for systems supplying over 50kW. A single loop is acceptable for smaller heating loads.
2. Standby pumps are to be installed with each pump and sized to handle 100% of full system load. Use automatic start, with lead/lag automatic switch control and manual-off-auto selector switch.

12.5.5.6 Distribution

1. Wall fin radiation is the preferred method of heat exchange. If permanent cabinets or built-in furniture must be located against the same wall as radiation units ensure appropriate inlet and riser vents are installed.
2. Floor and wall mounted forced flow units are usually required for vestibules and entrances. Units should be recessed where structural conditions allow and controlled by low range thermostats.
3. Use radiant floor systems with approval of TW only.
4. A shut-off valve is required for each zoned section of radiation.

12.5.5.7 Controls and Instrumentation

1. Provide indoor/outdoor controls for boilers with 2 or 3 step settings without reducing water flow to each boiler. Ensure a boiler's lowest water temperature shall not be below the boiler manufacturer's recommendations. Where low water temperature scheduling is economically justifiable, apply on secondary heating loops.
2. Normally open, electrically operated heating zone valves shall be used. Do not use thermostatic valves. Isolation valves and unions to be provided on both sides of zone valves and a piggy back drain is to be provided on the discharge side of the zone valve.
3. Thermostats located in public areas must have vandal proof guards. Locking type thermostats shall be used in public facilities where maintenance personnel only should be able to adjust temperature settings. In areas where it is deemed appropriate for users to adjust thermostat settings, the range shall be restricted to prevent extreme settings. Where group of radiation units are controlled by a room thermostat, provide knob operated dampers in each unit enclosure.

12.5.5.8 Monitoring

1. Devices installed to allow testing of low water fuel cut-offs must allow testing without draining the boiler.
2. Stack thermometers are required at breeching outlet of each boiler.
3. Thermometers are required on wells located on:

a. return piping of each zone
b. converging side of 3 way valves
c. supply and return side of coils
d. supply and return headers of heating equipment
e. digital gauges and thermometers are preferred

12.5.5.9 Maintenance Requirements

1. Air Vents: with clearly identified access covers. Automatic air vents may only be used in mechanical rooms where system contains glycol. All air vents must have isolation valves.
2. An 18mm combination hot and cold water connection shall be installed in the boiler room in close proximity to the boilers. The hose bibbs shall be equipped with vacuum breakers.
3. Access doors to all control and isolation valves are required.
4. Radiation cabinets must be secure but easily removable by maintenance personnel.

12.5.6 FUEL TANKS AND PIPING

12.5.6.1 General

1. Support tanks by a fire resistant cradle.
2. The design and installation of fuel tanks shall be in accordance with the National Fire Code of Canada and provincial regulations.
3. Use aboveground tanks, where possible.

12.5.6.2 Above Ground

1. Fabricate horizontal steel tanks conforming to ULC standards or field fabricated to API Standards.
2. Equip tanks with secondary containment conforming to ULC standards, and a provision for monitoring the secondary containment.
3. Coat tanks and steel containments internally and externally with a corrosion resistant material providing 100% surface coverage.
4. All above ground tanks shall be double walled with interstitial leak detection.

12.5.6.3 Underground

1. Place a geotextile fabric in the excavation to separate the native soil from the backfilling material.
2. Where underground tanks are proposed, first consideration shall be given to reinforced double wall fiberglass tanks.
3. Double wall tanks shall have interstitial leak detection conforming to ULC standards.

12.5.6.4 Piping

All storage tank piping located at or below the product level shall be equipped with either a manual or automatic shut-off valve as close as practical to the storage tank.

12.5.6.5 Additional Requirements for Sensitive Sites

Double wall tanks shall have interstitial leak detection conforming to ULC standards.

12.5.7 HEAT PUMP SYSTEMS - UNITARY WATER-LOOP

1. Minimize the use of console units. Use preferably ceiling mounted units and vertical closet-type units.
2. Select units for quiet operation. Locate units away from noise-sensitive areas and avoid noise transmission through ceiling and return air intakes.
3. Provide an acoustically lined “T” or “L” section at the return air inlet of each unit.
4. Units must be easy to access for routine service.
5. Operate the outside make-up air system at 100% when the outside temperature permits and modulate with return air when required.
6. In the ceiling plenum, duct the outside air supply for each pump to within 1.2m of the return air of the unit, and discharge the air directly towards the inlet, or supply the outside air directly to the occupied space.
7. Thermal storage is generally required in reducing supplementary heating use and stabilizing loop temperature.
8. Provide freeze protection for the heat rejecter and associated piping.
9. Protect the supplementary heater against conditions of both thermal shock and low water flow.

12.5.8 GROUND SOURCE HEAT PUMPS

TO BE DEVELOPED

12.6 VENTILATION AND AIR CONDITIONING

12.6.1 VENTILATION

1. Minimum ventilation rates shall be as per ASHRAE Standard 62.1 (most current edition.) Outside air make-up shall not be less than all exhaust air flows. Control provision for continuous monitoring is an acceptable method of ensuring system is supplying minimum required ventilation rate.
2. Tailor a HVAC System type selection and its design to the need.
3. Provide HVAC system flexible in buildings which employ an open-office type setting.
4. Equipment shall be with BACnet Compatible.
5. Air velocity within an occupied space, defined as any point between 200mm and 1700mm from floor and more than 300mm from a full height partition or an exterior wall, shall meet the following:
    a. Winter - not more than 0.15m/s
    b. Summer - not more than 0.25m/s
6. Locate outside air intakes so they will not entrain air from building exhaust or relief air outlets, vehicle exhausts, or other fume/contaminant sources. Consider relative locations, prevailing winds and air flow patterns around buildings in selecting exhaust/relief outlet and air intake locations.
7. Use flow stations to control and monitor all H/V unit fans.

12.6.2 VARIABLE AIR VOLUME (VAV) SYSTEMS

1. Bypass type VAV systems, with constant supply fan air flow, may be considered for small buildings where packaged air handling or roof top equipment is appropriate.
2. Performance characteristics of selected diffusers/grilles and registers shall be adequate over the whole range of air flows.
3. Do not use a VAV system to provide perimeter heating.

4. VAV system at minimum setting, must supply the minimum outdoor air requirements.
5. Supply fan air flow modulation control recommendations:
6. Systems larger than 10,000 l/s - Static pressure control VSD.
7. Systems smaller than 1,000 l/s. - No control; select forward curved fan to maintain acceptable duct static pressures as the system curve 'rides' up the fan curve. Ensure that excessive VAV terminal box pressure drops do not occur.
8. Return fan air flow modulation control recommendations:
9. No return fan. Where the building design makes possible a return air flow pathway open enough so a return fan is unnecessary.
10. Relief fan. Where the building design makes possible a return air flow pathway open enough so that the supply fan can draw return air effectively on minimum outside air operation, use a relief fan when the system is on free cooling operation. Relief fan and inlet damper should be controlled from building space pressure with high quality, low pressure span, differential pressure.
11. Return fan. Use on large systems, and where free cooling is justifiable.
12. Where it is necessary to maintain specific pressure relationships between adjacent areas (such as adjacent to laboratories), special control provisions for the VAV shall be provided.

12.6.3 DESIGN TEMPERATURES (COOLING LOAD)

1. Use July 2.5% values as given in the National Building Code, latest edition for the outside design temperatures for space heat and humidity calculations. Omit envelope heat gains from cooling load calculations where air conditioned areas are unoccupied during summer months.
2. Interior design temperatures for cooling loads as per table below. The consultant, upon request, shall show calculations indicating the need for mechanical cooling where necessary to maintain indoor design temperatures. If ventilation system is the primary source of heat, follow the design temperatures given previously.

3. Maximum temperature fluctuation is 2°C per hour.

Type of Space	Occupied Hours	Unoccupied Hours
Office Areas	24°C	None
Warehouse, storage space, etc. with transient occupancy	None	None
Industrial areas such as kitchen, laundry, shops, etc.	project specific	project specific
Institutional	24°C	None
Laboratory	24°C	None
Health Care Facilities to CSA Z317.2	to CSA Z317.2	to CSA Z317.2
Correctional (Administration)	24°C	None
Correctional (Inmates)	27°C	None
Correctional (Industrial areas)	None	None

12.6.4 TEMPERATURE GRADIENTS:

1. Horizontal - Maximum 2°C between 300mm and 3000mm from exterior wall at desk height.
2. Vertical - Maximum 2°C between 200mm and 1700mm from floor at any point more than 300mm from an exterior wall.

12.6.5 ZONING

1. Group spaces with similar thermal load profiles and/or occupancy shall be grouped into thermal control zones. Given this principle, consider the following in making final zoning decisions:
   a. perimeter and interior spaces zoned separately
   b. perimeter spaces, normally zoned by exposure
2. Perimeter zones:
   a. maximum size for cooling, 100m^2

b. Interior Zones:

3. Interior Zones:
   a. Maximum size – 250m^2 for open space
   b. 100m^2 for enclosed spaces
4. Zone conference/meeting rooms larger than 20m^2 separate with a local control to provide extra cooling and air changes as necessary.
5. Areas with special functional, occupancy or environmental requirements are to have separate zones or systems.
6. Each occupied space shall have its own cooling unit and tempered controller unless otherwise approved by TW.

12.6.6 HUMIDITY

1. Humidification during the winter shall be required if it is determined that the humidity level will drop below 25% at the design room temperature. Provide 30% R.H. minimum humidification for normal occupancy.
2. Dehumidification during the summer months shall be accomplished by latent cooling. Cooling coils shall be capable of keeping humidity level below 60% at design room temperature.
3. Maximum humidity fluctuation is 20% per hour.

12.6.7 ACOUSTICS

1. Design HVAC systems to control equipment vibration and noise propagation such that background noises from these systems are below the maximums indicated in the most current version of the ASHRAE design manuals.
2. Ensure the HVAC systems serving private offices, interview rooms, counseling rooms, conference rooms, etc., provide a degree of acoustic privacy consistent with the rest of the construction.

12.6.8 EQUIPMENT AND COMPONENTS

12.6.8.1 General

Select systems, equipment and components to suit local service and maintenance capabilities. Use less complex equipment in remote areas.

12.6.8.2 Air Handling Equipment

1. Factors to be considered for operating efficiency and cost optimization when selecting air handling equipment:
   a. Fan selection and efficiency:
      - optimum air inlet/discharge configuration (follow AMCA recommendations)
      - noise levels
      - highest operating efficiency
      - part load operation for VAV systems.
   b. Coil face area:
      - larger face area gives lower friction loss (both air-side and heating/cooling fluid)
      - larger heat exchange surface area will permit smaller temperature difference (e.g. on cooling will permit higher refrigerant evaporating temperature and system efficiency)
      - on cooling, fewer rows may be possible.
   c. Filter face area:
      - larger face area decreases static pressure drop, and increases dust-holding capacity.
   d. Duct system design:
      - lower duct velocities and streamlined duct fittings both decrease system friction loss.
   e. Roof top units are generally not recommended. However, in certain circumstances it may be hard to justify not using roof top units when analyzing capital cost. The use of roof top units generally depends on:
      - the climate
      - whether or not primary space heating depends on the unit, and
      - controls complexity required.
   f. Place over areas where noise is not a concern
   g. Avoid contaminated air through heat recovery wheels. Avoid recirculation type heat recovery equipment defrost

12.6.8.3 Refrigeration Equipment Selection

1. Do not select refrigeration equipment using refrigerants which are restricted under the 1987 Montreal Protocol on substances which deplete the ozone layer.
2. All refrigeration equipment of 7.0kW (2.0 tons) or greater capacity must be complete with a liquid-line filter-drier, complete with shut-off valves to permit service or replacement.
3. Select packaged refrigeration equipment which has service valves or ports to permit withdrawal, and isolation, of the refrigerant charge into a receiver or container, thus preventing its release to the atmosphere during service work. For refrigeration equipment with a cooling capacity greater than 35kW (10 tons), select equipment with isolation valves to permit containment of the refrigeration charge in one portion of the system, thus reducing the amount of refrigerant which has to be recovered and replaced during service work.
4. In order to maximize refrigeration system operating efficiency, consider life-cycle cost optimization in the selection of refrigeration equipment, both packaged units and individually selected components. Some factors to consider are:
    a. larger coil surface areas will reduce condensing, and increase evaporating, temperatures thus improving efficiency
    b. basic compressor efficiency and performance
    c. humidity requirements for product cooling/freezing may limit selection flexibility
5. Consider condenser heat recovery from product cooling/freezing units for domestic hot water preheating.
6. Where operation of refrigeration systems will be required in cold weather, ensure equipment with the necessary low-ambient temperature features is selected. Where refrigeration system components are located outdoors, or where freezing temperatures could occur, ensure the design provides for protection from freeze-up or damage due to the cold conditions.

7. Avoid use of municipal water supply for once-through water-cooled condensing unless there is no realistic alternative. If it is proposed, provide justification and obtain the approval of the Design Manager prior to commencement of final design. Discharge only to storm water drainage system.

12.6.9 EQUIPMENT ACCESS

1. Provide access via stairway for equipment located in a penthouse.
2. Provide access for roof mounted equipment from the interior.
3. Equipment access doors must be hinged and latched.
4. Provide access around equipment so that it is easily accessible for servicing and maintenance.

12.6.10 AIR DISTRIBUTION SYSTEMS

1. Design ducts to conform to good engineering practice such as described in the ASHRAE Handbooks.
2. Distribution system design must permit easy relocation of any ceiling diffuser within a radius of 1.5m.
3. Limit flexible duct use to buildings where frequent repartitioning is expected. Flexible ducts are not allowed to align duct branches. Maximum flexible duct length is 1.5m.
4. Design systems for good air distribution throughout the occupied space under all load conditions. In particular, the design must avoid the following unsatisfactory conditions:
    a. exterior wall drafts during cold weather when heating is from a ventilation system with ceiling supply
    b. short-circuiting, when both supply and return are at the ceiling, particularly in perimeter areas during cold weather when the ventilation system provides space heating
    c. lack of adequate return air flow from private offices and meeting rooms
    d. incorporate ASHRAE HVAC applications volume included hourly circulation air changes in design

5. Provide low leakage type motorized dampers for inlet, relief or exhaust air at the building envelope.
6. Where building design permits, provide an open return air flow pathway and avoid the use of return fans.

12.6.11 AIR FILTRATION

1. For unitary equipment, including roof top units up to 3000 l/s air flow, minimum 35% ASHRAE atmospheric dust spot efficiency test method.
2. For roof top units and central station air handling equipment delivering more than 3000 l/s, minimum 45% ASHRAE efficiency.
3. Examine in conjunction with the Department the possibility of using “high efficiency” filters (80%-90% ASHRAE efficiency). Select filter efficiencies to CSA Z317.2 Special Requirements for Heating, Ventilation and Air-Conditioning Systems in Health Care Facilities.

12.6.12 HUMIDIFIERS

1. Humidifiers should be electrode steam design, with a self-contained cleanable steam cylinder, or provided by a boiler when economically justified.
2. Distribution shall normally be through a supply air duct mounted rapid steam absorption bank/panel.

12.7 CONTROL SYSTEMS FOR HVAC

12.7.1 GENERAL

1. Most medium and large size buildings will utilize an Energy Management and Control System (EMCS). Most control functions will be carried out by computerized direct digital controls (DDC). Local hard-wired controls will only be used for simple functions such as unit heaters, small exhaust fans and for all safety shut-downs such as freezstats. All fans starters will be equipped with hand-off-auto switches.
2. Submit control sequence descriptions and schematic diagrams for all systems for review.

12.7.2 HARDWARE

1. Control panels to be stand alone intelligent controllers with non-volatile program memory. The panel is comprised of a micro processor capable of supporting all necessary software.
2. Application Specific Controllers
    a. Control panels shall have the capability of being networked for single point programming and for the sharing of point information and control instructions between panels
    b. It should be possible for each control panel to have a dedicated local display or for a collection of control panels to share in single operator terminal
    c. Control loops shall be user programmable, automatic self-tuning digital control loops with individual proportional gain and integral adjustments, capable of sharing controller inputs and integration through controller software
3. The system shall be capable of generating job specific control strategies that can be activated in any of the following ways:
    a. continuously
    b. at a particular time of day
    c. on a predefined date
    d. when a specific measured or controlled variable reads a selected value or state
    e. when a piece of equipment has run for a certain period of time (trend)
4. Provide a personal computer interfaced with the Digital Control System (DCS) located in the mechanical room.
5. Specify web browser control where available for remote monitoring.
6. Provide a printer located in the mechanical room for printing alarms and summaries etc.
7. Required points are to be summarized in the specification or on the drawing.

12.7.3 SOFTWARE

1. Energy management system software shall be a graphics-based display in a Windows environment and contains features in the NL Master Specification Guide for Public Funded Buildings.
2. Include communications software package for remote monitoring of controls system.

12.8 ENERGY LIFE CYCLE COSTS

1. Identify those criteria which have the major or greatest effect on life cycle costs and whether only one specific escalation rate is required and can be justified for each major criteria identified.
2. Use energy costs obtained from utilities for oil, gas, and electrical energy sources when making comparative studies. Rates shall relate to energy peaks and consumption based on building concepts under consideration.
3. TW will provide the following to the Consultant for the life cycle study:
    a. present value discount interest rate to be used
    b. escalation rate for annual maintenance services
    c. annual escalation rate to be applied for each energy source
    d. the asset life, generally 25 years
    e. industry average costs for operating and maintaining mechanical systems if specific cost experience is unavailable for the proposed facility
4. Define a base building systems concept for use as a basis for comparison and selection of the final design concept solution. The base concept should represent the latest acceptable conventional system.
5. Analyze alternative systems' energy and cost deviations from the base concept.
6. Provide a life cycle cost summary comparing alternatives with the base building system concept.

13 ELECTRICAL - TECHNICAL

13.1 GENERAL REQUIREMENTS

1. Base the electrical design on providing the following features at the most economical cost, considering both investment and operating expenditures:
    a. Safety to personnel during operation and maintenance
    b. Ease of maintenance of equipment
    c. Flexibility of electrical services
    d. Energy conservation and efficiency (Pursuant to the latest edition of the National Energy Code)
    e. Proper coordination of all elements of the electrical system as to:
        i. insulation levels
        ii. interrupting capacities
        iii. voltage & current ratings
        iv. protective devices
        v. mechanical strength
        vi. hazardous location classification.
2. Coordinate electrical systems with all other affected disciplines and building systems.

13.2 REGULATIONS

13.2.1 CODES AND STANDARDS

1. Canadian Electrical Code CSA C22
2. National Building of Canada (NBCC)
3. National Energy Code (NEC)
4. National Fire Code (NFC)
5. National Fire Protection Association (NFPA)
6. Provincial Fire Commissioner's Regulations
7. Electrical Safety in Patient Care Areas - CAN/CSA-Z32.2
8. Essential Electrical Systems for Hospitals - CAN/CSA-232.4
9. Installation of Fire Alarm Systems CAN/ULC-S524

10. Inspection and Testing of Fire Alarm Systems CAN/ULC-S536
11. Verification of Fire Alarm Systems CAN/ULC-S537
12. IESNA - Illuminating Engineering Society of North America
13. CAN/CSA-T530-M90 - Design Guidelines for Telecommunications
14. CAN/CSA-T529-M - Design Guidelines for Telecommunications Wiring in Commercial Buildings
15. EIA/TIA568, TSB40 Specifications for Category 6 Data Wiring

13.2.2 AUTHORITIES HAVING JURISDICTION

1. Office of the Fire Commissioner
2. Government Services & Lands
3. Department of Environment & Conservation
4. Mechanical & Building Inspections, Department of Government Services
5. Department of Health & Community Services
6. Workplace Health, Safety and Compensation Commission
7. Municipality

13.3 SUBMISSION REQUIREMENTS

13.3.1 SUBMISSIONS

1. Submissions are to follow “Guidelines for Electrical Engineering Services” published by PEGNL, August 1995.
2. Specifications are to follow the NL Master Specification Guide for Public Funded Buildings edited to suit the project requirements. Include track changes for each review submission.
3. Before final submission, submit plans and specifications required by the Inspection Authority, the Power Utility, Telephone Company, and Provincial Fire Commissioner’s Office. Submit copies of correspondence to Design Manager indicating status of submittals.

13.4 SERVICE AND DISTRIBUTION

13.4.1 INCOMING ELECTRICAL SERVICES

1. Generally, underground service through an exterior padmounted transformer is preferred and where required to conform to local practice. Cable and installation should be to the approval of the local Power Utility and Inspection Authorities. Provide spare ducts for future additions or maintenance. Ensure underground service conduit is suitably drained.
2. If an exterior padmount transformer is used, ensure padmount is at lower elevation than electrical room to prevent water infiltration into electrical room through underground ducts.
3. Overhead service is acceptable for small buildings.
4. Include protective devices, instrument transformers, metering equipment and other requirements of the local Power Utility.
5. Well in advance, discuss with the local Power Utility the size and type of service required. Obtain from them the three phase symmetrical short circuit fault level at the incoming end of their service to determine the interrupting capacity required for the service equipment.
6. Obtain from the local Power Utility data regarding point of connection, service characteristics and requirements, extent and cost of work provided by the Utility, type of service permitted (overhead or underground), whether a transformer vault is required and reasons therefore, and the best method of metering, outside or inside.
7. Obtain approval from the local Power Utility and Inspection Authority for proposed service entrance equipment, switchgear, duct-manhole systems, transformers, termination pole and associated equipment

13.4.2 CAPACITY OF ELECTRICAL SERVICE

1. Allow for 100% lighting load plus an appropriate demand factor on the remaining load based on operating characteristics.
2. The main service should provide for a maximum of 20% load growth plus an allowance for future expansion if anticipated.

3. Submit summaries of the connected and demand loads on the building at the contract document submission. Also show extent of loads connected to the emergency power, if applicable.

13.4.3 ELECTRICAL ROOMS

1. Allow room space for future expansion of equipment, (e.g. future distribution section on end of service entrance board or wall space for future distribution panel), when determined by program design.
2. Ensure an independent ventilation system, (gravity where possible), with intake and exhaust direct to the outside is provided, where heat generating equipment is installed, (e.g. transformers, remote mounted ballasts, etc.).
3. All major electrical equipment installations shall be located remotely from public areas and housed in areas providing limited access. All miscellaneous openings at the exterior of the building related to electrical systems shall be provided with approved security grilles or screens.
4. Design electrical rooms to allow future space for expansion/extension.
5. Do not locate electrical rooms under washrooms, shower rooms, janitor closets and kitchen's or any such areas where flooding could occur. Do not run plumbing lines in walls and ceilings of electrical rooms.
6. Minimize mechanical ventilation duct work in ceiling spaces above electrical rooms.

13.4.4 SWITCHGEAR ASSEMBLIES

1. Use metal-enclosed assemblies with circuit breakers where current, voltage and short circuit characteristics are within their limits.
2. Incorporate H.R.C. current limiting fuses into circuit breakers on circuits requiring high short circuit protection.
3. Fused switches may be used for main and distribution feeders.
4. The electrical equipment supplier is to provide a short circuit analysis and time-current coordination study to justify selection of fuses and breakers. Include in the analysis and study the system from the utility primary fuse to

the largest breaker in each branch circuit panelboard and motor control center.

5. Specify for Owner's metering that the switchgear manufacturer install a micro processor controlled digital AC instrumentation package for Owner's metering purposes.
6. All bussing shall be tin-plated aluminum in main switchgear assemblies.
7. Specify sprinkler proof enclosure as required.

13.4.5 TRANSFORMER TYPES

1. Dry type transformers are preferred for primary voltages of 15 kV or lower where insulation, coordination and protection satisfactory to the Power Supply Authority can be obtained. Provide lightning arrestors.
2. Liquid cooled transformers are preferable above 15kV, although dry type may be used if approved by the Power Utility. Check BIL requirements. This type of transformer should be supplied by the Utility.
3. When providing secondary voltage service entrance, padmounted or pole mounted utility-owned transformers are preferred.
4. Locate the transformer to minimize the length of the secondary cable run to the building and to minimize visual impact on the site.
5. Specify sprinkler-proof enclosures for transformers located in sprinklered rooms.
6. Meet or exceed US Department of Energy (DOE) CSL3 efficiency standards tested as per NEMA TP-2.

13.4.6 WIRING METHODS

1. Wire size is to be No. 12 AWG minimum for power or lighting circuits. Bonding conductors may be a minimum of No. 14 AWG. Specify that each receptacle circuit providing computer power must have a separate dedicated neutral wire and be powered from dedicated panelboards thru separate harmonic mitigating transformers as required.
2. Specify wire type to be copper complete with RW90 XLPE insulation. Insulation ratings shall be a minimum of 600 volts for 347/600 volt a.c. circuits

and 300 volts for 250 volt a.c. circuits and below. Specify the use of RWU90 type insulation on conductors for exterior underground use.

3. Give consideration to the use of nickel aluminum alloy conductors for feeders and large branch circuits 60 Amps and greater. Take into account differences in voltage drop and conduit size when using alloy conductors verses copper.
4. Minimum conduit size is to be 19mm with an allowance made for the use of 12mm conduit in cases where one (1) 3 wire, 15 amp branch circuit is wired or for switch legs.

13.4.7 PANELBOARDS

1. Use circuit breaker type panelboards for motors, power equipment and lighting. Consider use of MCP's for motor protection.
2. Circuit breakers are to be of the bolt-on type. Multiple breakers shall have single handle. Tie-bars are not permitted.
3. Specify mains or bussing to be made of tin plated aluminum.
4. Include in panelboards a minimum of 20% spare breakers and space for a minimum of 10% more.
5. Specify sprinkler proof enclosure as required.
6. Specify that splices are not permitted in any panelboard feeders.

13.4.8 CEILING DISTRIBUTION

1. Provide power distribution system, in the ceiling space, for office areas as follows:
    a. system to be capable of supplying three phase power to modular office furniture or single phase pack poles
    b. common neutrals not acceptable
    c. connection length in ceiling not to exceed 3m
    d. allow for a maximum of four duplex receptacles per circuit except two duplex receptacles per circuit for computer
2. Provide communication (voice & data) system, in the ceiling space, for open office areas as follows:

   a. system of zone conduits sized as required for open office areas or instrumentation cable tray routed along corridor ceiling space
   b. terminate conduits/cable tray at backboard in communication closet
   c. design the system to minimize length of cables. Do not install cables directly on ceiling tiles
3. Installation to meet latest industry standards:
   a. CAN/CSA - T530-M90 “Design Guidelines for Telecommunications”
   b. CAN/CSA - T529-M “Design Guidelines for Telecommunications wiring systems in Commercial Buildings”
4. If zone conduit system is utilized, provide separate zone conduits for telephone and data.

13.5 LIGHTING

13.5.1 LIGHTING - GENERAL

1. For each room or area determine the task performed and provide maintained lighting levels as shown in the latest edition of IESNA (Illuminating Engineering Society of North America) Lighting Handbook.
2. Provide video display terminal task lighting to IESNA recommended practice for lighting offices containing computer visual display terminals (RP-24).
3. Recessed fixtures shall have hinged frame lenses.
4. Use fixtures with parabolic louvers where glare is a problem.
5. Provide minimum V.C.P. value of 70 for all spaces.
6. Design office area lighting to provide between 500 and 550 lux average maintained on the task with furniture and screens in place.
7. Provide local switching for enclosed rooms, (e.g. private offices, conference rooms, training rooms, etc.). For large areas provide a switching arrangement to conserve energy with the use of occupancy and daylighting sensors.
8. Fixtures are to be relocatable within a 1.5m radius without wiring alterations.
9. Provide a life cycle cost analyses. If a life cycle cost saving can be achieved, provide a programmable low voltage lighting control system with the following options:

a. high resolution color monitor and CPU
b. desk top printer
c. manual switch and digital telephone override

10. Provide exterior lighting control by a photo cell and contactor with HOA switch and time clock or programmable controller set back. Provide manual bypass.
11. Submit a computer analysis of the lighting for typical spaces showing point-by-point lighting level values.
12. Provide exterior security lighting for drives, walks and parking areas.
13. Energy efficient lighting systems shall be provided and shall not exceed the lighting power densities as per the latest edition of the National Energy Code of Canada for interior and exterior lighting systems.
14. The illumination of any space should be based on the intended use and the efficient utilization of energy. Follow the procedures recommended by the current IESNA Handbook to as great extent as possible without exceeding the allowable lighting power budget and power densities as permitted by the latest edition of the National Energy Code Canada.
15. In most cases, the levels of illumination listed in IESNA Model Handbook are for specific tasks. When levels are listed for locations, (e.g. foyer) they shall be considered average levels.
16. In areas surrounding task locations, the average level of illumination shall not be more than 1/3 the level of the task performed in the area. Where more than one task occurs in space, the general level shall not be more than 1/3 the average of the task levels.
17. In circulation and seating areas and other seldom occupied space or those in which no critical visual tasks occur, the average level of illumination shall not exceed 1/3 of the average lighting in the adjacent task space.
18. Recommended lighting levels for a few typical areas are as follows:
    a. hallways or corridors - 110 lx
    b. work and circulation areas surrounding work stations - 325 lx
    c. prolonged office work (on task only) - 550 lx

19. Design switching of lighting fixtures to conserve energy, using one or more of the following schemes:
    a. separate switching of lights at the perimeter of the building
    b. provide low voltage switching for general office areas
    c. provide switching at each floor and at central location
    d. automatic control systems (occupancy and daylighting sensors)
    e. switching by zones, not less than 4 zones/floor
20. Switch lighting by zones in open and modified landscape spaces not exceeding 160 square meters.
21. Switch lighting in all enclosed rooms separately.
22. In selecting reflectances and interior surfaces, bear in mind energy utilization implications as well as those of other disciplines.
    a. ceiling - 70%
    b. walls - 50%
    c. floors - 30%
23. Plan lighting designs for high ceiling areas (e.g. atriums, stairwells) such that ease of relamping is achievable. Use wall mounted fixtures in exit stairwells.

13.5.2 LIGHTING FIXTURES

1. For indoors, recessed fluorescent fixtures utilizing low brightness pure virgin acrylic lenses or parabolic louvers are preferred. Ballasts to be electronic energy efficient type with less than 10% harmonic distortion. Lamps to be imperial measure, instant start, T8 configuration, energy efficient, color temperature and color rendering index (CRI) to match application.
2. For outdoors, LED fixtures are preferred.
3. Identify all fixtures on the working drawings and specify in detail in the specification, the quality of material, construction and standard of performance required.
4. Lenses are to be ULC certified.

13.5.3 EXTERIOR LIGHTING

1. For building perimeter lighting, use LED type fixtures, located on the exterior wall a minimum of 2700mm above ground level. Ensure the fixtures are located to prevent damage caused from falling ice and snow from the roof.
2. Light the vehicle parking lot with pole-mounted, LED type fixtures.
3. Provide lighting levels as follows:
    a. perimeter lighting - 15 lx at ground level
    b. active entrance - 54 lx at ground level
    c. parking entrance - 10 lx at ground level
    d. secure parking compound - 10 lx at ground level
4. Emergency power is to be provided to perimeter lighting only to maintain 25% of the above lighting level where an emergency generator is provided in the project.
5. Account for site and building lighting impact on nearby residential areas. Lighting should be used in a positive way to enhance the appearance of both the site and building.
6. All exterior fixtures to be dark sky compliant.
7. Design exterior lights to achieve the LEED credit for Light Pollution Reduction.

13.5.4 EMERGENCY LIGHTING

1. Provide sufficient emergency lighting to permit a safe evacuation. Design emergency lighting systems in accordance with the latest editions of the National Building Code of Canada, National Fire Code of Canada, and the NFPA 101 Life Safety Code.
2. Power for emergency lighting may be from a diesel generator, a central battery bank or individual unit battery packs.
3. If emergency lighting is from a diesel generator, supplement it with battery units in critical locations such as the public main lobby, electrical and mechanical rooms.

13.5.5 EXIT SIGNS

1. Exits and paths of exit travel are to be indicated by electrically illuminated uni-lingual exit signs.
2. Exit signs are to be illuminated with energy efficient L.E.D. lamps.
3. Connect signs to emergency A.C. system, or provide additional sockets and D.C. lamps and connect to emergency battery units.
4. Bilingual and international signs are to be provided where required.

13.6 ELECTRIC HEATING

1. If electrical heating is used, ensure that the heating unit specified provides the required wattage but does not exceed specified values.
2. Integrate the heating controls with the total environmental aspect of the building.
3. Use low watt density heaters where feasible.

13.7 SYSTEMS

13.7.1 INTERCOMMUNICATION SYSTEMS

Provide an intercom and a public address/paging system as required by the Department.

13.7.2 FIRE ALARM SYSTEM

1. Provide a fire alarm system in accordance with the National Building Code of Canada and Authorities Having Jurisdiction.
2. The system is to be electrically supervised, single or two stage as necessary and zoned.
3. Control panel shall be multi-plexed type, of modular design, supervised, with space for future expansion, and in a metallic cabinet with viewing windows suitable for the location. Provide supervised bypass switches on panel to allow testing of bells, fan shut down or remote station notification.
4. Annunciator, where required, is to be electronic lamp type with lamp supervision, front relamping with plastic zone identification plates.
5. Manual Stations shall be addressable, pull lever, open circuit type, installed at 1200 mm height.

6. Heat and smoke detectors shall be the addressable type.
7. Wiring shall be color coded and minimum size #14 AWG for signal circuits, and #16 for station and detector circuits. Provide bonding wire for all field devices.
8. Specify the system be tested and verified by the equipment manufacturer prior to takeover inspection. At final inspection the certificates issued by the manufacturer shall be available to the Authorities Having Jurisdiction and Department of Transportation & Works.
9. Provide complete riser diagram on drawings indicating all devices, locations, conduit risers and sizes, wire type, and control sequences.

13.7.3 Intrusion Alarm and Remote Monitoring

1. Projects requiring Security Systems should be tendered with a separate contract for provision of security systems.
2. Use Departmental standard specifications and guidelines to suit project requirements.
3. All points of building entry and exit and interior unit spaces designated as requiring security control are to be equipped with the capacity for installation of intrusion alarms. All exterior doors and frames are to be provided with facilities for alarm devices and conduits to the security room.
4. Provide conduit for centralized monitoring and control systems and console for fire alarm, emergency telephones, elevators, and lighting systems.

13.7.4 Telecommunications System (Telephone and Data)

1. Provision of structured cable systems for data networks throughout new and existing buildings will be confirmed by the Project Manager at the concept design stage. Where required, they shall be configured for a “star” topology pattern, emanating from data closets with the use of dedicated zone conduits. Typically all data wire, conduit, patch panels, line cords, patch cords, plates, boxes, hubs, etc., will be supplied as part of the system.
2. Design a telecommunication system in accordance with the latest editions of the following guidelines and standards:

a. CAN/CSA-T530-M90 “Building Facilities, Design Guidelines for Telecommunications”
b. CAN/CSA-T529-M “Design Guidelines for Telecommunications Wiring System in Commercial Buildings”

3. Position Voice/Data outlets in close proximity to receptacle power outlets.
4. Provide a data raceway system complete with Cat 6 wiring, outlets, cover plates, patch panels, hub devices and patch cords to constitute a complete operable system. Zone conduits or cable trays in ceiling plenum are preferred complete with wall stub-ups from device outlets. Provide separate raceway for the telephone system.
5. Generally, provide one combination outlet per single office and at 8m intervals along perimeter walls where there are no offices (e.g. in open area office space).
6. Provide pay phones in the public lobby unless otherwise directed.
7. Connect elevator emergency phone to Security Control Center if applicable.

13.7.5 CLOCKS

Provide clock outlets in common areas such as main lobbies, cafeterias, lunch rooms, workshops, conference room, general offices, mail rooms, file rooms and classrooms wired back to central clock system controller.

13.8 MOTORS AND CONTROLS

13.8.1 MOTOR CONTROLS

1. Coordinate control sequences to provide starters, and other auxiliary control equipment with the proper characteristics and features to obtain the performance intended.
2. Electrical shall provide disconnect switches, starters and auxiliary control equipment which are not an integral part of packaged units described in equipment specifications but which are required for performance and sequence of operation of equipment specified under other Divisions.
3. Check that the voltage drop due to motor starting is within limits acceptable to the local utility. If required, use a reduced-voltage starter.

4. Motor starters are not to be supplied from lighting panelboards -Supply separate from dedicated panelboards.
5. Automatic control devices such as thermostats, floats or pressure switches may control the starting and stopping of motors directly if designed and rated for that purpose. Otherwise use a magnetic starter.
6. When a manual-automatic operation is required, use a “Hand-Off-Automatic” selector switch. Connect the selector switch so that only the normal automatic regulating control devices will be bypassed when the switch is in hand position. Connect safety control devices, such as low or high pressure cutouts, high temperature cutouts, and motor overload in the control circuit in both the Hand and Automatic positions of the selector switch.
7. For three-phase motor starters provide:
    a. magnetically operated motor starter
    b. fused control transformer for 120 or 24 volt control
    c. hand-off-automatic selector switch where remote control is used
    d. combination starters are preferred, starters with separate disconnect devices may be acceptable
    e. motor starter disconnecting devices to be manually operated and to be load-break fused or non-fused switches, or circuit breakers
8. Control devices in individual special purpose enclosures should be mounted in groups.
9. Mount control devices in a common enclosure where numbers warrant.
10. Motor starters are to be EEMAC rated. Specify sprinkler proof enclosure as required.
11. Provide lockable disconnecting means within sight and 1 meter from each motor.

13.8.2 MOTOR CONTROL CENTERS

1. Use motor control centers where they provide an economical and practical grouping of controls.
2. Centers should be free-standing structures.
3. Use combination starters.

4. Mount centers on continuous mounting channels on concrete.
5. Wall mount type may be used for groups of up to four starters.
6. Identify each starter by a black laminated plastic nameplate with white letters.
7. Specify control centers as per EEMAC Standard for class and type.
8. Specify sprinkler proof enclosure as required.
9. Specify that splices are not permitted in MCC feeders.

13.8.3 MOTOR EQUIPMENT FEEDERS

1. In open equipment areas consider the advantages of running motor equipment feeders from overhead rather than up through floor slabs. Specify type of support.
2. Splices shall not be permitted in motor equipment feeders.

13.9 LIGHTNING PROTECTION

1. Review the requirement for the installation of lightning protection. If required, provide protection to meet CSA standard B72-1987 and any provincial or local regulation.
2. Provide specific comments on this subject in the design synopsis of the concept design submission.

13.10 CONTROL SYSTEMS

Coordinate provision of building automated control systems with the mechanical division.

13.11 EMERGENCY GENERATOR

1. Provide an emergency power generator as directed or required by code, sized to operate the following:
    a. a number of spaces. See unit spaces for requirements
    b. a limited number of exterior lights for perimeter security (25%)
    c. minimal heating and ventilating equipment
    d. elevators (1 at a time to operate to closest floor)
    e. fire alarms and exit lights, emergency lighting in stairwell, corridors and all other areas where required by code

f. alarm and control systems
g. all electrically operated doors

2. Confirm the load requirements for the standby generator to power the security lighting in addition to the emergency services and fire alarm systems.

13.12 CENTRAL CONTROL CONSOLES

1. The majority of large public buildings are equipped with fire alarms, trouble alarms and voice communication systems terminating at a central control console area which is monitored by security staff on a twenty-four hour basis. Where required, the master elevator control and intrusion alarm system shall also terminate at this area.
2. The central control console is normally located on the ground floor of the building and is readily accessible to any emergency response force responding to an alarm. Where the central control console is co-located with an information desk or security checkpoint, the control console should be planned in such a manner as to prevent overview of access from the public counter.

13.13 POWER QUALITY

1. To ensure good quality power for stand alone and networked computer systems, the building electrical systems design should incorporate features to reduce and eliminate line noise, voltage fluctuation, harmonics, and frequency variations.
2. Electrical distribution of power for computer receptacles shall be:
3. On dedicated branch circuit panelboards used solely for computer power supplies. Do not connect lighting, heating, motors, print M/C's, fax M/C's, etc. to dedicated panels for computers.
4. Regular ground receptacles complete with ground conductor to ground bus of panelboard. Provide bonding ground in panelboard feeder and tie to common ground bus in main electrical room. Specify distinguishing color for receptacle cover plate.

5. Dedicated computer panelboards shall incorporate a line voltage conditioner/surge suppressor installed and connected in parallel with the panelboard feeder at the panel location.
6. Isolate power for computer receptacle panelboards from the rest of the electrical distribution through a separate power-conditioning harmonic mitigating transformer. Specify that the transformer be sized to accommodate harmonic currents.
7. In existing buildings, perform a power quality study on the existing electrical distribution system with respect to power factor, harmonics, line noise (common and normal mode), voltage fluctuations and frequency variations.

13.14 GROUNDING

1. Provide grounding systems within electrical distribution networks to meet the latest edition of the Canadian Electrical Code, CSA C22.1, Section 10 - Grounding and Bonding.
2. Ground conductors shall be copper.
3. Provide grounding riser diagrams on working drawings and distinguish between distribution ground and bonding ground.

13.15 SUSTAINABILITY MANAGEMENT SYSTEM (SMS) PUBLIC INTERFACE

1. Provide an interactive Sustainability Management System (SMS) that uses real-time building systems data to educate users about energy and resource use as well as the building's high performance features. The user interface shall incorporate intuitive animated graphics and user interaction to engage a wide primarily non technical audience via both a local touch-screen display and web browser.
2. SMS System Hardware: A touch-screen display and computer.
3. Web-hosted SMS System Software
4. Provide all software, programming and hardware to provide a seamless BACNET interface to all monitored items including but not limited to Building Automation System, electric meters and water meters. Utilize this interface to provide all data for the public interface.

5. Provide facility electrical metering systems to have the data stream communication compatibility to transfer building electrical load information seamlessly to the BAS system and from the BAS system to the SMS system. The following load profiles require complete independent monitoring: lighting loads, heat loads, process loads, mechanical loads, elevators and others as indicated.

14 LEED REQUIREMENTS

1. Leadership in Energy and Environmental Design (LEED) is a Green Building Rating System administered by the Canada Green Building Council (CaGBC). The system is based on a credit system, where credits are divided amongst five categories; Sustainable Sites, Water Efficiency, Energy Efficiency, Material Selection and Indoor Environmental Quality.
2. The importance and impact of each credit is gauged by the number of points available for achieving the credit, which varies from credit to credit. Both the requirements and potential points for each credit are described in the current LEED reference manual (see below). There are four distinct levels of LEED certification; Certified, Silver, Gold and Platinum. To obtain each level, a building must obtain a number of points as defined in the current LEED reference manual, available through the CaGBC website. For a more detailed introduction to LEED, or information on ordering LEED reference manuals, visit the CaGBC at the following link:
   http://www.cagbc.org/Content/NavigationMenu/Programs/LEED/default.htm
3. LEED is a system which focuses on the design and construction of buildings which promote the health of both the environment and the building's occupants. As environmental stewardship is important to the Government of Newfoundland and Labrador, LEED certification is required for projects in accordance with the Build Better Buildings (BBB) Policy. All members of the project team are required to be active in the pursuit of LEED certification for successful results. Project team will follow the principles and structure of the Integrated Design Approach, which is a key step in a successful LEED certification result.

15 REFERENCE FORMS AND DOCUMENTS

TO BE DEVELOPED