Government of Canada
Existing Building Renovation
Tender Client Review
144202775
Alberta

Specifications

June 8, 2016

Stantec

DIVISION 01 GENERAL REQUIREMENTS

APPENDIX NO. 1 – 144202775.200 St. Paul, Alberta

DIVISION 02 EXISTING CONDITIONS

DIVISION 03 CONCRETE

DIVISION 23 HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)

DIVISION 26 ELECTRICAL

APPENDIX NO. 2 – 144202775.205 Edson, Alberta

DIVISION 02 EXISTING CONDITIONS

DIVISION 03 CONCRETE

DIVISION 04 MASONRY

DIVISION 05 METALS

DIVISION 23 HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)

DIVISION 26 ELECTRICAL

DIVISION 06 WOOD, PLASTICS AND COMPOSITES

DIVISION 07 THERMAL AND MOISTURE PROTECTION

DIVISION 08 OPENINGS

DIVISION 09 FINISHES

DIVISION 11 EQUIPMENT

DIVISION 22 PLUMBING

DIVISION 23 HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)

DIVISION 26 ELECTRICAL

DIVISION 23 HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)

DIVISION 26 ELECTRICAL

END OF SPECIFICATION INDEX

1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 14 00 - Work Restrictions.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

.1 Work of this Contract comprises renovations to existing buildings in Alberta Canada for the Government of Canada; and further identified as Project No. 144202775.

.2 Division 01 applies to the following 4 projects; technical specification sections (Division 02 – Division 26 inclusive) are included as appendices after Division 01:

.1 Appendix No.1 144202755.200 – St. Paul Technical Specifications and Drawings as listed;

A000	COVER
A001	GENERAL NOTES, LEGENDS, CODE MATRIX, SCHEDULES & ABBREVIATIONS
A111	BASEMENT DEMOLITION & CONSTRUCTION PLANS
A151	BASEMENT DEMOLITION & CONSTRUCTION REFLECTED CEILING PLANS
A301	SECTIONS & DETAILS
A401	ENLARGED VIEWS & INTERIOR ELEVATIONS
A601	DETAILS
S001	DESIGN NOTES
S101	FLOOR PLANS, SECTIONS AND DETAILS
M001	MECHANICAL LEGEND, SCHEDULES AND DRAWING LIST
M101	BASEMENT - MECHANICAL DEMOLITION & RENOVATION PLANS
M102	MECHANICAL ROOF PLAN
M201	MECHANICAL SECTIONS
M301	MECHANICAL DETAILS
M302	MECHANICAL DETAILS
E001	ELECTRICAL SYMBOL, LEGEND, NOTES, SCHEDULE AND DRAWING LIST
E100	BASEMENT DEMOLITION FLOOR PLAN - LIGHTING, POWER AND SYSTEM
E200	BASEMENT FLOOR PLAN - LIGHTING, POWER AND SYSTEM
E300	BASEMENT FLOOR PLAN - COLOR LIGHTING MAP
E400	ELECTRICAL DETAILS AND MECHANICAL EQUIPMENT SCHEDULE

.2 Appendix No.2 144202755.205 – Edson Technical Specifications and Drawings as listed;

A000	COVER
A001	GENERAL NOTES, LEGENDS, CODE MATRIX, SCHEDULES AND ABBREVIATIONS
A105	ARCHITECTURAL SITE PLAN
A111	BASEMENT DEMOLITION & CONSTRUCTION PLANS
A151	BASEMENT DEMOLITION & CONSTRUCTION REFLECTED CEILING PLANS
A301	SECTIONS AND DETAILS
A401	ENLARGED PLANS & INTERIOR ELEVATIONS
A601	DETAILS
S001	DESIGN NOTES
S101	FLOOR PLANS, SECTIONS AND DETAILS
M001	MECHANICAL LEGEND, SCHEDULES & DRAWING LIST
M010	MECHANICAL SITE PLAN & ROOF PLAN
M101	BASEMENT - MECHANICAL DEMOLITION & RENOVATION PLANS
M102	MECHANICAL ROOM - MECHANICAL DEMOLITION & RENOVATION PLANS
M201	MECHANICAL SECTIONS
M301	MECHANICAL DETAILS

M302 MECHANICAL DETAILS
E001 ELECTRICAL SYMBOL LEGEND, NOTES, SCHEDULE AND DRAWING LIST
E100 BASEMENT DEMOLITION FLOOR PLAN -LIGHTING, POWER AND SYSTEM
E200 BASEMENT FLOOR PLAN -LIGHTING, POWER AND SYSTEM
E300 BASEMENT FLOOR PLAN - COLOR LIGHTING MAP
E400 ELECTRICAL DETAILS AND MECHANICAL EQUIPMENT SCHEDULE

.3 Appendix No.3 144202775.210 – Red Deer Technical Specifications and Drawings as listed;

A000 COVER
A001 GENERAL NOTES, LEGEND, CODE MATRIX , SCHEDULES AND ABBREVIATIONS
A105 ARCHITECTURAL SITE PLAN
A111 BASEMENT DEMOLITION & CONSTRUCTION PLANS
A151 BASEMENT DEMOLITION & CONSTRUCTION REFLECTED CEILING PLANS
A301 SECTIONS AND DETAILS
A401 ENLARGED PLANS
A402 ENLARGED PLANS
A403 INTERIOR ELEVATIONS
A601 DETAILS
S001 DESIGN NOTES
S101 FLOOR PLAN, SECTIONS AND DETAILS
M001 MECHANICAL LEGEND, SCHEDULES & DRAWING LIST
M010 MECHANICAL SITE PLAN & ROOF PLAN
M101 BASEMENT - MECHANICAL DEMOLITION & RENOVATION PLANS
M201 MECHANICAL SECTIONS
M301 MECHANICAL DETAILS
E001 ELECTRICAL SYMBOL LEGEND, NOTES, SCHEDULE AND DRAWING LIST
E100 BASEMENT DEMOLITION FLOOR PLAN - LIGHTING, POWER AND SYSTEM
E200 BASEMENT FLOOR PLAN - LIGHTING, POWER AND SYSTEM
E300 BASEMENT FLOOR PLAN - COLOR LIGHTING MAP
E400 ELECTRICAL DETAILS AND MECHANICAL EQUIPMENT SCHEDULE

.4 Appendix No.4 144202775.215 – Edmonton Technical Specifications and Drawings as listed;

A000 COVER
A001 GENERAL NOTES, LEGENDS, CODE MATRIX, SCHEDULES & ABBREVIATIONS
A111 SUB-BASEMENT DEMOLITION & CONSTRUCTION PLANS
A151 SUB-BASEMENT DEMOLITION & CONSTRUCTION REFLECTED CEILING PLANS
A301 SECTION & DETAILS
A401 ENLARGED PLANS
A402 INTERIOR ELEVATIONS
A601 MILLWORK DETAILS
S001 DESIGN NOTES
S101 FLOOR PLAN, SECTIONS AND DETAILS
M001 MECHANICAL LEGEND, SCHEDULES & DRAWING LIST
M101 SUB-BASEMENT - MECHANICAL DEMOLITION & RENOVATION PLANS
M102 SUB-BASEMENT - PLUMBING & FIRE PROTECTION PLAN & SECTION
M201 MECHANICAL SECTIONS & PARTIAL PLAN
M301 MECHANICAL DETAILS
M302 MECHANICAL DETAILS
E001 ELECTRICAL SYMBOL LEGEND, NOTES, SCHEDULE AND DRAWING LIST
E100 BASEMENT DEMOLITION FLOOR PLAN - LIGHTING, POWER AND SYSTEM
E200 BASEMENT FLOOR PLAN - LIGHTING, POWER AND SYSTEM
E300 BASEMENT FLOOR PLAN - COLOR LIGHTING MAP
E400 ELECTRICAL DETAILS

1.3 CONTRACT METHOD

.1 Construct Work under single stipulated price contract.

1.4 WORK SEQUENCE

.1 Construct Work in stages to accommodate Owner's continued use of premises during construction.

.2 Co-ordinate Progress Schedule and co-ordinate with Owner Occupancy during construction.

.3 Refer to the drawings for phasing of the Work.

.4 Construct Work in stages to provide for continuous public and staff usage. Do not close off public and staff usage of facilities until use of one stage of Work will provide alternate usage.

.5 Maintain fire access/control.

1.5 CONTRACTOR USE OF PREMISES

.1 Limit use of premises for Work, for storage, and for access, to allow:
.1 Owner occupancy.

.2 Co-ordinate use of premises under direction of Departmental Representative.

.3 Obtain and pay for use of additional storage or work areas needed for operations under this Contract.

.4 Remove or alter existing work to prevent injury or damage to portions of existing work which remain.

.5 Repair or replace portions of existing work which have been altered during construction operations to match existing or adjoining work, as directed by Departmental Representative.

.6 At completion of operations condition of existing work: equal to or better than that which existed before new work started.

1.6 OWNER OCCUPANCY

.1 Owner will occupy premises during entire construction period for execution of normal operations.

.2 Co-operate with Owner in scheduling operations to minimize conflict and to facilitate Owner usage.

1.7 ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING BUILDING

.1 Execute work with least possible interference or disturbance to building operations occupants and normal use of premises. Arrange with Departmental Representative to facilitate execution of work.

.2 Refer also to Section 01 35 16 - Alteration & Renovation Procedures.

1.8 EXISTING SERVICES

.1 Notify, Departmental Representative and utility companies of intended interruption of services and obtain required permission.

.2 Where Work involves breaking into or connecting to existing services, give Departmental Representative 48 hours notice for necessary interruption of mechanical or electrical service throughout course of work. Minimize duration of interruptions. Carry out work at times as directed by governing authorities with minimum disturbance to pedestrian and vehicular traffic and building operations.

.3 Provide alternative routes for pedestrian and vehicular traffic as required.

.4 Establish location and extent of service lines in area of work before starting Work. Notify Departmental Representative of findings.

.5 Submit schedule to and obtain approval from Departmental Representative for any shut-down or closure of active service or facility including power and communications services. Adhere to approved schedule and provide notice to affected parties.

.6 Provide temporary services to maintain critical building systems.

.7 Provide adequate bridging over trenches which cross sidewalks or roads to permit normal traffic.

.8 Where unknown services are encountered, immediately advise Departmental Representative and confirm findings in writing.

.9 Protect, relocate or maintain existing active services. When inactive services are encountered, cap off in manner approved by authorities having jurisdiction.

.10 Record locations of maintained, re-routed and abandoned service lines.

.11 Construct barriers in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.

1.9 DOCUMENTS REQUIRED

.1 Maintain at job site, one copy each document as follows:
- .1 Contract Drawings.
- .2 Specifications.
- .3 Addenda.
- .4 Reviewed Shop Drawings.
- .5 List of Outstanding Shop Drawings.

.6 Change Orders.
.7 Other Modifications to Contract.
.8 Field Test Reports.
.9 Copy of Approved Work Schedule.
.10 Health and Safety Plan and Other Safety Related Documents.
.11 Other documents as specified.

2 Products

2.1 NOT USED

.1 Not used.

3 Execution

3.1 NOT USED

.1 Not used.

END OF SECTION

1 General

1.1 ACCESS AND EGRESS

.1 Design, construct and maintain temporary "access to" and "egress from" work areas, including stairs, runways, ramps or ladders and scaffolding, independent of finished surfaces and in accordance with relevant municipal, provincial and other regulations.

1.2 USE OF SITE AND FACILITIES

.1 Note: the existing facility is in operation 24 hours per day, 7 days per week. Do not interrupt utilities and operations to occupied areas.

.2 Execute work with least possible interference or disturbance to normal use of premises. Make arrangements with Departmental Representative to facilitate work as stated.

.3 Maintain existing services to building and provide for personnel and vehicle access.

.4 Where security is reduced by work provide temporary means to maintain security.

.5 Departmental Representative will assign sanitary facilities for use by Contractor's personnel. Keep facilities clean.

.6 Closures: protect work temporarily until permanent enclosures are completed.

1.3 ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING BUILDING

.1 Execute work with least possible interference or disturbance to building operations and normal use of premises. Arrange with Departmental Representative to facilitate execution of work.

1.4 EXISTING SERVICES

.1 Notify, Departmental Representative and utility companies of intended interruption of services and obtain required permission.

.2 Where Work involves breaking into or connecting to existing services, give Departmental Representative, 48 hours of notice for necessary interruption of mechanical or electrical service throughout course of work. Keep duration of interruptions minimum. Carry out interruptions after normal working hours of occupants, preferably on weekends.

.3 Provide for pedestrian and vehicular traffic.

.4 Construct barriers in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.

.5 Refer also to Section 01 35 16 - Alteration & Renovation Procedures.

1.5 SPECIAL REQUIREMENTS

.1 Paint and carpet public or Departmental Representative occupied areas Monday to Friday from 18:00 to 07:00 hours only and on Saturdays, Sundays, and statutory holidays.

.2 Carry out noise generating Work Monday to Friday from 18:00 to 07:00 hours and on Saturdays, Sundays, and statutory holidays.

.3 Submit schedule in accordance with Section 01 32 16.06 - Construction Progress Schedule - Critical Path Method (CPM).

.4 Ensure Contractor's personnel employed on site become familiar with and obey regulations including safety, fire, traffic and security regulations.

.5 Keep within limits of work and avenues of ingress and egress.

.6 Ingress and egress of Contractor vehicles at site is limited to access locations as directed by the Departmental Representative.

.7 Deliver materials outside of peak traffic hours 17:00 to 07:00 and 13:00 to 15:00 unless otherwise approved by Departmental Representative.

1.6 SECURITY

.1 Where security has been reduced by Work of Contract, provide temporary means to maintain security.

.2 Security clearances:

- .1 The successful Contractor Team must provide personal data including the full name, date of birth, present address and other data as requested by the Departmental Representative, for each person working on this project, if requested. This information will be used for security clearance purposes. Fingerprinting may be required. This information must be provided within three (3) days of request.
- .2 Ensure that all persons who will have access to Departmental Representative’s protected information, hold a valid Departmental Representative’s reliability status secure clearance issued by Departmental Representative’s Security.
- .3 The Prime Contractor's Project Manager and Site Supervisor will be required to/ Personal requiring access to the Detachment that are operational or otherwise so identified at time of construction may be required to:
  - .1 Complete and submit all security clearance forms.
  - .2 Attain and provide copies of the following documents
    - .1 drivers licence.
    - .2 birth certificate.
    - .3 2 passport pictures.
    - .4 2 sets of fingerprints.
  - .3 If born outside of Canada, attain and provide copies of one of the following:
    - .1 Permanent Residence Card for Canada.

.2 Canada Citizenship Card.
.3 immigration papers (certificate of landing).
.4 valid work permit for Canada

.4 Participate in a Security/ Reliability Interview.
.5 Sign disclosure documents for Departmental Representative's protected material.

.4 All other personal requiring access to the site will be to:
.1 Complete and submit all required security clearance forms
.2 Attain and provide a copy of their drivers licence or passport.

.3 Security escort:
.1 Personnel employed on this project must be escorted when executing work in non-public areas during normal working hours. Personnel must be escorted in all areas after normal working hours.
.2 Submit an escort request to Departmental Representative at least 14 days before service is needed. For requests submitted within time noted above, costs of security escort will be paid for by Departmental Representative. Cost incurred by late request will be Contractor's responsibility.
.3 Any escort request may be cancelled free of charge if notification of cancellation is given at least 4 hours before scheduled time of escort. Cost incurred by late request will be Contractor's responsibility.
.4 Calculation of costs will be based on average hourly rate of security officer for minimum of 8 hours per day for late service request and of 4 hours for late cancellations.

1.7 BUILDING SMOKING ENVIRONMENT

.1 Comply with smoking restrictions. Smoking is not permitted.

2 Products

2.1 NOT USED

.1 Not Used.

3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

1 General

1.1 CASH ALLOWANCES

.1 Include in Contract Price specified cash allowances.

.2 Cash allowances, unless otherwise specified, cover net cost to Contractor of services, products, and equipment and other authorized expenses incurred in performing Work.

.3 Contract Price, and not cash allowance, includes Contractor's Contractor's overhead and profit in connection with such cash allowance.

.4 Contract Price will be adjusted by written order to provide for excess or deficit to each cash allowance.

.5 Where costs under a cash allowance exceed amount of allowance, Contractor will be compensated for excess incurred and substantiated plus allowance for overhead and profit as set out in Contract Documents.

.6 Include progress payments on accounts of work authorized under cash allowances in monthly certificate for payment.

.7 Prepare schedule jointly with Departmental Representative and Contractor to show when items called for under cash allowances must be authorized by Departmental Representative for ordering purposes so that progress of Work will not be delayed.

.8 Amount of each allowance, for Work specified in respective specification Sections is as follows:

.1 Section 01 29 83 - Payment Procedures for Testing Laboratory Services, include allowance of $ 50,000.00 for payment for independent testing performed by certified testing agencies, as specified in the individual specification Sections.

2 Products

2.1 NOT USED

.1 Not Used.

3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

1 General

1.1 RELATED REQUIREMENTS

.1 Particular requirements for inspection and testing to be carried out by testing laboratory designated by Departmental Representative are specified under individual specification sections.

1.2 APPOINTMENT AND PAYMENT

.1 Departmental Representative will appoint for services of testing laboratory except follows:
- .1 Inspection and testing required by laws, ordinances, rules, regulations or orders of public authorities.
- .2 Inspection and testing performed exclusively for Contractor's convenience.
- .3 Testing, adjustment and balancing of mechanical and electrical equipment and systems.
- .4 Mill tests and certificates of compliance.
- .5 Tests specified to be carried out by Contractor under supervision of Departmental Representative.

.2 The Contractor will pay all costs for testing out of the Cash Allowance specified in Section 01 21 00. Refer to the individual specification Sections for testing requirements.

.3 Where tests or inspections by designated testing laboratory reveal Work not in accordance with contract requirements, pay costs (not out of the Cash Allowance) for additional tests or inspections as required by Departmental Representative to verify acceptability of corrected work.

1.3 CONTRACTOR'S RESPONSIBILITIES

.1 Provide labour, equipment and facilities to:
- .1 Pay all costs for testing out of the Cash Allowance specified in Section 01 21 00.
- .2 Provide access to Work for inspection and testing.
- .3 Facilitate inspections and tests.
- .4 Make good Work disturbed by inspection and test.
- .5 Provide storage on site for laboratory's exclusive use to store equipment and cure test samples.

.2 Notify Departmental Representative 48 hours minimum sufficiently in advance of operations to allow for assignment of laboratory personnel and scheduling of test.

.3 Where materials are specified to be tested, deliver representative samples in required quantity to testing laboratory.

.4 Pay costs (not out of Cash Allowance) for uncovering and making good Work that is covered before required inspection or testing is completed and approved by Departmental Representative.

2 Products

2.1 NOT USED

.1 Not Used.

3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

1 General

1.1 ADMINISTRATIVE

.1 Schedule and administer project meetings throughout the progress of the work at the call of Departmental Representative.

.2 Prepare agenda for meetings.

.3 Distribute written notice of each meeting four days in advance of meeting date to Departmental Representative.

.4 Provide physical space and make arrangements for meetings.

.5 Preside at meetings.

.6 Record the meeting minutes. Include significant proceedings and decisions. Identify actions by parties.

.7 Reproduce and distribute copies of minutes within three days after meetings and transmit to meeting participants and affected parties not in attendance and Departmental Representative.

.8 Representative of Contractor, Subcontractor and suppliers attending meetings will be qualified and authorized to act on behalf of party each represents.

1.2 PRECONSTRUCTION MEETING

.1 Within 15 days after award of Contract, request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.

.2 Senior representatives of Departmental Representative, Contractor, major Subcontractors, field inspectors and supervisors will be in attendance.

.3 Establish time and location of meeting and notify parties concerned minimum 5 days before meeting.

.4 Incorporate mutually agreed variations to Contract Documents into Agreement, prior to signing.

.5 Agenda to include:
.1 Appointment of official representative of participants in the Work.
.2 Schedule of Work: in accordance with Section 01 32 16.06 - Construction Progress Schedule - Critical Path Method (CPM).
.3 Schedule of submission of shop drawings, samples, colour chips. Submit submittals in accordance with Section 01 33 00 - Submittal Procedures.
.4 Requirements for temporary facilities, site sign, offices, storage sheds, utilities, fences in accordance with Section 01 52 00 - Construction Facilities.

.5 Delivery schedule of specified equipment.
.6 Site security in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.
.7 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements.
.8 Owner provided products.
.9 Record drawings in accordance with Section 01 33 00 - Submittal Procedures.
.10 Maintenance manuals in accordance with Section 01 78 00 - Closeout Submittals.
.11 Take-over procedures, acceptance, warranties in accordance with Section 01 78 00 - Closeout Submittals.
.12 Monthly progress claims, administrative procedures, photographs, hold backs.
.13 Appointment of inspection and testing agencies or firms.
.14 Insurances, transcript of policies.

1.3 PROGRESS MEETINGS

.1 During course of Work and four (4) weeks prior to project completion, schedule progress meetings monthly.

.2 Contractor, major Subcontractors involved in Work Departmental Representative are to be in attendance.

.3 Notify parties minimum five (5) days prior to meetings.

.4 Record minutes of meetings and circulate to attending parties and affected parties not in attendance within three (3) days after meeting.

.5 Agenda to include the following:
.1 Review, approval of minutes of previous meeting.
.2 Review of Work progress since previous meeting.
.3 Field observations, problems, conflicts.
.4 Problems which impede construction schedule.
.5 Review of off-site fabrication delivery schedules.
.6 Corrective measures and procedures to regain projected schedule.
.7 Revision to construction schedule.
.8 Progress schedule, during succeeding work period.
.9 Review submittal schedules: expedite as required.
.10 Maintenance of quality standards.
.11 Review proposed changes for affect on construction schedule and on completion date.
.12 Other business.

2 Products

2.1 NOT USED

.1 Not Used.

3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

1 General

1.1 REFERENCES

.1 Definitions:

.1 Activity: element of Work performed during course of Project. Activity normally has expected duration, and expected cost and expected resource requirements. Activities can be subdivided into tasks.

.2 Bar Chart (Gantt chart): graphic display of schedule-related information. In typical bar chart, activities or other Project elements are listed down left side of chart, dates are shown across top, and activity durations are shown as date-placed horizontal bars.

.3 Baseline: original approved plan (for Project, work package, or activity), plus or minus approved scope changes.

.4 Cash Flow: projection of progress payment requests based on cash loaded construction schedule.

.5 Completion Milestones: they are firstly Interim Certificate and secondly Final Certificate.

.6 Constraint: applicable restriction or limitation, either internal or external to project, that will affect performance of Project. Factors that affect activities can be scheduled.

.7 Control: process of comparing actual performance with planned performance, analyzing variances, evaluating possible alternatives, and taking appropriate corrective action as needed.

.8 Critical Activity: any activity on a critical path.

.1 Most commonly determined by using critical path method.

.9 Critical Path: sequence of activities that determines duration of Project. Generally, it is the longest path through Project.

.1 Usually defined as those activities with float less than or equal to specified value, often zero.

.10 Critical Path Method (CPM): network analysis technique used to determine the amount of scheduling flexibility (amount of float) on various logical network paths in Project schedule network, and to determine the minimum total Project duration.

.11 Data Date: date through which project status and progress were last determined and reported for analyses, such as scheduling and performance measurements.

.12 Duration: total number of work periods (not including holidays or other non-working periods) required to complete activity or other Project element.

.1 Usually expressed as workdays or work weeks.

.13 Early Finish Date: in critical path method, earliest possible point in time on which uncompleted portions of activity (or Project) can finish, based on network logic and schedule constraints.

.1 Early finish dates can change as Project progresses and changes are made to Project plan.

.14 Early Start Date: in critical path method, earliest possible point in time on which uncompleted portions of activity (or Project) can start, based on network logic and schedule constraints.
  .1 Early start dates can change as Project progresses and changes are made to Project Plan.
.15 Finish Date: point in time associated with activity's completion.
  .1 Usually qualified by one of following: actual, planned, estimated, scheduled, early, late, baseline, target, or current.
.16 Float: amount of time that activity may be delayed from its early start without delaying Project finish date.
  .1 This resource is available to both Departmental Representative and Contractor.
.17 Impact Analysis: schedule analysis technique that adds a modeled delay to an accepted construction schedule to determined possible outcome of that delay on project completion.
.18 Lag: modification of logical relationship that directs delay in successor activity.
.19 Late Finish Date (LF): in critical path method, latest possible point in time that activity may be completed without delaying specified milestone (usually Project finish date).
.20 Late Start Date (LS): in critical path method, latest possible point in time that activity may begin without delaying specified milestone (usually Project finish date).
.21 Lead: modification of logical relationship that allows acceleration of successor task.
.22 Logic Diagram: see Project network diagram.
.23 Master Schedule: summary-level schedule that identifies major deliverable; work breakdowns structure and key milestones.
.24 Milestone: significant point or event in Project, usually completion of major deliverable.
.25 Monitoring: capture, analysis, and reporting of Project performance, usually as compared to plan.
.26 Non-Critical Activities: activities which when delayed, do not affect specified Contract duration.
.27 Project Control System: fully computerized system utilizing commercially available software packages.
.28 Project Network Diagram: schematic display of logical relationships of Project activities.
  .1 Always drawn from left to right to reflect Project chronology.
.29 Project Plan: formal, approved document used to guide both Project execution and Project control.
  .1 Primary uses of Project plan are to document planning assumptions and decisions, facilitate communication among stakeholders, and document approved scope, cost, and schedule baselines.
  .2 Project plan may be summary or detailed.
.30 Project Planning: development and maintenance of Project Plan.
.31 Project Planning, Monitoring and Control System: overall system operated to enable monitoring of Project Work in relation to established milestones.
.32 Project Schedule: planned dates for performing activities and planned dates for meeting milestones.

.33 Quantified days duration: working days based on 5 day work week, discounting statutory holidays.

.34 Risk: uncertain event or condition that, if it occurs, has positive or negative effect on Project's objectives.

.35 Start Date: point in time associated with activity's start, usually qualified by one of following: actual, planned, estimated, scheduled, early, late, target, baseline, or current.

.36 Work Breakdown Structure (WBS): deliverable-oriented hierarchical decomposition of Work to be executed by contractor to accomplish project objectives and create required deliverables. It organizes and defines total scope of Project. Each descending level represents an increasingly detailed definition of Project Work. WBS is decomposed into Work packages.

.2 Reference Standards:

.1 Project Management Institute (PMI Standards)

.1 A Guide to the Project Management Body of Knowledge (PMBOK Guide) - Fourth Edition.

.2 Practice Standard for Scheduling - 2011.

1.2 ADMINISTRATIVE REQUIREMENTS

.1 Project Meeting:

.1 Meet with Departmental Representative within five (5) working days of Award of Contract date, to establish Work requirements and approach to project construction operations.

.2 Participate in regular project progress meetings with Departmental Representative specifically intended to discuss update of detailed schedule and contract changes.

.2 Scheduling:

.1 Planning: ensure that planning process is iterative and results in generally top-down processing with more detail being developed as planning progresses, and decisions concerning options and alternatives are made.

.2 Ensure project schedule efficiencies through monitoring of Project in detail to ensure integrity of Critical Path, by comparing actual completions of individual activities with their scheduled completions, and review progress of activities that has started but are not yet completed..

.3 Monitor sufficiently often so that causes of delays can immediately be identified and removed.

.3 Project monitoring and reporting:

.1 Keep team aware of changes to schedule, and possible consequences as project progresses.

.2 Use narrative reports to provide advice on seriousness of difficulties and measures to overcome them.

.3 Begin narrative reporting with statement on general status of Project followed by summarization of delays, potential problems, corrective measures and Project status criticality.

.4 Critical Path Method (CPM) Requirements:

.1 Ensure Master Plan and Detail Schedule are practical and remain within specified Contract duration.

.2 Revise Master Schedule and Detail Schedule deemed impractical by Departmental Representative and resubmit for approval.

.3 Change to Contract Duration:

.1 Acceptance of Master Schedule and Detail Schedule showing scheduled Contract duration shorter than specified Contract duration does not constitute change to Contract.

.2 Duration of Contract may only be changed through bilateral Agreement.

.4 Consider Master Schedule and Detail Schedule deemed practical by Departmental Representative, showing Work completed in less than specified Contract duration, to have float.

.5 First Milestone on Master Schedule and Detail Schedule will identify start Milestone with an "ES" constraint date equal to Award of Contract date.

.6 Calculate dates for completion milestones from Plan and Schedule using specified time periods for Contract.

.7 Interim Certificate with "LF" constraint equal to calculated date.

.8 Calculations on updates to be such that if early finish of Interim Certificate falls later than specified Contract duration then float calculation to reflect negative float.

.9 Delays to non-critical activities, those with float may not be basis for time extension.

.10 Do not use float suppression techniques such as software constraints, preferential sequencing, special lead/lag logic restraints, extended activity times and imposed dates other than required by Contract.

.11 Allow for and show Master Plan and Detail Schedule adverse weather conditions normally anticipated.

.1 Specified Contract duration has been predicated assuming normal amount of adverse weather conditions.

.12 Provide necessary crews and manpower to meet schedule requirements for performing Work within specified Contract duration.

.1 Simultaneous use of multiple crews on multiple fronts on multiple critical paths may be required.

.13 Arrange participation on and off site of subcontractors and suppliers, as required by Departmental Representative, for purpose of network planning, scheduling, updating and progress monitoring.

.1 Approvals by Departmental Representative of original networks and revisions do not relieve Contractor from duties and responsibilities required by Contract.

.14 Ensure that it is understood that Award of Contract or time of beginning, rate of progress, Interim Certificate and Final Certificate as defined times of completion are of essence of this contract.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit to Departmental Representative Project Control System for planning, scheduling, monitoring and reporting of project progress.

.3 Submit Project Control System to Departmental Representative for approval.
- .1 Failure to comply with each required submission, may result in progress payment being withheld in accordance with Federal Government's GC 5 Terms of Payment.

.4 Include costs for execution, preparation and reproduction of schedule submittals in bid documents.

.5 Submit letter ensuring that schedule has been prepared in co-ordination with major sub-contractors.

.6 Refer to article "PROGRESS MONITORING AND REPORTING" of this specification Section for frequency of Project control system submittals.

.7 Submit impact analysis of schedule for changes that result in extension of contract duration.
- .1 Include draft schedule update and report as outlined in article "PROGRESS MONITORING AND REPORTING".

.8 Submit Project planning, monitoring and control system data as part of initial schedule submission and monthly status reporting as required by Departmental Representative in following form.
- .1 CD files in original scheduling software containing schedule and cash flow information, labelled with data date, specific update, and person responsible for update.
- .2 Master Schedule Bar Chart.
- .3 Construction Detail schedule Bar Chart.
- .4 Listing of project activities including milestones and logical connectors, networks (sub-networks) from Project start to end. Sort activities by activity identification number and accompany with descriptions. List early and late start and finish dates together with durations, codes and float.
- .5 Criticality report listing activities and milestones with up to 5 days total float used as first sort for ready identification of critical paths through entire project. List early and late starts and finishes dates, together with durations, codes and float for critical activities.
- .6 Progress report in early start sequence, listing for each trade, activities due to start, underway, or finished within 2 months from monthly update date. List activity identification number, description and duration. Provide columns for entry of actual start and finish dates, duration remaining and remarks concerning action required.

1.4 QUALITY ASSURANCE

.1 Use experienced personnel, fully qualified in planning and scheduling to provide services from start of construction to Final Certificate, including Commissioning.

1.5 WORK BREAKDOWN STRUCTURE (WBS)

.1 Prepare construction Work Breakdown Structure (WBS) within five (5) working days of Award of Contract date.
  .1 Develop WBS through at least five levels: project, stage, element, sub-element and work package.

1.6 PROJECT MILESTONES

.1 Project milestones form targets for both Master Schedule and Detail Schedule of CPM construction network system. Indicate the project milestone dates for the following items:
  .1 Excavation
  .2 Substructure completed.
  .3 Superstructure completed.
  .4 Building closed-in and weatherproofed.
  .5 Interior finishing and fitting, mechanical and electrical work.
  .6 Interim Certificate (substantial completion).
  .7 Outside work completed.
  .8 Final Certificate completion.

1.7 MASTER SCHEDULE

.1 Structure and base CPM construction networks system on WBS coding in order to ensure consistency throughout Project.

.2 Prepare comprehensive construction Master Schedule (CPM logic diagram) and dependent Cash Flow Projection within five (5) working days of finalizing Agreement to confirm validity or alternates of identified milestones.
  .1 Master Schedule will be used as baseline.
    .1 Revise baseline as conditions dictate and as required by Departmental Representative.
    .2 Departmental Representative as Project progresses will review and return revised baseline within ten (10) work days.

.3 Reconcile revisions to Master Schedule and Cash Flow Projections with previous baseline to provide continuous audit trail.

.4 Initial and subsequent Master Schedule will include:
  .1 CD containing schedule and cash flow information, clearly labelled with data date, specific update, and person responsible for update.
  .2 Bar chart identifying coding, activity durations, early/late and start/finish dates, total float, completion as percentile, current status and budget amounts.
  .3 Network diagram showing coding, activity sequencing (logic), total float, early/late dates, current status and durations.
  .4 Actual/projected monthly cash flow: expressed monthly and shown in both graphical and numerical form.

1.8 DETAIL SCHEDULE

.1 Provide detailed project schedule (CPM logic diagram) within twenty (20) working days of Award of Contract date showing activity sequencing, interdependencies and duration estimates. Include listed activities as follows:
- .1 Shop drawings.
- .2 Samples.
- .3 Approvals.
- .4 Procurement.
- .5 Construction.
- .6 Installation.
- .7 Site works.
- .8 Testing.
- .9 Commissioning and acceptance.

.2 Detail CPM schedule to cover in detail minimum period of six (6) months beginning from Award of Contract date with each activity duration indicated in days.
- .1 Show remaining activities for CPM construction network system up to Final Certificate and develop complete detail as project progresses.
- .2 Detail activities completely and comprehensively throughout duration of project.

.3 Relate Detail Schedule activities to basic activities and milestones developed and approved in Master Schedule.

.4 Clearly show sequence and interdependence of construction activities and indicate:
- .1 Start and completion of all items of Work, their major components, and interim milestone completion dates.
- .2 Activities for procurement, delivery, installation and completion of each major piece of equipment, materials and other supplies, including:
  - .1 Time for submittals, resubmittals and review.
  - .2 Time for fabrication and delivery of manufactured products for Work.
  - .3 Interdependence of procurement and construction activities.
- .3 Include sufficient detail to assure adequate planning and execution of Work. Activities should generally range in duration from 3 to 15 workdays each.

.5 Provide level of detail for project activities such that sequence and interdependency of Contract tasks are demonstrated and allow co-ordination and control of project activities. Show continuous flow from left to right.

.6 Ensure activities with no float are calculated and clearly indicated on logical CPM construction network system as being, whenever possible, continuous series of activities throughout length of Project to form "Critical Path". Increased number of critical activities is seen as indication of increased risk.

.7 Insert Change Orders in appropriate and logical location of Detail Schedule. After analysis, clearly state and report to Departmental Representative for review effects created by insertion of new Change Order.

1.9 REVIEW OF THE CONSTRUCTION DETAIL SCHEDULE

.1 Allow 5 work days for review by Departmental Representative of proposed construction Detail Schedule.

.2 Upon receipt of reviewed Detail Schedule make necessary revisions and resubmit to Departmental Representative for review within 5 work days.

.3 Promptly provide additional information to validate practicability of Detail Schedule as required by Departmental Representative.

.4 Submittal of Detail Schedule indicates that it meets Contract requirements and will be executed generally in sequence.

1.10 COMPLIANCE WITH DETAIL SCHEDULE

.1 Comply with reviewed Detail Schedule.

.2 Proceed with significant changes and deviations from scheduled sequence of activities that cause delay, only after written receipt of approval by Departmental Representative.

.3 Identify activities that are behind schedule and causing delay. Provide measures to regain slippage.
- .1 Corrective measures may include:
  - .1 Increase of personnel on site for effected activities or work package.
  - .2 Increase in materials and equipment.
  - .3 Overtime work.

.4 Submit to Departmental Representative, justification, project schedule data and supporting evidence for approval of extension to Contract completion date or interim milestone date when required. Include as part of supporting evidence:
- .1 Written submission of proof of delay based on revised activity logic, duration and costs, showing time impact analysis illustrating influence of each change or delay relative to approved contract schedule.
- .2 Prepared schedule indicating how change will be incorporated into the overall logic diagram. Demonstrate perceived impact based on date of occurrence of change and include status of construction at that time.
- .3 Other supporting evidence requested by Departmental Representative.
- .4 Do not assume approval of Contract extension prior to receipt of written approval from Departmental Representative.

.5 In event of Contract extension, display in Detail Schedule that scheduled float time available for work involved has been used in full without jeopardizing earned float.
- .1 Departmental Representative will determine and advise Contractor number of allowable days for extension of Contract based on project schedule updates for period in question, and other factual information.
- .2 Construction delays affecting project schedule will not constitute justification for extension of contract completion date.

1.11 PROGRESS MONITORING AND REPORTING

.1 On ongoing basis, Detail Schedule on job site must show "Progress to Date". Arrange participation on and off site of subcontractors and suppliers, as, and when necessary, for purpose of network planning, scheduling, updating and progress monitoring. Inspect

Work with Departmental Representative at least once monthly to establish progress on each current activity shown on applicable networks.

.2 Update and reissue project Work Breakdown Structure and relevant coding structures as project develops and changes.

.3 Perform Detail Schedule update monthly with status dated (Data Date) on last working day of month. Update to reflect activities completed to date, activities in progress, logic and duration changes.

.4 Do not automatically update actual start and finish dates by using default mechanisms found in project management software.

.5 Submit to Departmental Representative copies of updated Detail Schedule.

.6 Requirements for monthly progress monitoring and reporting are basis for progress payment request.

.7 Submit monthly written report based on Detail Schedule, showing Work to date performed, comparing Work progress to planned, and presenting current forecasts. Report must summarize progress, defining problem areas and anticipated delays with respect to Work schedule, and critical paths. Explain alternatives for possible schedule recovery to mitigate any potential delay. Include in report:
- .1 Description of progress made.
- .2 Pending items and status of: permits, shop drawings, change orders, possible time extensions.
- .3 Status of Contract completion date and milestones.
- .4 Current and anticipated problem areas, potential delays and corrective measures.
- .5 Review of progress and status of Critical Path activities.

2 Products

2.1 NOT USED

.1 Not used.

3 Execution

3.1 NOT USED

.1 Not used.

END OF SECTION

1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 33 50 - Delegated Design Submittals.

1.2 ADMINISTRATIVE

.1 Submit to Departmental Representative submittals listed for review. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.

.2 Do not proceed with Work affected by submittal until review is complete.

.3 Present shop drawings, product data, samples and mock-ups in SI Metric units.

.4 Where items or information is not produced in SI Metric units converted values are acceptable.

.5 Review submittals prior to submission to Departmental Representative. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and co-ordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and considered rejected.

.6 Notify Departmental Representative, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.

.7 Verify field measurements and affected adjacent Work are co-ordinated.

.8 Contractor's responsibility for errors and omissions in submission is not relieved by Departmental Representative's review of submittals.

.9 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Departmental Representative review.

.10 Keep one reviewed copy of each submission on site.

1.3 SHOP DRAWINGS AND PRODUCT DATA

.1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.

.2 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Alberta. Refer to Section 01 33 50 - Delegated Design Submittals.

.3 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been co-ordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.

.4 Allow fourteen (14) days for Departmental Representative's review of each submission.

.5 Adjustments made on shop drawings by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.

.6 Make changes in shop drawings as Departmental Representative may require, consistent with Contract Documents. When resubmitting, notify Departmental Representative in writing of revisions other than those requested.

.7 Accompany submissions with transmittal letter, in duplicate, containing:
- .1 Date.
- .2 Project title and number.
- .3 Contractor's name and address.
- .4 Identification and quantity of each shop drawing, product data and sample.
- .5 Other pertinent data.

.8 Submissions include:
- .1 Date and revision dates.
- .2 Project title and number.
- .3 Name and address of:
  - .1 Subcontractor.
  - .2 Supplier.
  - .3 Manufacturer.
- .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
- .5 Details of appropriate portions of Work as applicable:
  - .1 Fabrication.
  - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
  - .3 Setting or erection details.
  - .4 Capacities.
  - .5 Performance characteristics.
  - .6 Standards.
  - .7 Operating weight.
  - .8 Wiring diagrams.
  - .9 Single line and schematic diagrams.
  - .10 Relationship to adjacent work.

.9 After Departmental Representative's review, distribute copies.

.10 Submit electronic copy of shop drawings for each requirement requested in specification Sections and as Departmental Representative may reasonably request.

.11 Submit electronic copies of product data sheets or brochures for requirements requested in specification Sections and as requested by Departmental Representative where shop drawings will not be prepared due to standardized manufacture of product.

.12 Submit electronic copies of test reports for requirements requested in specification Sections and as requested by Departmental Representative.
- .1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.
- .2 Testing must have been within 3 years of date of contract award for project.

.13 Submit electronic copies of certificates for requirements requested in specification Sections and as requested by Departmental Representative.
- .1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.
- .2 Certificates must be dated after award of project contract complete with project name.

.14 Submit electronic copies of manufacturers instructions for requirements requested in specification Sections and as requested by Departmental Representative.
- .1 Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.

.15 Submit electronic copies of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Departmental Representative.

.16 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.

.17 Submit electronic copies and two (2) hard copies of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Departmental Representative.

.18 Delete information not applicable to project.

.19 Supplement standard information to provide details applicable to project.

.20 If upon review by Departmental Representative, no errors or omissions are discovered or if only minor corrections are made, copies will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.

.21 The review of shop drawings by Departmental Representative is for sole purpose of ascertaining conformance with general concept.

.1 This review shall not mean that the Departmental Representative approves detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting requirements of construction and Contract Documents.

.2 Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of sub-trades.

1.4 SAMPLES

.1 Submit for review samples in duplicate as requested in respective specification Sections. Label samples with origin and intended use.

.2 Deliver samples prepaid to Departmental Representative's business address.

.3 Notify Departmental Representative in writing, at time of submission of deviations in samples from requirements of Contract Documents.

.4 Where colour, pattern or texture is criterion, submit full range of samples.

.5 Adjustments made on samples by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.

.6 Make changes in samples which Departmental Representative may require, consistent with Contract Documents.

.7 Reviewed and accepted samples will become standard of workmanship and material against which installed Work will be verified.

1.5 MOCK-UPS

.1 Erect mock-ups in accordance with 01 45 00 - Quality Control.

1.6 PHOTOGRAPHIC DOCUMENTATION

.1 Submit electronic copy of colour digital photography in .jpg format, fine resolution monthly with progress statement as directed by Departmental Representative.

.2 Project identification: name and number of project and date of exposure indicated.

.3 Number of viewpoints: 24 interior and exterior locations.
.1 Viewpoints and their location as determined by Departmental Representative.

.4 Frequency of photographic documentation: monthly as directed by Departmental Representative.

1.7 CERTIFICATES AND TRANSCRIPTS

.1 Immediately after award of Contract, submit Workers' Compensation Board status.

.2 Submit transcription of insurance immediately after award of Contract.

2 Products

2.1 NOT USED

.1 Not Used.

3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 - Submittal Requirements.

1.2 CONTRACTOR=S DESIGN REQUIREMENTS

.1 For all Sections of Work which require the Contractor and Subcontractors to provide professional engineering services by a Professional Engineer registered in the Province of Alberta, have the Contractor=s and Subcontractor=s Registered Professional Engineer design and engineer components for the project which the Contractor=s and Subcontractor=s Registered Professional Engineer is responsible for, and sign and seal all shop drawings and supporting documentation, to the satisfaction of the Consultant and according to requirements of the authority having jurisdiction.

.2 The Contractor=s and Subcontractor=s Engineer, must be a Professional Engineer registered in the Province of Alberta and must be fully qualified and experienced in the design of items which he/she is designing and to be responsible for the design of such components and systems, and to prepare, seal, and sign all shop drawings and to perform field reviews.

.3 The Contractor=s and Subcontractor's Professional Engineer responsible for this work is to inspect the fabrication and erection of all items in accordance with APEGA "Responsibilities for Engineering Services on Building Projects" - dated March 2009.

.4 Submit a signed and sealed Letter of Commitment in accordance with format in Appendix A attached to the end of this Section prior to starting Work requiring design and seal of a Professional Engineer registered in the province of Alberta. Note: where signed and sealed shop drawings are requested in the specifications, this letter is required in addition to the shop drawings.

.5 At completion of the Work, have each of the Contractor=s and Subcontractor=s Registered Professional Engineers provide a letter confirming that:

- .1 Relevant civil, structural, architectural, mechanical, electrical and other components are fabricated and erected in conformance with their design.
- .2 Relevant components are capable of supporting all the loads or capable of performance specified or indicated on the reviewed shop drawings.
- .3 All changes to the Contract Documents have been reviewed and are acceptable.
- .4 Relevant components have been designed, fabricated and installed to substantially comply with the applicable requirements of the Alberta Building Code 2014.
- .5 Relevant components have been designed and installed to conform with the seismic restraint requirements of the Alberta Building Code 2014.
- .6 The fabrication and installation of such components has been reviewed and accepted by the Contractor=s and Subcontractor=s Registered Professional Engineers.
- .7 Relevant components are fabricated and erected in accordance with the reviewed shop drawings.

.8 Submit a signed and sealed Letter of Compliance on company letterhead addressed to Consultant in accordance with format in Appendix B attached to the end of this

Section on completion of Work requiring design and seal of a Professional Engineer registered in the province of Alberta.

1.3 SEISMIC DESIGN AND REQUIREMENTS

.1 Design components of the Building, as applicable, and comply with all Regulations and requirements of any authority having jurisdiction and Part 4 of the Alberta Building Code 2014.

.2 Provide seismic restraint to new and relocated fixtures, equipment, and devices to the satisfaction of the authority having jurisdiction.

.3 Provide vibrating equipment with seismically designed vibration isolation. Only non vibrating equipment is permitted to be secured to the structure. Provide structural connection by means of direct connection to the structure by bolting, using rigid seismic restraints or taut cable restraints. Locate connection to the structure where capable of withstanding the forces applied.

.4 Describe the proposed connections and general design of products, equipment and systems in shop drawing format with identification and location of forces imposed on the structure. Have the shop drawings signed and sealed by a professional engineer registered in the Province of Alberta and have the appropriate understanding of the issues at hand.

.5 Submit shop drawings as specified in this Section.

2 Products

2.1 NOT USED

.1 Not Used.

3 Execution

3.1 NOT USED

.1 Not Used.

APPENDIX AA@

Model Schedule S-B
ASSURANCE OF PROFESSIONAL DESIGN AND COMMITMENT FOR FIELD REVIEW
by
Supporting Registered Professional

Note: 1. The applicable Code is the Alberta Building Code 2014 and National Building Code of Canada 2010, hereinafter referred to as the Code.
2. In this letter the words in italics have the same meaning as in the Code.

To: (RPR) _____ Date: _____

_____

_____

_____

Re: _____
Name of Project (Print)

_____
Address of Project (Print)

This is to advise that the undersigned is the *Registered Professional* retained by _____ to design engineering/architectural components for the captioned project in accordance with the Code.

The undersigned hereby gives assurance that the design and supporting documents prepared by this *Registered Professional* in support of the project for _____

_____
(Insert here the area of responsibility, e.g. seismic restraint, fire resistance, acoustic properties, structural capacity)
substantially comply with the Code and other applicable enactments respecting safety except for construction safety aspects.
These engineering/architectural components are addressed in the report/drawings prepared by me, or under my direct supervision, which bear my Professional Seal and signature.
(With respect to field reviews, initial or cross out the following statement as applicable)

____ The undersigned hereby undertakes to be responsible for field reviews of the above referenced components during construction.

Project Address

I confirm I have liaised as required with the appropriate *Registered Professionals* for the purposes of my services.

I hereby give my assurance that I am a registered professional as defined in the Code.

Name (Print)

Signed

Date

Address (Print)

Phone

(PROFESSIONAL SEAL)

Email

(If the *Registered Professional* is a member of a firm, complete the following.)

I am a member of the firm

(Print name of firm)

and I sign this letter on behalf of the firm.

Note: The above letter must be signed by a *Registered Professional*. The Code defines a *Registered Professional* to mean:

(a) a person who is registered or licensed to practise as an architect under the *Architects Act*, or

(b) a person who is registered or licensed to practise as a professional engineer under the *Engineering and Geoscience Professions Act.*

APPENDIX AB@

Model Schedule S-C
ASSURANCE OF PROFESSIONAL FIELD REVIEW AND COMPLIANCE
by
Supporting Registered Professional

Note: 1. The applicable Code is the Alberta Building Code 2014 and National Building Code of Canada 2010, hereinafter referred to as the Code.
2. In this letter the words in italics have the same meaning as in the Code.

To: (RPR) _____ Date: _____

_____

_____

_____

Re: _____
Name of Project (Print)

_____
Address of Project (Print)

(With respect to field reviews, initial the applicable statement (A or B) and cross out the non-applicable statement below)

DESIGN AND FIELD REVIEW

A. ____ I hereby give assurance that I have fulfilled my obligations for field review as outlined in the Code and in the previously submitted Schedule S-B, Assurance of Professional Design and Commitment for Field Review, and
that those components of the project identified in the Schedule S-B substantially comply in all requests for information with the applicable requirements of the Code and other enactments respecting safety, not including construction safety aspects, and the plans and supporting documents prepared by the undersigned, respecting:

____ _____

(Insert here the area of responsibility, e.g. seismic restraint, fire resistance, acoustic properties, structural capacity)

FIELD REVIEW ONLY

B. ____ I hereby give assurance that I have fulfilled my obligations for field review as outlined in the Code and that those components of the project substantially comply in all requests for information with the applicable requirements of the Code and other enactments respecting safety, not including construction safety aspects, and the plans and supporting documents, respecting

____ _____

_____

(Insert here the area of responsibility, e.g. seismic restraint, fire resistance, and the like.)

_____

Project Address

I confirm I have liaised as required with the appropriate *Registered Professionals* for the purposes of my services.

I hereby give my assurance that I am a *Registered Professional* as defined in the Code.

_____

Name (Print)

_____ _____

Signed Date

_____

Address (Print)

_____

_____

_____

Phone

_____ (PROFESSIONAL SEAL)

Email

(If the *Registered Professional* is a member of a firm, complete the following.)

I am a member of the firm _____

(Print name of firm)

and I sign this letter on behalf of the firm.

Note: The above letter must be signed by a *Registered Professional*. The Code defines a registered professional to mean:

(a) a person who is registered or licensed to practise as an architect under the *Architects Act*, or
(b) a person who is registered or licensed to practise as a professional engineer under the *Engineering and Geoscience Professions Act.*

END OF SECTION

1General

1.1 SCOPE OF WORK

.1 The scope of work of this Section is the performance of alteration work which applies to the contract in general, and miscellaneous items to be administered by the Contractor.

1.2 SITE CONDITIONS

.1 Verify existing conditions during Bidding period. If existing conditions are found to be different from what is indicated or expected, notify the Department Representative immediately. Extra payments will not be authorized for work required by situations which could have been determined by a careful examination of existing conditions during the Bidding period.

.2 When on site, if anything is found to be out of the ordinary, or is found in poor condition that has not been previously noted, the contractor is to bring the item to the attention of the Departmental Representative.

1.3 QUALITY ASSURANCE

.1 All equipment and fixtures are to be CSA approved and carry the appropriate CSA label.

.2 Ensure all work performed and materials used, are of the same standard of quality as that of the existing finished building, as a minimum, unless otherwise scheduled or indicated.

1.4 RESPONSIBILITY AND ASSIGNMENT TO TRADES

.1 The Contractor will assign the work of moving, removal, cutting, patching and repair to trades under his supervision, so as to cause the least damage to each type of work encountered, and so as to return the building as much as possible to the appearance of new work.

.2 Assign patching and finishing materials to mechanics skilled in the Work of the finish trade involved.

2 Products

2.1 MATERIALS

.1 Refer to the individual specifications sections for other materials.

3 Execution

3.1 ALTERATIONS/RENOVATIONS

.1 Do all Work as indicated on drawings and as specified in the applicable specification Section.

.2 Schedule and co-ordinate Work with the Departmental Representative before commencement.

.3 Where structural changes are required to be made, carry out proper investigations to determine whether the required changes can be made safely. Immediately advise the Departmental Representative when existing conditions differ from the drawings.

.4 During Owner occupation, temporarily protect portions of the existing building where work is to be demolished, cut or removed and where new work is to be done, connections made, materials handled, or equipment moved and relocated. Provide temporary protection to protect and secure the interior of the building at all times from dust and interior environmental conditions are maintained.

.5 Furnish and install adequate guards and other temporary protection to prevent injury to persons.

.6 Where alterations occur, or where new and existing work join, cut, remove, patch, repair or refinish, the immediate adjacent surfaces, or so much thereof as is required by the involved conditions, and leave in as good a condition as existed prior to the commencing of the work. Ensure that the materials and workmanship employed in the alterations involving new construction, unless otherwise shown or specified, matches that of the original work. Perform each portion of the alteration work using trades which generally perform these portions. Maintain the integrity of fire rated construction.

.7 Ensure that operations will not interfere with existing fire safety measures and arrangements, including supply of water, electric power, gas and other services, alarm systems, and approaches to the building which may be needed for fire fighting.

.8 If it becomes necessary for performance of contract work to interfere with the fire safety measures or arrangements, make application to the Departmental Representative for directions including any alternative fire safety precautions to be taken.

.9 Maintain safe passage to and from exits. Maintain access to and from the building at all times.

3.2 PREPARATION OF SURFACES

.1 After demolition of existing finishes, and the like, prepare surfaces for the new finishes. Include all work required to produce surfaces suitable to receive the new construction, or new finishes.

.2 Where existing walls or other existing construction is removed, patch and fill in existing substrates such as floors, walls and ceilings which are to remain. Where existing floors are damaged due to removal of partitions, patch and fill in floor level and smooth, ready to receive floor finish.

.3 Repair all surfaces affected by demolition or otherwise requiring preparation, and leave ready to receive new finish.

.4 Infill all walls, floors and ceilings to match existing construction where mechanical, electrical and other items are removed.

.5 Fill in existing openings with fire stop and smoke seal specified in Section 07 84 00, as required to maintain fire ratings. Infill other openings as detailed on the drawings or as otherwise required.

3.3 PREPARATION OF EXISTING CONCRETE SLABS AND SUBFLOORS

.1 Fill existing holes, cracks, chips and other similar defects in slabs, such as where pipes, conduit and other such are abandoned and other such small holes, using specified grout concrete. Mix and install grout in strict accordance with manufacturer's instructions. Trowelled smooth and flush with adjacent surfaces.

3.4 PATCHING, EXTENDING AND MAKING GOOD TO EXISTING WORK

.1 Skill:
- .1 Patch, extend and make good existing work to match existing remaining surfaces. The quality of work must match existing and as specified in the Sections of this Specification.
- .2 Where new materials are specified to be patched into or are to be installed adjacent to existing materials that are to remain as a part of the finished Work, ensure the new materials matches the existing as closely as possible in colour, texture, pattern and thickness. Provide tight joints or seamed joints as applicable. Provide a sample area(s) for Departmental Representative's review prior to proceeding with the work.

.2 Patching:
- .1 In all areas where a portion of an existing finished surface is damaged, lifted, stained or otherwise imperfect, patch or replace the imperfect portion of the surface with matching material, to Departmental Representative's acceptance. Finish to match existing finishes unless specified otherwise. When existing material cannot be matched, salvaged material may be used subject to acceptance by the Departmental Representative.

- .2 If the patched or imperfect surface was originally painted, repaint the entire surface area to logical boundaries.

- .3 Carefully remove and store modular, manufactured type finishes, such as lay-in existing ceiling tile in component ceiling systems, that are to remain in the finished work, and stored for re-installation. Replace damaged tile with tiles salvaged from existing areas where the ceiling is to be demolished. Where matching material is not available, Departmental Representative may accept the most similar product locally available, which meets the same performance requirements as existing product. If matching product is not available, replace with new materials. Obtain acceptance of Departmental Representative prior to installation of other than a matching product.

.3 Transitions:

.1 Where new work abuts or finishes flush with existing work, make the transition as smooth and workmanlike as possible. Install patched work to match existing adjacent work in texture and appearance so as to make the patch or transition acceptable to the Departmental Representative.

.2 Where masonry, tile, metal or other finished surface is cut by demolition in such a way that a smooth transition is not possible, terminate the existing surface in a neat fashion along a straight line at a natural point of division and provide trim to Departmental Representative's acceptance.

.3 Where two or more spaces are indicated to become one space, refinish substrate, floors, walls and ceilings so that horizontal planes meet without breaks, steps or bulkheads.

.4 In cases of extreme change of level, obtain instructions from the Departmental Representative as to method of executing transition by means of stepping, bulkheading, encasement, ramping or sloping.

.5 All means and methods must be to the Departmental Representative's acceptance.

.4 Matching:

.1 Restore existing Work that is to remain in place but which is damaged during construction, to condition equal to that at the time of the start of work, to the satisfaction of the Departmental Representative.

.5 Overall Requirements:

.1 Where an existing product or type of construction occurs in the existing building, which is required to be patched and made good, but which is not specified as part of the new work, provide such products or types of construction as needed to patch, and match the existing work, as noted in this Section.

3.5 SPECIAL PATCHING REQUIREMENTS

.1 In areas where any portion of an existing fire or acoustically rated finished surface structure is damaged, lifted, stained or otherwise made or found to be imperfect as a result of Work of this Contract, patch or replace the damaged area of the surface with matching material to provide same or better rating.

.2 Provide solid support or substrate for patching of finishes.

3.6 WORK TO EXISTING

.1 Perform all work to existing as required to accommodate new construction as indicated and as otherwise required to complete the Work of this project.

.2 Patch and make good around new openings in existing exterior envelope, to make water tight. Where new roof top units are installed, ensure that they are installed to provide a weather tight installation. Provide new flashings as required or as indicated on the drawings.

.3 For Project No. 144202775.210 - Red Deer, excavate as required to accommodate new well for duct penetration through existing foundation wall. Compact existing subgrade to minimum 98% Standard Proctor Maximum Dry Density. After foundations for new well have been installed, backfill around new well and compact to minimum 98% Standard Proctor Maximum Dry Density.

.1 Neatly and accurately saw cut new opening through foundation wall as required to accommodate new duct. Do not oversize hole.

.2 Patch and make good existing construction around new penetration for ducts and the like through existing wall.

.3 Seal around duct penetration to provide a watertight installation.

3.7 MISCELLANEOUS ITEMS

.1 Where new openings are being cut into existing partitions, take care not to damage existing adjacent flooring.

.2 Take care not to damage existing electrical panels and cables which are to remain.

END OF SECTION

1General

1.1 REFERENCES

.1 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations

.2 Province of Alberta

.1 Occupational Health and Safety Act, R.S.A. - Updated 2013.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit site-specific Health and Safety Plan: Within 7 days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include:

.1 Results of site specific safety hazard assessment.

.2 Results of safety and health risk or hazard analysis for site tasks and operation.

.3 Submit three (3) copies of Contractor's authorized representative's work site health and safety inspection reports to authority having jurisdiction, weekly to the Departmental Representative.

.4 Submit copies of reports or directions issued by Federal, Provincial and Territorial health and safety inspectors.

.5 Submit copies of incident and accident reports.

.6 Departmental Representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within ten (10) days after receipt of plan. Revise plan as appropriate and resubmit plan to Departmental Representative within five (5) days after receipt of comments from Departmental Representative.

.7 Departmental Representative's review of Contractor's final Health and Safety plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction Health and Safety.

.8 Medical Surveillance: where prescribed by legislation, regulation or safety program, submit certification of medical surveillance for site personnel prior to commencement of Work, and submit additional certifications for any new site personnel to Departmental Representative.

.9 On-site Contingency and Emergency Response Plan: address standard operating procedures to be implemented during emergency situations.

1.3 FILING OF NOTICE

.1 File Notice of Project with Provincial authorities prior to beginning of Work.

.2 Contractor shall be responsible and assume the Principal Contractor role for each work zone location and not the entire complex. Contractor shall provide a written acknowledgement of this responsibility with 3 weeks of contract award.

.3Contractor shall agree to install proper site separation and identification in order to maintain time and space at all times throughout life of project.

1.4 SAFETY ASSESSMENT

.1 Perform site specific safety hazard assessment related to project.

1.5 MEETINGS

.1 Schedule and administer Health and Safety meeting with Departmental Representative prior to commencement of Work.

1.6 REGULATORY REQUIREMENTS

.1 Do Work in accordance with Section 01 41 00 - Regulatory Requirements.

1.7 GENERAL REQUIREMENTS

.1 Develop written site-specific Health and Safety Plan based on hazard assessment prior to beginning site Work and continue to implement, maintain, and enforce plan until final demobilization from site. Health and Safety Plan must address project specifications.

.2 Departmental Representative may respond in writing, where deficiencies or concerns are noted and may request re-submission with correction of deficiencies or concerns.

1.8 RESPONSIBILITY

.1 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.

.2Contractor will be responsible and assume the role Constructor as described in the Ontario Occupational Health and Safety Act and Regulations for Construction Projects.

.3 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

1.9 COMPLIANCE REQUIREMENTS

.1Comply with Occupational Health and Safety Act, Occupational Health and Safety Code 2009.

.2Comply with Canada Labour Code, Canada Occupational Safety and Health Regulations.

1.10 UNFORSEEN HAZARDS

.1When unforeseen or peculiar safety-related factor, hazard, or condition occur during performance of Work, follow procedures in place for Employee's Right to Refuse Work in accordance with Acts and Regulations of Province having jurisdiction and advise Departmental Representative verbally and in writing.

.2 When unforeseen or peculiar safety-related factor, hazard, or condition occur during performance of Work, advise Health and Safety co-ordinator and follow procedures in accordance with Acts and Regulations of Province having jurisdiction and advise Departmental Representative verbally and in writing.

1.11 HEALTH AND SAFETY CO-ORDINATOR

.1Employ and assign to Work, competent and authorized representative as Health and Safety Co-ordinator. Health and Safety Co-ordinator must: Have site-related working experience specific to activities associated with the Work.

.2 Have working knowledge of occupational safety and health regulations.

.3 Be responsible for completing Contractor's Health and Safety Training Sessions and ensuring that personnel not successfully completing required training are not permitted to enter site to perform Work.

.4 Be responsible for implementing, enforcing daily and monitoring site-specific Contractor's Health and Safety Plan.

.5 Be on site during execution of Work and report directly to and be under direction of site supervisor.

1.12 POSTING OF DOCUMENTS

.1 Ensure applicable items, articles, notices and orders are posted in conspicuous location on site in accordance with Acts and Regulations of Province having jurisdiction, and in consultation with Departmental Representative.

1.13 CORRECTION OF NON-COMPLIANCE

.1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by Departmental Representative.

.2 Provide Departmental Representative with written report of action taken to correct non-compliance of health and safety issues identified.

.3 Departmental Representative may stop Work if non-compliance of health and safety regulations is not corrected.

1.14 BLASTING

.1 Blasting or other use of explosives is not permitted.

1.15 POWDER ACTUATED DEVICES

.1 Use powder actuated devices only after receipt of written permission from Departmental Representative.

1.16 WORK STOPPAGE

.1 Give precedence to safety and health of public and site personnel and protection of environment over cost and schedule considerations for Work.

2Part Products

2.1 NOT USED

.1 Not used.

3Part Execution

3.1 NOT USED

.1 Not used.

END OF SECTION

1 General

1.1 REFERENCES

.1 Definitions:
- .1 Environmental Pollution and Damage: presence of chemical, physical, biological elements or agents which adversely affect human health and welfare; unfavourably alter ecological balances of importance to human life; affect other species of importance to humans; or degrade environment aesthetically, culturally and/or historically.
- .2 Environmental Protection: prevention/control of pollution and habitat or environment disruption during construction.

.2 Reference Standards:
- .1 U.S. Environmental Protection Agency (EPA)/Office of Water
  - .1 EPA 832/R-92-005-92, Storm Water Management for Construction Activities, Chapter 3.
  - .2 EPA General Construction Permit (GCP) 2012.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:
- .1 Submit manufacturer's instructions, printed product literature and data sheets and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Submit 2 copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements.

.3 Before commencing construction activities or delivery of materials to site, submit Environmental Protection Plan for review and approval by Departmental Representative.

.4 Environmental Protection Plan must include comprehensive overview of known or potential environmental issues to be addressed during construction.

.5 Address topics at level of detail commensurate with environmental issue and required construction tasks.

.6 Include in Environmental Protection Plan:
- .1 Names of persons responsible for ensuring adherence to Environmental Protection Plan.
- .2 Names and qualifications of persons responsible for manifesting hazardous waste to be removed from site.
- .3 Names and qualifications of persons responsible for training site personnel.
- .4 Descriptions of environmental protection personnel training program.

.5 Erosion and sediment control plan identifying type and location of erosion and sediment controls to be provided including monitoring and reporting requirements to assure that control measures are in compliance with erosion and sediment control plan, Federal, Provincial, and Municipal laws and regulations and EPA 832/R-92-005, Chapter 3.

.6 Drawings indicating locations of proposed temporary excavations or embankments for haul roads, stream crossings, material storage areas, structures, sanitary facilities, and stockpiles of excess or spoil materials including methods to control runoff and to contain materials on site.

.7 Traffic Control Plans including measures to reduce erosion of temporary roadbeds by construction traffic, especially during wet weather.

.1 Plans to include measures to minimize amount of material transported onto paved public roads by vehicles or runoff.

.8 Work area plan showing proposed activity in each portion of area and identifying areas of limited use or non-use.

.1 Plan to include measures for marking limits of use areas and methods for protection of features to be preserved within authorized work areas.

.9 Spill Control Plan to include procedures, instructions, and reports to be used in event of unforeseen spill of regulated substance.

.10 Non-Hazardous solid waste disposal plan identifying methods and locations for solid waste disposal including clearing debris.

.11 Air pollution control plan detailing provisions to assure that dust, debris, materials, and trash, are contained on project site.

.12 Contaminant Prevention Plan identifying potentially hazardous substances to be used on job site; intended actions to prevent introduction of such materials into air, water, or ground; and detailing provisions for compliance with Federal, Provincial, and Municipal laws and regulations for storage and handling of these materials.

.13 Waste Water Management Plan identifying methods and procedures for management and discharge of waste waters which are directly derived from construction activities, such as concrete curing water, clean-up water, dewatering of ground water, disinfection water, hydrostatic test water, and water used in flushing of lines.

.14 Pesticide treatment plan to be included and updated, as required.

1.3 FIRES

.1 Fires and burning of rubbish on site is not permitted.

1.4 DRAINAGE

.1 Develop and submit erosion and Sediment Control Plan (ESC) identifying type and location of erosion and sediment controls provided. Plan to include monitoring and reporting requirements to assure that control measures are in compliance with erosion and sediment control plan, Federal, Provincial, and Municipal laws and regulations, EPA 832/R-92-005, Chapter 3.

.2 Storm Water Pollution Prevention Plan (SWPPP) to be substituted for erosion and sediment control plan.

.3 Provide temporary drainage and pumping required to keep excavations and site free from water.

.4 Ensure pumped water into waterways, sewer or drainage systems is free of suspended materials.

.5 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements.

1.5 SITE CLEARING AND PLANT PROTECTION

.1 Protect trees and plants on site and adjacent properties as indicated.

.2 Protect trees and shrubs adjacent to construction work, storage areas and trucking lanes, and encase with protective wood framework from grade level to height of 2 m minimum.

.3 Protect roots of designated trees to dripline during excavation and site grading to prevent disturbance or damage.

.1 Avoid unnecessary traffic, dumping and storage of materials over root zones.

.4 Minimize stripping of topsoil and vegetation.

.5 Restrict tree removal to areas designated by Departmental Representative.

1.6 POLLUTION CONTROL

.1 Maintain temporary erosion and pollution control features installed under this Contract.

.2 Control emissions from equipment and plant in accordance with local authorities' emission requirements.

.3 Prevent sandblasting and other extraneous materials from contaminating air and waterways beyond application area.

.1 Provide temporary enclosures where directed by Departmental Representative.

.4 Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads.

1.7 NOTIFICATION

.1 Departmental Representative will notify Contractor in writing of observed noncompliance with Federal, Provincial or Municipal environmental laws or regulations, permits, and other elements of Contractor's Environmental Protection plan.

.2 Contractor: after receipt of such notice, inform Departmental Representative of proposed corrective action and take such action for approval by Departmental Representative.

.1 Take action only after receipt of written approval by Departmental Representative.

.3 Departmental Representative will issue stop order of work until satisfactory corrective action has been taken.

.4 No time extensions granted or equitable adjustments allowed to Contractor for such suspensions.

2 Products

2.1 NOT USED

.1 Not Used.

3 Execution

3.1 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
.1 Leave Work area clean at end of each day.

.2 Bury rubbish and waste materials on site where directed after receipt of written approval from Departmental Representative.

.3 Ensure public waterways, storm and sanitary sewers remain free of waste and volatile materials disposal.

.4 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

END OF SECTION

1 General

1.1 REFERENCES AND CODES

.1 Perform Work in accordance with Alberta Building Code 2014 and the National Building Code of Canada 2010 including amendments up to tender closing date and other codes of provincial or local application provided that in case of conflict or discrepancy, more stringent requirements apply.

.2 Meet or exceed requirements of:
.1 Contract documents.
.2 Specified standards, codes and referenced documents.

1.2 BUILDING SMOKING ENVIRONMENT

.1 Comply with smoking restrictions and municipal by-laws.

2 Products

2.1 NOT USED

.1 Not Used.

3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

1 General

1.1 INTENT

.1 All references to codes, standards and standard specifications and any amendments or updates referred to in these Specifications or used on drawings means those that are in force on the day of receipt of Bids are applicable to the Work during the duration of the Contract regardless of the date of the reference indicated in the individual specification Sections.

.2 Where referenced standards contain provisions on required methods of fabrication, procedure, and the like, comply with all such provisions.

.3 Where these specifications are in conflict with a referenced standard, the most stringent requirements govern.

.4 In some Sections of these specifications, items from the referenced standards are duplicated, in short form. Interpret these as advisory and to facilitate inspection. The full provisions of the referenced standards govern.

1.2 BUILDING CODE

.1 Conform to and perform work in accordance with the Alberta Building Code 2014 and National Building Code of Canada 2010, as a minimum, except as indicated as being performed to a higher standard in the Contract Documents.

1.3 STANDARDS ORGANIZATIONS

.1 The following list of standards organizations indicate the most common standards that may be referenced within the technical specifications:
- .1 ANSI - American National Standards Institute
- .2 ASTM - American Society for Testing and Materials
- .3 CGA - Canadian Gas Association
- .4 CGSB - Canadian General Standards Board
- .5 CSA - Canadian Standards Association
- .6 CAN1 - National Standard of Canada (published by CGA)
- .7 CAN2 - National Standard of Canada (published by CGSB)
- .8 CAN3 - National Standard of Canada (published by CSA)
- .9 CAN4 - National Standard of Canada (published by ULC)
- .10 ULC - Underwriters Laboratories of Canada
- .11 UL or ULI - Underwriters Laboratories Inc.
- .12 WHI - Warnock Hersey / Intertek Testing Services

.2 The following limitations on marks issued by standards organizations will apply to the standards issued by the organizations listed in 1.3.1 above:
- .1 Underwriters Laboratories Inc.: Only systems designated by “cUL” or “cULus” will be acceptable for use on this project. Systems indicating “UL” or “ULus” will only be considered where local authorities having jurisdiction have reviewed and accepted the systems in writing.

.2 Warnock Hersey Intertek: Only materials designated by "cWHI" or cWHIus will be acceptable for use on this project. Materials bearing a "WH", "WHI" or "WHIus" mark will only be considered where local authorities having jurisdiction have reviewed and accepted the materials in writing.

.3 Contractor will be responsible for obtaining written acceptance of materials and submitting them to the Departmental Representative prior to installation.

1.4 REFERENCES

.1 Within the text of the specifications, reference may be made to published standards and codes, including but not limited to the following:

ABC - Alberta Building Code 2014
ACI - American Concrete Institute
AFCA - Alberta Floor Covering Association
AISC - American Institute of Steel Construction
AISI - American Iron & Steel Institute
AMCA - Air Movement & Control Association
ANSI - American National Standards Institute
ARCA - Alberta Roofing Contractor's Association
ASA - American Standards Association
ASHRAE American Society of Heating, Refrigerating & Airconditioning Engineers
ASME - American Society of Mechanical Engineers
ASTM - American Society for Testing and Materials
AWCC - Association of Wall and Ceiling Contractors
AWMAC - Architectural Woodwork and Millwork Association of Canada
AWPA - American Wood Preservers' Association
CAN - National Standard of Canada, as follows:
CAN1: CGA - Canadian Gas Association
CAN2(or CAN/CGSB): CGSB - Canadian General Standards Board
CAN3(or CAN/CSA): CSA - Canadian Standards Association
CAN4: ULC - Underwriters' Laboratories of Canada
CEC - Canadian Electrical Code (published by CSA)
CEMA - Canadian Electrical Manufacturer's Association
CGSB - Canadian General Standards Board
CISC - Canadian Institute of Steel Construction
CLA - Canadian Lumberman's Association
CSA - Canadian Standards Association
CWB - Canadian Welding Bureau
FM - Factory Mutual Engineering Corporation
HRAI - Heating, Refrigerating and Air-Conditioning Institute of Canada
HI - Hydronics Institute
IEEE - Institute of Electrical and Electronic Engineers
ICEA - Insulated Cable Engineers Association
IFAI - Industrial Fabric Association International
IGMAC - Insulated Glass Manufacturers Association of Canada
ITS - Intertek Testing Services
MPI - Master Painters Institute
NAAMM- National Association of Architectural Metal Manufacturers

NBCC	-	National Building Code of Canada 2010
NEMA	-	National Electrical Manufacturers' Association
NFPA	-	National Fire Protection Association
NLGA	-	National Lumber Grades Authority
SSPC	-	The Society for Protective Coatings
TTMAC	-	Terrazzo, Tile and Marble Association of Canada
ULC	-	Underwriters' Laboratories of Canada
ULI	-	Underwriters' Laboratories Incorporated (U.S.)
WHI	-	Warnock Hersey Inc.

2 Products

2.1 NOT USED

.1 Not used.

3 Execution

3.1 NOT USED

.1 Not used.

END OF SECTION

1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 21 00 - Allowances.

.2 Section 01 29 83 - Payment Procedures for Testing Laboratory Services.

1.2 INSPECTION

.1 Allow Departmental Representative access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.

.2 Give minimum five (5) days notice requesting inspection if Work is designated for special tests, inspections or approvals by Departmental Representative instructions, or law of Place of Work.

.3 If Contractor covers or permits to be covered Work that has been designated for special tests, inspections or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.

.4 Departmental Representative will order part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction. If such Work is found in accordance with Contract Documents, Departmental Representative shall pay cost of examination and replacement.

1.3 INDEPENDENT INSPECTION AGENCIES

.1 Independent Inspection/Testing Agencies will be engaged by Departmental Representative for purpose of inspecting and/or testing portions of Work. Cost of such services will be borne by Contractor out of the Cash Allowance specified in Section 01 21 00.

.2 Refer also to Section 01 29 83 - Payment Procedures for Testing Laboratory Services.

.3 Provide equipment required for executing inspection and testing by appointed agencies.

.4 Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.

.5 If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by Departmental Representative at no cost to Departmental Representative. Pay costs for retesting and reinspection (not out of the Cash Allowance).

1.4 ACCESS TO WORK

.1 Allow inspection/testing agencies access to Work, off site manufacturing and fabrication plants.

.2 Co-operate to provide reasonable facilities for such access.

1.5 PROCEDURES

.1 Notify appropriate agency and Departmental Representative in advance of requirement for tests, in order that attendance arrangements can be made.

.2 Submit samples and/or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in orderly sequence to not cause delays in Work.

.3 Provide labour and facilities to obtain and handle samples and materials on site. Provide sufficient space to store and cure test samples.

1.6 REJECTED WORK

.1 Remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by Departmental Representative as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.

.2 Make good other Contractor's work damaged by such removals or replacements promptly.

.3 If in opinion of Departmental Representative it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, Owner will deduct from Contract Price difference in value between Work performed and that called for by Contract Documents, amount of which will be determined by .

1.7 REPORTS

.1 Submit 4 copies of inspection and test reports to Departmental Representative.

.2 Provide copies to subcontractor of work being inspected or tested and manufacturer or fabricator of material being inspected or tested.

1.8 TESTS AND MIX DESIGNS

.1 Furnish test results and mix designs as requested.

.2 Cost of tests and mix designs beyond those called for in Contract Documents or beyond those required by law of Place of Work will be appraised by Departmental Representative and may be authorized as recoverable.

1.9 MOCK-UPS

.1 Prepare mock-ups for Work specifically requested in specifications. Include for Work of Sections required to provide mock-ups.

.2 Construct in locations acceptable to Departmental Representative.

.3 Prepare mock-ups for Departmental Representative's review with reasonable promptness and in orderly sequence, to not cause delays in Work.

.4 Failure to prepare mock-ups in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.

.5 If requested, Departmental Representative will assist in preparing schedule fixing dates for preparation.

.6 Remove mock-up at conclusion of Work or when acceptable to Departmental Representative.

.7 Mock-ups may remain as part of Work.

.8 Specification section identifies whether mock-up may remain as part of Work or if it is to be removed and when.

1.10 MILL TESTS

.1 Submit mill test certificates as required of specification Sections.

1.11 EQUIPMENT AND SYSTEMS

.1 Submit adjustment and balancing reports for mechanical, electrical and building equipment systems.

2 Products

2.1 NOT USED

.1 Not Used.

3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

1 General

1.1 REFERENCES

.1 U.S. Environmental Protection Agency (EPA) / Office of Water
.1 EPA 832R92005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

1.3 INSTALLATION AND REMOVAL

.1 Provide temporary utilities controls in order to execute work expeditiously.

.2 Remove from site all such work after use.

1.4 WATER SUPPLY

.1 Departmental Representative will provide continuous supply of potable water for construction use, from a designated existing source.

.2 Departmental Representative will pay for utility charges at prevailing rates.

1.5 TEMPORARY HEATING AND VENTILATION

.1 Within existing building:
.1 The permanent heating system will be in operation during the work of this Contract. The Departmental Representative will pay all costs for operation of permanent heating system.
.2 Prevent hazardous accumulations of dust, fumes, mists, vapours or gases in areas occupied during construction. Provide and pay for additional heating as may be required, beyond that provided by the Departmental Representative.

.2 Ventilating:
.1 To existing building:
.1 The permanent ventilating system will be in operation during the work of this Contract. The Departmental Representative will pay all costs for operation of permanent ventilation system.
.2 Provide and pay for additional ventilation to heated areas and keep building free of exhaust or combustion gases and to meet health regulations for a safe working environment. Prevent hazardous accumulations of dust, fumes, mists, vapours or gases in areas occupied during construction.
.3 Use whatever means necessary to prevent passage of dust from construction area into remainder of building.
.3 Permanent heating system of building, to be used when available. Be responsible for damage to heating system if use is permitted.

.4 On completion of Work for which permanent heating system is used, replace filters and restore heating equipment to new condition.

.5 Ensure Date of Substantial Performance and Warranties for heating system do not commence until entire system is in as near original condition as possible and is certified by Departmental Representative.

.6 Pay costs for maintaining temporary heat, when using permanent heating system within the new addition. Departmental Representative will pay utility charges when temporary heat source is existing building equipment.

.7 Maintain strict supervision of operation of temporary heating and ventilating equipment to:
- .1 Conform with applicable codes and standards.
- .2 Enforce safe practices.
- .3 Prevent abuse of services.
- .4 Prevent damage to finishes.
- .5 Vent direct-fired combustion units to outside.

.8 Be responsible for damage to Work due to failure in providing adequate heat and protection during construction.

1.6 TEMPORARY POWER AND LIGHT

.1 The Departmental Representative will provide and pay for temporary power required during construction from a designated existing source for lighting and operating power tools and other temporary power requirements for construction, as available in the existing building. Provide and pay for additional power as may be required, beyond that available in the existing building. Connect to existing power supply in accordance with Canadian Electrical Code and provide meters and switching.

.2 Provide and maintain temporary lighting throughout project. Ensure level of illumination on all floors and stairs is not less than 162 lx.

.3 Electrical power and lighting systems installed under this Contract may be used for construction requirements only with prior approval of Departmental Representative provided that guarantees are not affected. Make good damage to electrical system caused by use under this Contract. Replace lamps which have been used for more than 3 months.

1.7 TEMPORARY COMMUNICATION FACILITIES

.1 Provide and pay for temporary telephone, fax and data hook up, lines and equipment necessary for own use and use of Departmental Representative.

1.8 FIRE PROTECTION

.1 Provide and maintain temporary fire protection equipment during performance of Work required by insurance companies having jurisdiction, governing codes, regulations and bylaws.

.2 Burning rubbish and construction waste materials is not permitted on site.

2 Products

2.1 NOT USED

.1 Not Used.

3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

1 General

1.1 REFERENCES

.1 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB 1.189, Exterior Alkyd Primer for Wood.
- .2 CGSB 1.59, Alkyd Exterior Gloss Enamel.

.2 Canadian Standards Association (CSA International)
- .1 CAN/CSA-A23.1-14/A23.2-14: Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
- .2 CSA O121-08(R2013), Douglas Fir Plywood.
- .3 CAN/CSA O141-05(R2014), Softwood Lumber.
- .4 CSA O151-09(R2014), Canadian Softwood Plywood.
- .5 CAN/CSA-S269.2-M1987(R2003), Access Scaffolding for Construction Purposes.

.3 Public Works Government Services Canada (PWGSC) Standard Acquisition Clauses and Conditions (SACC)-ID: R0202D, Title: General Conditions 'C', In Effect as of: May 14, 2004.

.4 U.S. Environmental Protection Agency (EPA) / Office of Water
- .1 EPA 832R92005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

1.3 INSTALLATION AND REMOVAL

.1 Prepare site plan indicating proposed location and dimensions of area to be fenced and used by Contractor, number of trailers to be used, avenues of ingress/egress to fenced area and details of fence installation.

.2 Identify areas which have to be gravelled to prevent tracking of mud.

.3 Indicate use of supplemental or other staging area.

.4 Provide construction facilities in order to execute work expeditiously.

.5 Remove from site all such work after use.

1.4 SCAFFOLDING

.1 Scaffolding in accordance with CAN/CSA-S269.2.

.2 Provide and maintain scaffolding, ramps, ladders, swing staging, platforms, temporary stairs.

1.5 SITE STORAGE/LOADING

.1 Confine work and operations of employees by Contract Documents. Do not unreasonably encumber premises with products.

.2 Do not load or permit to load any part of Work with weight or force that will endanger Work.

1.6 CONSTRUCTION PARKING

.1 Parking will be permitted on site provided it does not disrupt performance of Work.

.2 Provide and maintain adequate access to project site.

.3 Clean runways and taxi areas where used by Contractor's equipment.

1.7 SECURITY

.1 The Contractor is responsible for all site and building security of site including after working hours and during holidays.

1.8 OFFICES

.1 Provide office heated to 22 degrees C, lighted 750 lx and ventilated, of sufficient size to accommodate site meetings and furnished with drawing laydown table.

.2 Provide marked and fully stocked first-aid case in a readily available location.

.3 Subcontractors to provide their own offices as necessary. Direct location of these offices.

1.9 EQUIPMENT, TOOL AND MATERIALS STORAGE

.1 Provide and maintain, in clean and orderly condition, lockable weatherproof sheds for storage of tools, equipment and materials.

.2 Locate materials not required to be stored in weatherproof sheds on site in manner to cause least interference with work activities.

1.10 SANITARY FACILITIES

.1 The Contractor and all Subcontractors may use designated existing sanitary facilities.

.2 Keep area and premises in sanitary condition.

1.11 PROTECTION AND MAINTENANCE OF TRAFFIC

.1 Provide access and temporary relocated roads as necessary to maintain traffic.

.2 Maintain and protect traffic on affected roads during construction period except as otherwise specifically directed by Departmental Representative.

.3 Provide measures for protection and diversion of traffic, including provision of watch-persons and flag-persons, erection of barricades, placing of lights around and in front of equipment and work, and erection and maintenance of adequate warning, danger, and direction signs

.4 Protect travelling public from damage to person and property.

.5 Contractor's traffic on roads selected for hauling material to and from site to interfere as little as possible with public traffic.

.6 Verify adequacy of existing roads and allowable load limit on these roads. Contractor: responsible for repair of damage to roads caused by construction operations.

.7 Construct access and haul roads necessary.

.8 Haul roads: constructed with suitable grades and widths; sharp curves, blind corners, and dangerous cross traffic shall be avoided.

.9 Provide necessary lighting, signs, barricades, and distinctive markings for safe movement of traffic.

.10 Dust control: adequate to ensure safe operation at all times.

.11 Location, grade, width, and alignment of construction and hauling roads: subject to approval by Departmental Representative.

.12 Lighting: to assure full and clear visibility for full width of haul road and work areas during night work operations.

.13 Provide snow removal during period of Work.

.14 Remove, upon completion of work, haul roads designated by Departmental Representative.

1.12 CLEAN-UP

.1 Remove construction debris, waste materials, packaging material from work site daily.

.2 Clean dirt or mud tracked onto paved or surfaced roadways.

.3 Store materials resulting from demolition activities that are salvageable.

.4 Stack stored new or salvaged material not in construction facilities.

2 Products

2.1 NOT USED

.1 Not Used.

3 Execution

3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL

.1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to sediment and erosion control plan, specific to site, that complies with EPA 832/R-92-005 or requirements of authorities having jurisdiction, whichever is more stringent.

.2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

.3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

END OF SECTION

1 General

1.1 REFERENCES

.1 Canadian Standards Association (CSA International)
.1 CSA-O121-08(R2013), Douglas Fir Plywood.

.2 Public Works Government Services Canada (PWGSC) Standard Acquisition Clauses and Conditions (SACC)-ID: R0202D, Title: General Conditions 'C', In Effect as Of: May 14, 2004.

1.2 INSTALLATION AND REMOVAL

.1 Provide temporary controls in order to execute Work expeditiously.

.2 Remove from site all such work after use.

1.3 HOARDING

.1 Erect hoarding to protect the public, workers, building staff and visitors, public and private property from injury or damage and to the approval of the authority having jurisdiction and to maintain access to areas which are to remain operational. Erect hoarding to separate areas of the building and site which are to remain open, and construction area.

.2 Erect site fencing/hoarding and gates around temporary parking area for construction personnel and temporary Contractor’s laydown area.

.3 Obtain and pay for all necessary permits to erect hoarding as required.

.4 Provide all other temporary safeguards and protection to adequately protect against accident or injury to any workers or other persons on the site, and adjacent work and property, roads and walks, damage to any part of the work, while under construction and to any adjacent structure, property, pavements, walks, services and other similar items, by frost, weather, overloading and any other cause resulting from the execution of the work.

.5 Provide hoarding with prefabricated temporary steel framed construction fence with mesh, 2400 mm high, with sections interlocked together and fence being self supporting, protecting public and private property from injury or damage.

.6 Provide one lockable truck entrance gate and at least one pedestrian door as directed and conforming to applicable traffic restrictions on adjacent streets. Equip gates with locks and keys.

.7 Provide barriers around trees and plants designated to remain. Protect from damage by equipment and construction procedures.

1.4 GUARD RAILS AND BARRICADES

.1 Provide guard rails and barricades as required by governing authorities.

1.5 DUST TIGHT SCREENS

.1 Provide dust tight screens or insulated partitions to localize dust generating activities, and for protection of workers, finished areas of Work and public.

.2 Maintain and relocate protection until such work is complete.

1.6 ACCESS TO SITE

.1 Provide and maintain access roads, sidewalk crossings, ramps and construction runways as may be required for access to Work.

1.7 PUBLIC TRAFFIC FLOW

.1 Provide and maintain competent signal flag operators, traffic signals, barricades and flares, lights, or lanterns as required to perform Work and protect public.

1.8 FIRE ROUTES

.1 Maintain access to property including overhead clearances for use by emergency response vehicles.

1.9 PROTECTION FOR OFF-SITE AND PUBLIC PROPERTY

.1 Protect surrounding private and public property from damage during performance of Work.

.2 Be responsible for damage incurred.

1.10 PROTECTION OF BUILDING FINISHES

.1 Provide protection for finished and partially finished building finishes and equipment during performance of Work.

.2 Provide necessary screens, covers, and hoardings.

.3 Confirm with Departmental Representative locations and installation schedule three (3) days prior to installation.

.4 Be responsible for damage incurred due to lack of or improper protection.

2 Products

2.1 NOT USED

.1 Not Used.

3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

1 General

1.1 REFERENCES

.1 Within text of each specifications section, reference may be made to reference standards. List of standards reference writing organizations is contained in Section 01 42 00 - References.

.2 Conform to these reference standards, in whole or in part as specifically requested in specifications.

.3 If there is question as to whether products or systems are in conformance with applicable standards, Departmental Representative reserves right to have such products or systems tested to prove or disprove conformance.

.4 Cost for such testing will be borne by Departmental Representative in event of conformance with Contract Documents or by Contractor in event of non-conformance.

1.2 QUALITY

.1 Products, materials, equipment and articles incorporated in Work shall be new, not damaged or defective, and of best quality for purpose intended. If requested, furnish evidence as to type, source and quality of products provided.

.2 Procurement policy is to acquire, in cost effective manner, items containing highest percentage of recycled and recovered materials practicable consistent with maintaining satisfactory levels of competition. Make reasonable efforts to use recycled and recovered materials and in otherwise utilizing recycled and recovered materials in execution of work.

.3 Defective products, whenever identified prior to completion of Work, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is precaution against oversight or error. Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.

.4 Should disputes arise as to quality or fitness of products, decision rests strictly with Departmental Representative based upon requirements of Contract Documents.

.5 Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout building.

.6 Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations, except where required for operating instructions, or when located in mechanical or electrical rooms.

1.3 AVAILABILITY

.1 Immediately upon signing Contract, review product delivery requirements and anticipate foreseeable supply delays for items. If delays in supply of products are foreseeable, notify

Departmental Representative of such, in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of Work.

.2 In event of failure to notify Departmental Representative at commencement of Work and should it subsequently appear that Work may be delayed for such reason, Departmental Representative reserves right to substitute more readily available products of similar character, at no increase in Contract Price or Contract Time.

1.4 STORAGE, HANDLING AND PROTECTION

.1 Handle and store products in manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions when applicable.

.2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work.

.3 Store products subject to damage from weather in weatherproof enclosures.

.4 Store cementitious products clear of earth or concrete floors, and away from walls.

.5 Keep sand, when used for grout or mortar materials, clean and dry. Store sand on wooden platforms and cover with waterproof tarpaulins during inclement weather.

.6 Store sheet materials, lumber and the like, on flat, solid supports and keep clear of ground. Slope to shed moisture.

.7 Store and mix paints in heated and ventilated room. Remove oily rags and other combustible debris from site daily. Take every precaution necessary to prevent spontaneous combustion.

.8 Remove and replace damaged products at own expense and to satisfaction of Departmental Representative.

.9 Touch-up damaged factory finished surfaces to Departmental Representative's satisfaction. Use touch-up materials to match original. Do not paint over name plates.

1.5 TRANSPORTATION

.1 Pay costs of transportation of products required in performance of Work.

.2 Transportation cost of products supplied by Owner will be paid for by Departmental Representative. Unload, handle and store such products.

1.6 MANUFACTURER'S INSTRUCTIONS

.1 Unless otherwise indicated in specifications, install or erect products in accordance with manufacturer's instructions. Do not rely on labels or enclosures provided with products. Obtain written instructions directly from manufacturers.

.2 Notify Departmental Representative in writing, of conflicts between specifications and manufacturer's instructions, so that Departmental Representative will establish course of action.

.3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes Departmental Representative to require removal and re-installation at no increase in Contract Price or Contract Time.

1.7 QUALITY OF WORK

.1 Ensure Quality of Work is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed. Immediately notify Departmental Representative if required Work is such as to make it impractical to produce required results.

.2 Do not employ anyone unskilled in their required duties. Departmental Representative reserves right to require dismissal from site, workers deemed incompetent or careless.

.3 Decisions as to standard or fitness of Quality of Work in cases of dispute rest solely with Departmental Representative, whose decision is final.

1.8 CO-ORDINATION

.1 Ensure co-operation of workers in laying out Work. Maintain efficient and continuous supervision.

.2 Be responsible for coordination and placement of openings, sleeves and accessories.

1.9 CONCEALMENT

.1 In finished areas conceal pipes, ducts and wiring in floors, walls and ceilings, except where indicated otherwise.

.2 Before installation inform Departmental Representative if there is interference. Install as directed by Departmental Representative.

1.10 REMEDIAL WORK

.1 Refer to Section 01 73 00 - Execution Requirements.
.2 Perform remedial work required to repair or replace parts or portions of Work identified as defective or unacceptable. Co-ordinate adjacent affected Work as required.

.3 Perform remedial work by specialists familiar with materials affected. Perform in a manner to neither damage nor put at risk any portion of Work.

1.11 LOCATION OF FIXTURES

.1 Consider location of fixtures, outlets, and mechanical and electrical items indicated as approximate.

.2 Inform Departmental Representative of conflicting installation. Install as directed.

1.12 FASTENINGS

.1 Provide metal fastenings and accessories in same texture, colour and finish as adjacent materials, unless indicated otherwise.

.2 Prevent electrolytic action between dissimilar metals and materials.

.3 Use non-corrosive hot dip galvanized steel fasteners and anchors for securing exterior work, unless stainless steel or other material is specifically requested in affected specification Section.

.4 Space anchors within individual load limit or shear capacity and ensure they provide positive permanent anchorage. Wood, or any other organic material plugs are not acceptable.

.5 Keep exposed fastenings to a minimum, space evenly and install neatly.

.6 Fastenings which cause spalling or cracking of material to which anchorage is made are not acceptable.

1.13 FASTENINGS - EQUIPMENT

.1 Use fastenings of standard commercial sizes and patterns with material and finish suitable for service.

.2 Use heavy hexagon heads, semi-finished unless otherwise specified. Use No. 304 stainless steel for exterior areas.

.3 Bolts may not project more than one diameter beyond nuts.

.4 Use plain type washers on equipment, sheet metal and soft gasket lock type washers where vibrations occur. Use resilient washers with stainless steel.

1.14 PROTECTION OF WORK IN PROGRESS

.1 Prevent overloading of parts of building. Do not cut, drill or sleeve load bearing structural member, unless specifically indicated without written approval of Departmental Representative.

1.15 EXISTING UTILITIES

.1 When breaking into or connecting to existing services or utilities, execute Work at times directed by local governing authorities, with minimum of disturbance to Work, and/or building occupants and pedestrian and vehicular traffic.

.2 Protect, relocate or maintain existing active services. When services are encountered, cap off in manner approved by authority having jurisdiction. Stake and record location of capped service.

2 Products

2.1 NOT USED

.1 Not Used.

3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

1 General

1.1 LAYOUT REQUIREMENTS

.1 Establish lines and levels, locate and layout, by instrumentation.

.2 Verify all lines, levels, datum, and dimensions as shown on the drawings, and report errors or inconsistencies in the above to the Departmental Representative before commencing work. Failure to do so does not relieve the Contractor from the responsibility of correcting same.

.3 Correctly lay out Work to lines and levels in accordance with the drawings; in all cases figured dimensions are to be followed rather that those scaled from the drawings.

.4 Exercise every possible precaution to verify the figures shown on the drawings and to obtain from the Departmental Representative any additional dimensions or information required before laying out the work. Be responsible for rectifying any errors or incorrect work due to his failure to exercise such precautions.

.5 Examine surfaces on, to or against which work is to go to ensure that same are square, true, level, plumb, or correct shape, and the like, or in the proper condition to receive such new work. Should any surface not be suitable notify the Departmental Representative, otherwise replace in an acceptable manner, any or all work as directed to correct any defects which may occur.

1.2 EXISTING SERVICES

.1 Before commencing work, establish location and extent of service lines in area of Work and notify Departmental Representative of findings.

.2 Where applicable, remove abandoned service lines within 2m of structures. Cap or otherwise seal lines at cut-off points as directed by Departmental Representative.

1.3 LOCATION OF EQUIPMENT AND FIXTURES

.1 Location of equipment, fixtures and outlets indicated or specified are to be considered as approximate.

.2 Locate equipment, fixtures and distribution systems to provide minimum interference and maximum usable space and in accordance with manufacturer's recommendations for safety, access and maintenance.

.3 Inform Departmental Representative of impending installation and obtain approval for actual location.

.4 Submit field drawings to indicate relative position of various services and equipment when required by Departmental Representative.

2 Products

2.1 NOT USED

.1 Not Used.

3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

1 General

1.1 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit written request in advance of cutting or alteration which affects:
- .1 Structural integrity of elements of project.
- .2 Integrity of weather-exposed or moisture-resistant elements.
- .3 Efficiency, maintenance, or safety of operational elements.
- .4 Visual qualities of sight-exposed elements.
- .5 Work of Owner or separate contractor.

.3 Include in request:
- .1 Identification of project.
- .2 Location and description of affected Work.
- .3 Statement on necessity for cutting or alteration.
- .4 Description of proposed Work, and products to be used.
- .5 Alternatives to cutting and patching.
- .6 Effect on Work of Owner or separate contractor.
- .7 Written permission of affected separate contractor.
- .8 Date and time work will be executed.

1.2 MATERIALS

.1 Required for original installation.

.2 Change in Materials: Submit request for substitution in accordance with Section 01 33 00 - Submittal Procedures.

1.3 PREPARATION

.1 Inspect existing conditions, including elements subject to damage or movement during cutting and patching.

.2 After uncovering, inspect conditions affecting performance of Work.

.3 Beginning of cutting or patching means acceptance of existing conditions.

.4 Provide supports to assure structural integrity of surroundings; provide devices and methods to protect other portions of project from damage.

.5 Provide protection from elements for areas which are to be exposed by uncovering work; maintain excavations free of water.

1.4 EXECUTION

.1 Execute cutting, fitting, and patching including excavation and fill, to complete Work.

.2 Fit several parts together, to integrate with other Work.

.3 Uncover Work to install ill-timed Work.

.4 Remove and replace defective and non-conforming Work.

.5 Remove samples of installed Work for testing.

.6 Provide openings in non-structural elements of Work for penetrations of mechanical and electrical Work.

.7 Execute Work by methods to avoid damage to other Work, and which will provide proper surfaces to receive patching and finishing.

.8 Employ original installer to perform cutting and patching for weather-exposed and moisture-resistant elements, and sight-exposed surfaces.

.9 Cut rigid materials using masonry saw or core drill. Pneumatic or impact tools not allowed on masonry work without prior approval.

.10 Restore work with new products in accordance with requirements of Contract Documents.

.11 Fit Work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

.12 At penetration of fire rated wall, ceiling, or floor construction, completely seal voids with firestopping material in accordance with Section 07 84 00 - Firestopping, full thickness of the construction element.

.13 Refinish surfaces to match adjacent finishes: Refinish continuous surfaces to nearest intersection. Refinish assemblies by refinishing entire unit.

.14 Conceal pipes, ducts and wiring in floor, wall and ceiling construction of finished areas except where indicated otherwise.

2 Products

2.1 NOT USED

.1 Not Used.

3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

1 General

1.1 PROJECT CLEANLINESS

.1 Maintain Work in tidy condition, free from accumulation of waste products and debris, other than that caused by Owner or other Contractors.

.2 Remove waste materials from site at daily regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site.

.3 Clear snow and ice from access to building, bank/pile snow in designated areas only.

.4 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.

.5 Provide on-site containers for collection of waste materials and debris.

.6 Dispose of waste materials and debris off site in a legal manner.

.7 Clean interior areas prior to start of finishing work, and maintain areas free of dust and other contaminants during finishing operations.

.8 Store volatile waste in covered metal containers, and remove from premises at end of each working day.

.9 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.

.10 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.

.11 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

1.2 FINAL CLEANING

.1 When Work is Substantially Performed remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.

.2 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.

.3 Prior to final review remove surplus products, tools, construction machinery and equipment.

.4 Remove waste products and debris other than that caused by Owner or other Contractors.

.5 Remove waste materials from site at regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site.

.6 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.

.7 Clean and polish glass, mirrors, hardware, wall tile, stainless steel, chrome, porcelain enamel, baked enamel, plastic laminate, and mechanical and electrical fixtures. Replace broken, scratched or disfigured glass.

.8 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, walls, ceilings, floors and other exposed surfaces.

.9 Clean lighting reflectors, lenses, and other lighting surfaces.

.10 Vacuum clean and dust building interiors, behind grilles, louvres and screens.

.11 Wax, seal or prepare floor finishes, as recommended by manufacturer.

.12 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.

.13 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.

.14 Remove dirt and other disfiguration from exterior surfaces.

.15 Sweep and wash clean paved areas.

.16 Clean equipment and fixtures to sanitary condition; clean or replace filters of mechanical equipment.

.17 Remove snow and ice from access to building.

2 Products

2.1 NOT USED

.1 Not Used.

3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

1 General

1.1 ADMINISTRATIVE REQUIREMENTS

.1 Acceptance of Work Procedures:
  .1 Contractor's Inspection: Contractor: conduct inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents.
    .1 Notify Departmental Representative in writing of satisfactory completion of Contractor's inspection and submit verification that corrections have been made.
    .2 Request Departmental Representative's inspection.
  .2 Departmental Representative's Inspection:
    .1 Departmental Representative and Contractor to inspect Work and identify defects and deficiencies.
    .2 Contractor to correct Work as directed.
  .3 Completion Tasks: submit written certificates in English that tasks have been performed as follows:
    .1 Work: completed and inspected for compliance with Contract Documents.
    .2 Defects: corrected and deficiencies completed.
    .3 Equipment and systems: tested, adjusted, balanced and fully operational.
    .4 Certificates required by Boiler Inspection Branch, Fire Commissioner and Utility companies: submitted.
    .5 Operation of systems: demonstrated to Owner's personnel.
    .6 Commissioning of mechanical systems: completed in accordance with 01 91 13 - General Commissioning (Cx) Requirements and copies of final Commissioning Report submitted to Departmental Representative.
    .7 Work: complete and ready for final inspection.
  .4 Final Inspection:
    .1 When completion tasks are done, request final inspection of Work by Departmental Representative and Contractor.
    .2 When Work incomplete according to Departmental Representative, complete outstanding items and request re-inspection.

  .5 Declaration of Substantial Performance: when Departmental Representative considers deficiencies and defects corrected and requirements of Contract substantially performed, make application for Certificate of Substantial Performance.

  .6 Commencement of Lien and Warranty Periods: date of Owner's acceptance of submitted declaration of Substantial Performance to be date for commencement for warranty period and commencement of lien period unless required otherwise by lien statute of Place of Work.

.7 Final Payment:
.1 When Departmental Representative considers final deficiencies and defects corrected and requirements of Contract met, make application for final payment.

.8 Payment of Holdback: after issuance of Certificate of Substantial Performance of Work, submit application for payment of holdback amount in accordance with contractual agreement.

1.2 FINAL CLEANING

.1 Clean in accordance with Section 01 74 11 - Cleaning.
.1 Remove surplus materials, excess materials, rubbish, tools and equipment.

2 Products

2.1 NOT USED

.1 Not Used.

3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

1 General

1.1 ADMINISTRATIVE REQUIREMENTS

.1 Pre-warranty Meeting:
- .1 Convene meeting one week prior to contract completion with Contractor's representative and Departmental Representative, in accordance with Section 01 31 19 - Project Meetings to:
  - .1 Verify Project requirements.
  - .2 Review warranty requirements and manufacturer's installation instructions.
- .2 Departmental Representative to establish communication procedures for:
  - .1 Notifying construction warranty defects.
  - .2 Determine priorities for type of defects.
  - .3 Determine reasonable response time.
- .3 Contact information for bonded and licensed company for warranty work action: provide name, telephone number and address of company authorized for construction warranty work action.
- .4 Ensure contact is located within local service area of warranted construction, is continuously available, and is responsive to inquiries for warranty work action.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Two weeks prior to Substantial Performance of the Work, submit to the Departmental Representative, one (1) final hard copy and three (3) unprotected PDF electronic copies on CDs of as built drawings and two (2) final hard copies and three (3) unprotected electronic copies on CDs, of operating and maintenance manuals and Building Management Manuals in English.

.3 Provide spare parts, maintenance materials and special tools of same quality and manufacture as products provided in Work.

.4 Provide evidence, if requested, for type, source and quality of products supplied.

1.3 FORMAT

.1 Organize data as instructional manual.

.2 Binders: vinyl, hard covered, 3 'D' ring, loose leaf 219 x 279 mm with spine and face pockets.

.3 When multiple binders are used correlate data into related consistent groupings.
- .1 Identify contents of each binder on spine.

.4 Cover: identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.

.5 Arrange content by systems, under Section numbers and sequence of Table of Contents.

.6 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.

.7 Text: manufacturer's printed data, or typewritten data.

.8 Drawings: provide with reinforced punched binder tab.
.1 Bind in with text; fold larger drawings to size of text pages.

.9 Provide two (2) copies of 1:1 scaled CAD files in unprotected PDF format on CD.

1.4 CONTENTS - PROJECT RECORD DOCUMENTS

.1 Table of Contents for Each Volume: provide title of project;
.1 Date of submission; names.
.2 Addresses, and telephone numbers of Consultant and Contractor with name of responsible parties.
.3 Schedule of products and systems, indexed to content of volume.

.2 For each product or system:
.1 List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.

.3 Product Data: mark each sheet to identify specific products and component parts, and data applicable to installation; delete inapplicable information.

.4 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.

.5 Typewritten Text: as required to supplement product data.
.1 Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 01 45 00 - Quality Control.

.6 Training: refer to Section 01 79 00 - Demonstration and Training.

1.5 AS -BUILT DOCUMENTS AND SAMPLES

.1 Maintain, at site for Departmental Representative one record copy of:
.1 Contract Drawings.
.2 Specifications.
.3 Addenda.
.4 Change Orders and other modifications to Contract.
.5 Reviewed shop drawings, product data, and samples.
.6 Field test records.
.7 Inspection certificates.
.8 Manufacturer's certificates.

.2 Store record documents and samples in field office apart from documents used for construction.
.1 Provide files, racks, and secure storage.

.3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual.
.1 Label each document "PROJECT RECORD" in neat, large, printed letters.

.4 Maintain record documents in clean, dry and legible condition.
.1 Do not use record documents for construction purposes.

.5 Keep record documents and samples available for inspection by Departmental Representative.

1.6 RECORDING INFORMATION ON PROJECT RECORD DOCUMENTS

.1 Record information on set of black line opaque drawings, and in copy of Project Manual, provided by Departmental Representative, and on two electronic unprotected PDF drawing sets and two electronic unprotected PDF copies of the Project Manual.

.2 Use felt tip marking pens, maintaining separate colours for each major system, for recording information.

.3 Record information concurrently with construction progress.
.1 Do not conceal Work until required information is recorded.

.4 Contract Drawings and shop drawings: mark each item to record actual construction, including:
.1 Measured depths of elements of foundation in relation to finish first floor datum.
.2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
.3 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.
.4 Field changes of dimension and detail.
.5 Changes made by change orders.
.6 Details not on original Contract Drawings.
.7 References to related shop drawings and modifications.

.5 Specifications: mark each item to record actual construction, including:
.1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.
.2 Changes made by Addenda and change orders.

.6 Other Documents: maintain manufacturer's certifications, inspection certifications, field test records, required by individual specifications sections.

.7 Provide digital photos, if requested, for site records.

1.7 FINAL SURVEY

.1 Submit final site survey certificate in accordance with Section 01 71 00 - Examination and Preparation, certifying that elevations and locations of completed Work are in conformance, or non-conformance with Contract Documents.

1.8 EQUIPMENT AND SYSTEMS

.1 For each item of equipment and each system include description of unit or system, and component parts.
  .1 Give function, normal operation characteristics and limiting conditions.
  .2 Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.

.2 Panel board circuit directories: provide electrical service characteristics, controls, and communications.

.3 Include installed colour coded wiring diagrams.

.4 Operating Procedures: include start-up, break-in, and routine normal operating instructions and sequences.
  .1 Include regulation, control, stopping, shut-down, and emergency instructions.
  .2 Include summer, winter, and any special operating instructions.

.5 Maintenance Requirements: include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

.6 Provide servicing and lubrication schedule, and list of lubricants required.

.7 Include manufacturer's printed operation and maintenance instructions.

.8 Include sequence of operation by controls manufacturer.

.9 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

.10 Provide installed control diagrams by controls manufacturer.

.11 Provide Contractor's co-ordination drawings, with installed colour coded piping diagrams.

.12 Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

.13 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

.14 Include test and balancing reports as specified in Section 01 45 00 - Quality Control and 01 91 13 - General Commissioning (Cx) Requirements.

.15 Additional requirements: as specified in individual specification sections.

1.9 MATERIALS AND FINISHES

.1 Building products, applied materials, and finishes: include product data, with catalogue number, size, composition, and colour and texture designations.
  .1 Provide information for re-ordering custom manufactured products.

.2 Instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

.3 Moisture-protection and weather-exposed products: include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

.4 Additional requirements: as specified in individual specifications sections.

1.10 MAINTENANCE MATERIALS

.1 Spare Parts:
  .1 Provide spare parts, in quantities specified in individual specification sections.
  .2 Provide items of same manufacture and quality as items in Work.
  .3 Deliver to location as directed; place and store.
  .4 Receive and catalogue items.
    .1 Submit inventory listing to Departmental Representative.
    .2 Include approved listings in Maintenance Manual.
  .5 Obtain receipt for delivered products and submit prior to final payment.

.2 Extra Stock Materials:
  .1 Provide maintenance and extra materials, in quantities specified in individual specification sections.
  .2 Provide items of same manufacture and quality as items in Work.
  .3 Deliver to location as directed; place and store.
  .4 Receive and catalogue items.
    .1 Submit inventory listing to Departmental Representative.
    .2 Include approved listings in Maintenance Manual.
  .5 Obtain receipt for delivered products and submit prior to final payment.

.3 Special Tools:
  .1 Provide special tools, in quantities specified in individual specification section.
  .2 Provide items with tags identifying their associated function and equipment.
  .3 Deliver to location as directed; place and store.
  .4 Receive and catalogue items.
    .1 Submit inventory listing to Departmental Representative.
    .2 Include approved listings in Maintenance Manual.

1.11 DELIVERY, STORAGE AND HANDLING

.1 Store spare parts, maintenance materials, and special tools in manner to prevent damage or deterioration.

.2 Store in original and undamaged condition with manufacturer's seal and labels intact.

.3 Store components subject to damage from weather in weatherproof enclosures.

.4 Store paints and freezable materials in a heated and ventilated room.

.5 Remove and replace damaged products at own expense and for review by Departmental Representative.

1.12 WARRANTIES AND BONDS

.1 Develop warranty management plan to contain information relevant to Warranties.

.2 Submit warranty management plan, 30 days before planned pre-warranty conference, to Departmental Representative approval.

.3 Warranty management plan to include required actions and documents to assure that Departmental Representative receives warranties to which it is entitled.

.4 Provide plan in narrative form and contain sufficient detail to make it suitable for use by future maintenance and repair personnel.

.5 Submit, warranty information made available during construction phase, to Departmental Representative for approval prior to each monthly pay estimate.

.6 Assemble approved information in binder, submit upon acceptance of work and organize binder as follows:
- .1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.
- .2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.
- .3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten days after completion of applicable item of work.
- .4 Verify that documents are in proper form, contain full information, and are notarized.
- .5 Co-execute submittals when required.
- .6 Retain warranties and bonds until time specified for submittal.

.7 Except for items put into use with Departmental Representative's permission, leave date of beginning of time of warranty until Date of Substantial Performance is determined.

.8 Conduct joint 4 month and 9 month warranty inspection, measured from time of acceptance, by Departmental Representative.

.9 Include information contained in warranty management plan as follows:
- .1 Roles and responsibilities of personnel associated with warranty process, including points of contact and telephone numbers within the organizations of Contractors, subcontractors, manufacturers or suppliers involved.
- .2 Listing and status of delivery of Certificates of Warranty for extended warranty items, to include roofs, HVAC balancing, pumps, motors, transformers,

commissioned systems, fire protection, alarm systems, sprinkler systems and the like.

.3 Provide list for each warranted equipment, item, feature of construction or system indicating:
- .1 Name of item.
- .2 Model and serial numbers.
- .3 Location where installed.
- .4 Name and phone numbers of manufacturers or suppliers.
- .5 Names, addresses and telephone numbers of sources of spare parts.
- .6 Warranties and terms of warranty: include one-year overall warranty of construction. Indicate items that have extended warranties and show separate warranty expiration dates.
- .7 Cross-reference to warranty certificates as applicable.
- .8 Starting point and duration of warranty period.
- .9 Summary of maintenance procedures required to continue warranty in force.
- .10 Cross-Reference to specific pertinent Operation and Maintenance manuals.
- .11 Organization, names and phone numbers of persons to call for warranty service.
- .12 Typical response time and repair time expected for various warranted equipment.

.4 Contractor's plans for attendance at 4 and 9 month post-construction warranty inspections.

.5 Procedure and status of tagging of equipment covered by extended warranties.

.6 Post copies of instructions near selected pieces of equipment where operation is critical for warranty and/or safety reasons.

.10 Respond in timely manner to oral or written notification of required construction warranty repair work.

.11 Written verification to follow oral instructions.
- .1 Failure to respond will be cause for the Departmental Representative to proceed with action against Contractor.

1.13 WARRANTY TAGS

.1 Tag, at time of installation, each warranted item. Provide durable, oil and water resistant tag approved by Departmental Representative.

.2 Attach tags with copper wire and spray with waterproof silicone coating.

.3 Leave date of acceptance until project is accepted for occupancy.

.4 Indicate following information on tag:
- .1 Type of product/material.
- .2 Model number.
- .3 Serial number.
- .4 Contract number.
- .5 Warranty period.

.6 Inspector's signature.
.7 Construction Contractor.

2 Products

2.1 NOT USED

.1 Not Used.

3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Brookfield Global Integrated Solutions - Equipment Data Collection Form (DCF) - Ver 1.2

ONLY EQUIPMENT THAT BROOK FIELD GIS IS RESPONSIBLE TO PERFORM PLANNED MAINTENANCE SHOULD BE RECORDED

GENERAL INFORMATION

Subm Date (Sep 22, 2010): _____ Project#: _____

CBG (ex: TD, CIBC, etc) **: _____ Requester Name**: _____

Client Building # **: _____ Requesters Phone #: _____

Building # **: _____ Building Address: _____

All O&M Binders should be submitted to the FM. Pdf versions can be submitted with this form to be stored on the Brookfield GIS Portal

** denotes mandatory field

EQUIPMENT INFORMATION

☐ Add Equipment ☐ Replace Old Equipment ☐ Update Equipment ☐ Inactivate Equipment (info retained)

Current Building Item ID# (if known): _____ Criticality (1-Critical, 2-Minimal Impact, 3-Non-Critical): _____

Building Item (Equip) Description **: _____

Belongs to Equipment ID: _____

Specific Location of Equip **: _____

What does this equipment service? (ex: Air Conditioning Unit serving LAN Room) _____

System Type (2 digits): _____

Building Item Type (3 digits): _____

Client ID#: _____

Manufacturer Name: _____

Model: _____

Serial #: _____

Note: These fields are mandatory for all HVAC products containing refrigerant **

Tonnage: _____

Ref Capacity (kg): _____

Refrigerant Type: _____

ODP Tag #: _____

ODP Tag Date: _____

WARRANTY INFORMATION

Warrantor Name: _____ Install Date: _____

Warranty/Terms: _____ Warranty Expiry Date: _____

Estimate Service Life (Years): _____

SPECIFIC EQUIPMENT INFORMATION

Volts: _____ Phase: _____ FLA: _____

Filter Size (hxwxthk): _____ Belt Size: _____ HP/Watt: _____

Filter Quantity: _____ Belt Quantity: _____ BTU/Watt: _____

Energy Source: ☐ NATURAL GAS ☐ OIL ☐ PROPANE ☐ ELECTRIC

REQUESTER COMMENTS

_____

_____

_____

PM SCHEDULING INFORMATION (Optional)

Please fill in date Annual should be performed in as well as any service provider if known

Service Provider 1: _____ First Date: _____ Frequency: _____ ***

Service Provider 2: _____ First Date: _____ Frequency: _____ ***

Service Provider 3: _____ First Date: _____ Frequency: _____ ***

*** Available: Daily, Weekly, Bi-Weekly (every 2 wks), Monthly, Bi-Monthly (every 2 mos), Quarterly, Semi-Annual, Annual, 2 Year, 3 Year, 5 Year, 6 Year, 10 Year, 12 Year, 15 Year

Return all completed forms to GOC.CMMS@Brookfieldgis.com, enter the region in the subject line of the email

1 General

1.1 ADMINISTRATIVE REQUIREMENTS

.1 Demonstrate scheduled operation and maintenance of equipment and systems to Owner's personnel two weeks prior to date of Substantial Performance.

.2 Departmental Representative: provide list of personnel to receive instructions, and co-ordinate their attendance at agreed-upon times.

.3 Preparation:
- .1 Verify conditions for demonstration and instructions comply with requirements.
- .2 Verify designated personnel are present.
- .3 Ensure equipment has been inspected and put into operation.
- .4 Ensure testing, adjusting, and balancing has been performed in accordance with Section 01 91 13 - General Commissioning (Cx) Requirements and equipment and systems are fully operational.

.4 Demonstration and Instructions:
- .1 Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, and maintenance of each item of equipment at scheduled times, at the equipment or designated location.
- .2 Instruct personnel in phases of operation and maintenance using operation and maintenance manuals as basis of instruction.
- .3 Review contents of manual in detail to explain aspects of operation and maintenance.
- .4 Prepare and insert additional data in operations and maintenance manuals when needed during instructions.

.5 Time Allocated for Instructions: ensure amount of time required for instruction of each item of equipment or system is adequate to fully demonstrate equipment use, trouble shooting, maintenance and the like as required.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit schedule of time and date for demonstration of each item of equipment and each system two weeks prior to designated dates, for Departmental Representative's approval.

.3 Submit reports within one week after completion of demonstration, that demonstration and instructions have been satisfactorily completed.

.4 Give time and date of each demonstration, with list of persons present.

.5 Provide copies of completed operation and maintenance manuals for use in demonstrations and instructions.

1.3 QUALITY ASSURANCE

.1 When specified in individual Sections requiring manufacturer to provide authorized representative to demonstrate operation of equipment and systems:
  .1 Instruct Owner's personnel.
  .2 Provide written report that demonstration and instructions have been completed.

2 Products

2.1 NOT USED

.1 Not Used.

3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

1. General

1.1 Summary

.1 Section Includes:

.1 General requirements relating to commissioning of project's components and systems, specifying general requirements to performance verification of components, equipment, sub-systems, systems, and integrated systems.

.2 Applicable to the St. Paul existing building renovation.

.2 Related Sections:

.1 Section 01 33 00 - Submittal Procedures

.2 Section 01 91 31 - Commissioning Plan

.3 Acronyms:

.1 Cx - Commissioning.

.2 CxA- Commissioning Authority

.3 EMCS - Energy Management and Control Systems.

.4 O&M - Operation and Maintenance.

.5 PI - Product Information.

.6 FPT - Functional Performance Testing.

.7 TAB - Testing, Adjusting and Balancing.

1.2 General

.1 Commissioning is a systematic verification, documentation and training process applied to all activities during the design, construction, static verification, start-up and functional performance testing of equipment and systems in a facility to ensure that the facility operates in conformity with the owner’s project requirements, the basis of design and the contract documents.. Objectives:

.1 Static Verification: The commissioning team shall verify and document that all identified commissionable equipment are in accordance with the design requirements and correctly installed, connected and labelled.

.2 Start-up: The commissioning team shall witness and document all start-up activities

.3 Functional Performance Testing: The commissioning team shall verify and document that the equipment and systems have been installed and activated in accordance the contract documents and manufacturer's instructions. Verification shall be completed and accepted before equipment or systems are handed over and or interim acceptance.

.4 Effectively train O&M staff.

.2 The commissioning process does not take away from or reduce the responsibility of the system designers or installing contractors to provide a finished, fully functioning product.

.3 The Commissioning Authority (CxA) is not responsible for primary quality assurance or quality control on the project. The role of the CxA is supplementary to the QA/QC role supplied by the Contractor and the Engineer of Record.

.4 The Commissioning Authority (CxA) is not responsible for the design concept, design criteria, compliance with codes design or general construction scheduling, cost estimating or construction management.

.5 The Commissioning Authority (CxA) is not responsible for system evaluations; adequacy of systems to meet owner's project requirements, capacity of systems, quality control checks, or any other elements and recommended final acceptance of systems to the Owner resides with the Engineer of Record.

.6 Corrective repairs should be completed prior to any scheduled testing.

1.3 Definitions

.1 The terms noted below will be used throughout the Cx process and within the Cx documentation. Any reference to these terms carries the stated and associated definition as outlined below.

.1 **Commissioning Authority (CxA) / Commissioning Manager** - Is the individual designated to organize, lead, and review the completion of commissioning process activities. The CxA facilitates communication among the Owner, Designer, and Contractors to ensure that complex systems are installed and function in accordance with the Owner's Project Requirements.

.2 **Commissioning Agents** - The internal technical resource staff of the Commissioning Authority that will be responsible for the execution of field reviews and the on-site "hands on" testing activities.

.3 **Commissioning Team** - Personnel that will be directly involved in the building commissioning process. The Commissioning Team will be made up of the Commissioning Agents, Contractors, Design Consultants, Owners' Representatives, Independent Third Party Testing Agencies, and Government of Alberta Representatives.

.4 **Commissioning Plan** - The Commissioning Plan is a document that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process. The Commissioning Plan is a dynamic document;

which is open to be updated by the Commissioning Team throughout the commissioning process to ensure accuracy and relevance as the project progresses. The final Commissioning Plan will be submitted in Commissioning Report.

.5 **Contractor's Site Cx Coordinator:** Personnel that represent the mechanical and electrical contractors that coordinate the commissioning process with the CxA.

.6 **Owner's Project Requirements** - Is a written document that details the ideas, concepts, and criteria that are determined by the Owner to be important to the success of the project.

.7 **Design Narrative** - The Design Narrative (DN) is where the design team describes in detail the concepts and features it intends to incorporate during schematic design.

.8 **Basis of Design** - Includes the necessary design information needed to accomplish the Owner's Project Requirements, including system descriptions, indoor environmental quality criteria, design assumptions and references to applicable codes, standards, regulations and guidelines.

.9 **Contractors** – Includes those responsible for physical construction of the project. This designation may include Prime Construction Contractors, and sub-contractors such as Electrical, Mechanical, and Controls firms.

.10 **Third Party Testing Firms** - Specialty firms or agencies retained to conduct acceptance tests on a system or component and provide a certificate of acceptance and conformance to governing standards.

.11 **Project Manager** - The individual or firm responsible for the overall management and delivery of the project to the Owner.

.12 **Consultants** - The Architects and Engineers responsible for producing the design drawings and specifications for this project, as well as the base contract administration inspection, quality assurance and acceptance activities.

.13 **User / Operator** - A User or Operator is an individual or group that will work in and operate various aspects of the facility once the project has been turned over.

.14 **In Contract Tests** - Testing requirements that are defined in the contract documents that are a Contractor's responsibility to carry out and document appropriately.

.15 **Out of Contract Tests** – Testing requirements that are not covered as part of the construction documents but are required to be carried out by certified agencies.

.16 **Commissioning Checksheets (Verification Forms)** – Mechanical and electrical equipment checksheets that are specific to each system, and its major components. These are used to verify system operation and are developed by the CxA with the support of the project team and OEM suppliers.

.17 **Static Installation Checks** – Systematic, detailed checks of mechanical and electrical system components. Contractors will utilize commissioning checksheets for recording installation compliance. The timing of the performance of static checks is tied to construction progress and occurs once the contractor's construction installation process and construction checks have been completed for the individual equipment components, or systems.

.18 **Contractor Start-Up Program** - Contractor start-up and verification program activities are conducted by the Contractors and/or their sub-trades and equipment vendors. Contractor / Vendor verification of the physical installation of equipment, and reviewing the completion of system installation and readiness, shall be completed prior to the Commissioning Agent's functional performance testing and verification activities.

.19 **Functional Performance Testing** - Functional performance tests are specific hands-on tests, used to verify that the equipment and associated systems meet the specified design parameters and operate as fully integrated components or systems through their respective level of automation. This testing also confirms the capabilities of each system to meet the requirements of the facility, and the Owner's Project Requirements. To test all systems under peak operating conditions, some functional performance testing may be deferred to times when peak operation occurs.

.20 **Acceptance Inspections** - A series of formal inspections carried out for systems that result in acceptance of the work as complete. These typically would consist of In-Wall, Above-Ceiling, and Semi-Final / Final site reviews.

1.4 Scope of Work

.1 Detailed testing shall be performed on identified commissionable installed equipment and systems to ensure that operation and performance conform to contract documents. All tests shall be performed by the responsible trade contractor, evaluated and witnessed by Commissioning Authority. After each grade of checklist and test are complete the system will be upgraded to the next test.

.2 Once a system(s) has been completed and passed all functional tests it will be ready for acceptance by the CxA and CM, with recommendation for turn-over to the Owner. The following testing is required as part of the commissioning process and is the responsibility of the appropriate trade contractor:

.1 Pre-Installation Checklists - completed for all equipment inspection for damage or compliance with an approved submittal upon arrival at the site from the supplier. Checklists are provided and completed and submitted by the respective manufacturer and/or contractor.

.2 Installation Checklists are comprised of a full range of checks developed to insure that all systems were actually installed correctly. This includes piping is complete, all electric is tied in and complete and all accessories are installed.

.3 Pre-functional checklists are comprised of a full range checks developed to insure that all systems were actually installed correctly. Following the installation

and vendor start-up, the installing contractor along with the manufacturer's representative are required to perform a series of physical installation checks, instrumentation inspections and control wiring verifications to ensure that the equipment is installed in accordance with the manufacturers recommendations, and all components, equipment, systems and interfaces between systems operate in accordance with the contract documents. This include piping is complete, all electric is tied-in and complete, all accessories are installed, interlocks verified. This includes all operating modes, interlocks, control responses, and specific responses to abnormal or emergency conditions.

.4 Functional Performance Tests (FPT) – Functional testing will not be permitted if any of the items are not completed as part of the start-up and pre-functional phases of the project. Functional performance testing phase is where operation of the equipment and/or systems is demonstrated to the CM, engineer and CxA for acceptance. This will include operation of the various components of the equipment as a complete system under load conditions in all operating modes, and determine if the mechanical and electrical systems are providing the required services in accordance with the finalized design intent. These tests shall also determine the installed capacity of the cooling and heating plant and the individual heat transfer components

.5 Integrated System Testing – Integrated testing shall not be permitted until all functional testing procedures have been completed and deficiencies corrected. This phase of the commissioning process will test the mechanical and emergency generator equipment/systems as complete systems to check interaction of systems and demonstrate integrated system operations during normal and failure scenarios.

.3 Comprehensive training O&M personnel shall be performed by the CM, MEP Contractors and where appropriate by other subcontractors and factory trained manufacturer's / vendor technicians prior to turnover of building to the Owner. The training shall include on-site classroom instruction, along with hands-on instruction on the installed equipment and systems

1.5 Equipment/Systems to be Commissioned

.1 The following equipment/systems will be commissioned as part of this project

.1 Mechanical

.1 Make up air unit

.2 Exhaust air fan

.3 Transfer air fan

.4 Airflow distribution system, including air flow velocities

.5 Domestic Water Systems

.6 Air compressor

.7 Controls

.2 Electrical

.1 Lighting systems (interior)

.2 Panel Boards (for Edson only).

1.6 Commissioning Overview

.1 Refer to Section 01 91 31 – Commissioning (Cx) Plan.

.2 For commissioning team responsibilities refer to the Commissioning (Cx) Plan.

.3 A commissioning kick-off meeting of all commissioning team members shall be held at a time and place designated by the CxA. The purpose shall be to familiarize all parties with the commissioning process, and to ensure that the responsibilities of each party are clearly understood.

.4 During the construction process commissioning meetings will take place that will include attendance for all necessary trades or a company representative that are involve in the commissioning process. During the beginning of construction they will take place monthly and increase in frequency as the project progresses.

.5 The contractor(s) shall complete all phases of work so the system can be started, tested, balanced, and acceptance procedures undertaken. This includes the complete installation of all equipment, materials, pipe, duct, wire, insulation, controls, etc. per the Contract Documents and related directives, clarifications and change orders.

.6 The CxA shall develop the Commissioning Plan. The Draft Commissioning Plan has been included as part of the Contract Documents. The Contractor shall assist the Commissioning Authority in preparing and up-dating the Commissioning Plan by providing necessary information pertaining to the actual equipment and installation. If contractor initiated system changes have been made that alter the commissioning process; the Commissioning Authority shall notify the CM and Owner. The Commissioning Plan can be modified based on the construction schedule and can be done so after consolation with the OWNER at the discretion of the CxA.

.7 Acceptance procedures are normally intended to being prior to completion of a system and/or sub-system, and shall be coordinated with Division 15 and 16. Start of acceptance procedures before system completion does not relieve the contractor from completing those systems as per the schedule

.8 Engineer will issue Substantial Completion when:

.1 Completed Cx documentation has been received, reviewed for suitability and approved by CxA.

.2 Equipment, components and systems have been commissioned.

.3 O&M training has been completed.

1.7 Non-Conformance to Performance Verification Requirements

.1 The CxA will observe and document the results of all functional performance tests performed by the trade contractors using the test procedural forms developed for that purpose.

.2 The CxA will record the results of the functional test on the procedure or test form. All issues shall be noted and reported to the Owner, CM and Contractors on an issues log.

.3 As tests progress and an issue are identified, the CxA shall discuss the issue with the commissioning team, and the executing contractor.

.4 When there is no dispute on the deficiency and the contractor accepts responsibility to correct it:

.1 The CxA will document the deficiency and the contractor's response and intentions or corrections. The CxA and contractor then proceed to another test or sequence. The contractor corrects the issues, and confirms that equipment is ready to be retested.

.2 Once the contractor corrects the deficiency, the test is rescheduled and repeated in the anticipation of correct operation or function. If a deficiency is identified, the cost of retesting will be as called for in "Cost of Retesting".

.5 Should equipment, system components, and associated controls be incorrectly installed or malfunction during commissioning, correct documented deficiencies, re-verify equipment and components within the non-functional system, including related systems as deemed required by Engineer, to ensure effective performance.

.6 Costs for corrective work, additional tests, inspections, to determine acceptability and proper performance of such items to be borne by Contractor.

.7 Cost for the contractor to retest a Pre-functional or Functional test if they are responsible shall be borne by responsible contractor. The CxA shall be compensated for the additional testing and shall submit a change order to the Owner for the additional commissioning cost.

.8 For an issue identified, not related to any Pre-functional checklist or start- up fault, the following shall apply: The CxA will direct the retesting of the equipment once at no "charge". However, the CxA's and owner's time for a second retest will be charged to the CM who may choose to recover costs from the responsible contractor or subcontractor. Before retesting occurs, the CM will inspect the deficiency and respond to the CxA that the issue has been addressed.

.9 The time for the CxA and Owner to direct any retesting required because a specific Prefuntional checklist or startup test item, reported to have been successfully completed but determined during functional testing to be faulty, will be back charged to the CM who may choose to recover costs from the party responsible for misinformation or deficiency.

.10 The contractor shall submit in writing to the CxA and CM at least as often as commissioning meetings are being scheduled concerning the status of each apparent

outstanding discrepancy identified during commissioning. Discussion shall cover explanations of any disagreement and proposals for their resolutions.

.11 Any required retesting by any contractor shall not be considered a justified reason for a claim of delay or for an extension of time by the CM, contractors or subcontractors.

1.8 Submittals

.1 The CxA will review approved submittals related to the commissioned equipment for conformance to the contract documents as it relates to the commissioning process, to the performance of the equipment and adequacy for developing test procedures. This review is intended primarily to aid in the development of performance procedures and only secondarily to verify compliance with equipment specifications. The CxA will notify the Owner of items missing or areas that are not in conformance with contract documents and which requires resubmission.

.2 Include O&M manuals specific for each piece of equipment together with all equipment submitted for engineer review and approval.

.3 The CxA may request additional design narrative from the A/E and controls contractor, depending on the completeness of the OPR documentation and sequences provided with the specifications.

.4 The CxA will review the submittals once. The CxA will receive a copy of the final approved submittals.

1.9 Commissioning Schedule

.1 The Commissioning Schedule is generated based on information provided to the commissioning team regarding construction dates and project timelines as supplied by the project and commissioning teams. The Commissioning Schedule is a dynamic process and designed to incorporate updates from the ongoing construction process as they become available. The overall commissioning process is targeted to dovetail into the construction process wherever practical by following the construction completion and readiness milestones. As project construction milestones and projected completion updates are made available to the Commissioning Team, the Commissioning Schedule will be updated and resubmitted accordingly.

.2 The Commissioning Authority will update the Commissioning Schedule on regular intervals to show commissioning progress and whenever significant changes occur to the dates provided for commissioning activities. The Commissioning Schedules are sent to the Owner to be distributed.

1.10 Commissioning Meetings

.1 Convene Cx meetings following project meetings: 01 91 31 - Commissioning Plan and as specified herein.

.2 Purpose: to resolve issues, monitor progress, identify deficiencies, relating to Cx.

.3 Continue Cx meetings on regular basis until commissioning deliverables have been addressed.

.4 At 60% construction completion stage. Contractor to call a separate Cx scope meeting to review progress, discuss schedule of equipment start-up activities and prepare for Cx. Issues at meeting to include:

.1 Review duties and responsibilities of Contractor and subcontractors, addressing delays and potential problems.

.2 Determine the degree of involvement of trades and manufacturer's representatives in the commissioning process.

.5 Thereafter Cx meetings to be held until project completion and as required during equipment start-up and functional testing period.

.6 Meetings will be scheduled and chaired by Contractor, who will record and distribute minutes.

.7 Ensure subcontractors and relevant manufacturer representatives are present at 60% and subsequent Cx meetings and as required.

1.11 Starting and Testing

.1 Construction checklists are important to verify that the equipment and systems are fully connected and operational. It ensures that performance testing (in-depth system checkout) may proceed without unnecessary delays. The construction checklists for a given system must be successfully completed and approved prior to startup and formal performance testing of equipment or subsystems of the given system.

.2 Provide 14 days' notice prior to commencement.

.3 Engineer and/or Cx Agent may witness start-up and testing.

.4 Startup and Checkout Plan: The CxA will assist the project commissioning team members responsible for startup of any equipment. The primary role of the CxA in this process is to ensure that there is written documentation that each of the manufacturer-recommended procedures has been completed. The CxA shall provide construction checklists and startup shall be identified in the commissioning scoping meeting and on the checklist forms

.1 The construction checklists (draft/samples) are provided in the attachment section of the Commissioning Plan. These checklists indicate required procedures to be executed as part of startup and initial checkout of the systems and the party responsible for their execution.

.2 The contractor shall determine which trade is responsible for executing and documenting each of the line item tasks and transmit the checklists to the responsible subcontractors. Each form may have more than one trade responsible for its execution.

.3 The contractor/subcontractor with assistance from the CxA responsible for the purchase of the equipment shall develop the full startup plan by combining the manufacturer's detailed startup and checkout procedures and the construction checklists.

.4 The contractor/subcontractor shall submit the full startup plan to the CxA for review and approval.

.5 The contractor will transmit the full startup plan to the subcontractors for their review and use.

.6 Operation and Maintenance Data – Contractors will provide a copy of O & M literature within 45 days of each submittal acceptance for use during the commissioning process for all commissioned equipment systems. The CxA will review the O & M literature once for conformance to project requirements. The CxA will receive a copy of the final approved O & M literature once corrections have been made by the contractor.

.7 Demonstration and Training – Contractors, their sub-contractors, equipment manufacturers and vendors will provide demonstration and training as required by the specification and these commissioning requirements. A complete training plan and schedule must be submitted by the Contractor to the CxA four (4) weeks prior to any training. A training agenda for each training session must be submitted to the CxA two (2) weeks prior to the training session.

1.12 Manufacturer's Involvement

.1 Factory testing: manufacturer to:

.1 Coordinate time and location of testing.

.2 Provide testing documentation for approval by Engineer.

.3 Arrange for Engineer to witness tests.

.4 Obtain written approval of test results and documentation from Engineer before delivery to site.

.2 Obtain manufacturers installation, start-up and operations instructions prior to start-up of components, equipment and systems and review with Engineer and Cx Agent.

.1 Compare completed installation with manufacturer's published data, record discrepancies, and review with manufacturer.

.2 Modify procedures detrimental to equipment performance and review same with manufacturer before start-up.

.3 Integrity of warranties:

.1 Use manufacturers trained start-up personnel where specified elsewhere in other divisions or required to maintain integrity of warranty.

.2 Verify with manufacturer that testing as specified will not void warranties.

.4 Qualifications of manufacturer's personnel:

.1 Experienced in design, installation and operation of equipment and systems.

.2 Ability to interpret test results accurately.

.3 To report results in clear, concise, logical manner.

1.13 Operation and Maintenance of Equipment and Systems

.1 After start-up, operate and maintain equipment and systems as directed by equipment/system manufacturer.

.2 With assistance of manufacturer develop written maintenance program and submit to Engineer for approval before implementation.

.3 Operate and maintain systems for length of time required for commissioning to be completed.

.4 After completion of commissioning, operate and maintain systems until issuance of certificate of interim acceptance.

1.14 Test Results

.1 If start-up, or testing produce unacceptable results, repair, replace or repeat specified starting and/or PV procedures until acceptable results are achieved.

.2 Provide manpower and materials, assume costs for re-commissioning.

1.15 Instruments / Equipment

.1 Submit to Cx Agent for review and approval:

.1 Complete list of instruments proposed to be used.

.2 Listed data including; serial number, current calibration certificate, calibration date, and calibration expiry date and calibration accuracy.

.2 Provide the following equipment as required:

.1 2-way radios.

.2 Ladders

.3 Equipment as required to complete work.

1.16 Extrapolation of Results

.1 Where Cx of weather, occupancy, or seasonal-sensitive equipment or systems cannot be conducted under near-rated or near-design conditions, extrapolate part-load results to design conditions when approved by Engineer in accordance with equipment manufacturer's instructions, using manufacturer's data, with manufacturer's assistance and using approved formulae.

1.17 Completion of Commissioning

.1 Upon completion of Cx leave systems in normal operating mode.

.2 Except for warranty and seasonal verification activities specified in Cx specifications, complete Cx prior to issuance of Interim Certificate of Completion.

.3 Cx to be considered complete when contract Cx deliverables have been submitted and accepted by Engineer.

1.18 Activities Upon Completion of Commissioning

.1 When changes are made to baseline components or system settings established during Cx process, provide updated Cx form for affected item.

1.19 Training

.1 In accordance with Section 01 79 00 – Demonstration and Training

1.20 Occupancy

.1 Cooperate fully with Engineer during stages of acceptance and occupancy of facility.

END OF SECTION

1. General

1.1 Summary

.1 Section Includes:

.1 General requirements relating to commissioning of project's components and systems, specifying general requirements to performance verification of components, equipment, sub-systems, systems, and integrated systems.

.2 Applicable to the Edson Existing Building Renovation.

.2 Related Sections:

.1 Section 01 33 00 - Submittal Procedures

.2 Section 01 91 31 - Commissioning Plan

.3 Acronyms:

.1 Cx - Commissioning.

.2 CxA- Commissioning Authority

.3 EMCS - Energy Management and Control Systems.

.4 O&M - Operation and Maintenance.

.5 PI - Product Information.

.6 FPT - Functional Performance Testing.

.7 TAB - Testing, Adjusting and Balancing.

1.2 General

.1 Commissioning is a systematic verification, documentation and training process applied to all activities during the design, construction, static verification, start-up and functional performance testing of equipment and systems in a facility to ensure that the facility operates in conformity with the owner’s project requirements, the basis of design and the contract documents.. Objectives:

.1 Static Verification: The commissioning team shall verify and document that all identified commissionable equipment are in accordance with the design requirements and correctly installed, connected and labelled.

.2 Start-up: The commissioning team shall witness and document all start-up activities

.3 Functional Performance Testing: The commissioning team shall verify and document that the equipment and systems have been installed and activated in accordance the contract documents and manufacturer's instructions. Verification shall be completed and accepted before equipment or systems are handed over and or interim acceptance.

.4 Effectively train O&M staff.

.2 The commissioning process does not take away from or reduce the responsibility of the system designers or installing contractors to provide a finished, fully functioning product.

.3 The Commissioning Authority (CxA) is not responsible for primary quality assurance or quality control on the project. The role of the CxA is supplementary to the QA/QC role supplied by the Contractor and the Engineer of Record.

.4 The Commissioning Authority (CxA) is not responsible for the design concept, design criteria, compliance with codes design or general construction scheduling, cost estimating or construction management.

.5 The Commissioning Authority (CxA) is not responsible for system evaluations; adequacy of systems to meet owner's project requirements, capacity of systems, quality control checks, or any other elements and recommended final acceptance of systems to the Owner resides with the Engineer of Record.

.6 Corrective repairs should be completed prior to any scheduled testing.

1.3 Definitions

.1 The terms noted below will be used throughout the Cx process and within the Cx documentation. Any reference to these terms carries the stated and associated definition as outlined below.

.1 **Commissioning Authority (CxA) / Commissioning Manager** - Is the individual designated to organize, lead, and review the completion of commissioning process activities. The CxA facilitates communication among the Owner, Designer, and Contractors to ensure that complex systems are installed and function in accordance with the Owner's Project Requirements.

.2 **Commissioning Agents** - The internal technical resource staff of the Commissioning Authority that will be responsible for the execution of field reviews and the on-site "hands on" testing activities.

.3 **Commissioning Team** - Personnel that will be directly involved in the building commissioning process. The Commissioning Team will be made up of the Commissioning Agents, Contractors, Design Consultants, Owners' Representatives, Independent Third Party Testing Agencies, and Government of Alberta Representatives.

.4 **Commissioning Plan** - The Commissioning Plan is a document that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process. The Commissioning Plan is a dynamic document;

which is open to be updated by the Commissioning Team throughout the commissioning process to ensure accuracy and relevance as the project progresses. The final Commissioning Plan will be submitted in Commissioning Report.

.5 **Contractor's Site Cx Coordinator:** Personnel that represent the mechanical and electrical contractors that coordinate the commissioning process with the CxA.

.6 **Owner's Project Requirements** - Is a written document that details the ideas, concepts, and criteria that are determined by the Owner to be important to the success of the project.

.7 **Design Narrative** - The Design Narrative (DN) is where the design team describes in detail the concepts and features it intends to incorporate during schematic design.

.8 **Basis of Design** - Includes the necessary design information needed to accomplish the Owner's Project Requirements, including system descriptions, indoor environmental quality criteria, design assumptions and references to applicable codes, standards, regulations and guidelines.

.9 **Contractors** – Includes those responsible for physical construction of the project. This designation may include Prime Construction Contractors, and sub-contractors such as Electrical, Mechanical, and Controls firms.

.10 **Third Party Testing Firms** - Specialty firms or agencies retained to conduct acceptance tests on a system or component and provide a certificate of acceptance and conformance to governing standards.

.11 **Project Manager** - The individual or firm responsible for the overall management and delivery of the project to the Owner.

.12 **Consultants** - The Architects and Engineers responsible for producing the design drawings and specifications for this project, as well as the base contract administration inspection, quality assurance and acceptance activities.

.13 **User / Operator** - A User or Operator is an individual or group that will work in and operate various aspects of the facility once the project has been turned over.

.14 **In Contract Tests** - Testing requirements that are defined in the contract documents that are a Contractor's responsibility to carry out and document appropriately.

.15 **Out of Contract Tests** – Testing requirements that are not covered as part of the construction documents but are required to be carried out by certified agencies.

.16 **Commissioning Checksheets (Verification Forms)** – Mechanical and electrical equipment checksheets that are specific to each system, and its major components. These are used to verify system operation and are developed by the CxA with the support of the project team and OEM suppliers.

.17 **Static Installation Checks** – Systematic, detailed checks of mechanical and electrical system components. Contractors will utilize commissioning checksheets for recording installation compliance. The timing of the performance of static checks is tied to construction progress and occurs once the contractor's construction installation process and construction checks have been completed for the individual equipment components, or systems.

.18 **Contractor Start-Up Program** - Contractor start-up and verification program activities are conducted by the Contractors and/or their sub-trades and equipment vendors. Contractor / Vendor verification of the physical installation of equipment, and reviewing the completion of system installation and readiness, shall be completed prior to the Commissioning Agent's functional performance testing and verification activities.

.19 **Functional Performance Testing** - Functional performance tests are specific hands-on tests, used to verify that the equipment and associated systems meet the specified design parameters and operate as fully integrated components or systems through their respective level of automation. This testing also confirms the capabilities of each system to meet the requirements of the facility, and the Owner's Project Requirements. To test all systems under peak operating conditions, some functional performance testing may be deferred to times when peak operation occurs.

.20 **Acceptance Inspections** - A series of formal inspections carried out for systems that result in acceptance of the work as complete. These typically would consist of In-Wall, Above-Ceiling, and Semi-Final / Final site reviews.

1.4 Scope of Work

.1 Detailed testing shall be performed on identified commissionable installed equipment and systems to ensure that operation and performance conform to contract documents. All tests shall be performed by the responsible trade contractor, evaluated and witnessed by Commissioning Authority. After each grade of checklist and test are complete the system will be upgraded to the next test.

.2 Once a system(s) has been completed and passed all functional tests it will be ready for acceptance by the CxA and CM, with recommendation for turn-over to the Owner. The following testing is required as part of the commissioning process and is the responsibility of the appropriate trade contractor:

.1 Pre-Installation Checklists - completed for all equipment inspection for damage or compliance with an approved submittal upon arrival at the site from the supplier. Checklists are provided and completed and submitted by the respective manufacturer and/or contractor.

.2 Installation Checklists are comprised of a full range of checks developed to insure that all systems were actually installed correctly. This includes piping is complete, all electric is tied in and complete and all accessories are installed.

.3 Pre-functional checklists are comprised of a full range checks developed to insure that all systems were actually installed correctly. Following the installation

and vendor start-up, the installing contractor along with the manufacturer's representative are required to perform a series of physical installation checks, instrumentation inspections and control wiring verifications to ensure that the equipment is installed in accordance with the manufacturers recommendations, and all components, equipment, systems and interfaces between systems operate in accordance with the contract documents. This include piping is complete, all electric is tied-in and complete, all accessories are installed, interlocks verified. This includes all operating modes, interlocks, control responses, and specific responses to abnormal or emergency conditions.

.4 Functional Performance Tests (FPT) – Functional testing will not be permitted if any of the items are not completed as part of the start-up and pre-functional phases of the project. Functional performance testing phase is where operation of the equipment and/or systems is demonstrated to the CM, engineer and CxA for acceptance. This will include operation of the various components of the equipment as a complete system under load conditions in all operating modes, and determine if the mechanical and electrical systems are providing the required services in accordance with the finalized design intent. These tests shall also determine the installed capacity of the cooling and heating plant and the individual heat transfer components

.5 Integrated System Testing – Integrated testing shall not be permitted until all functional testing procedures have been completed and deficiencies corrected. This phase of the commissioning process will test the mechanical and emergency generator equipment/systems as complete systems to check interaction of systems and demonstrate integrated system operations during normal and failure scenarios.

.3 Comprehensive training O&M personnel shall be performed by the CM, MEP Contractors and where appropriate by other subcontractors and factory trained manufacturer's / vendor technicians prior to turnover of building to the Owner. The training shall include on-site classroom instruction, along with hands-on instruction on the installed equipment and systems

1.5 Equipment/Systems to be Commissioned

.1 The following equipment/systems will be commissioned as part of this project

.1 Mechanical

.1 Make up air unit

.2 Exhaust air fan

.3 Transfer air fan

.4 Airflow distribution system, including air flow velocities

.5 Air compressor

.6 Controls

.2 Electrical

.1 Lighting systems (interior)

.2 Panel Boards

1.6 Commissioning Overview

.1 Refer to Section 01 91 31 – Commissioning (Cx) Plan.

.2 For commissioning team responsibilities refer to the Commissioning (Cx) Plan.

.3 A commissioning kick-off meeting of all commissioning team members shall be held at a time and place designated by the CxA. The purpose shall be to familiarize all parties with the commissioning process, and to ensure that the responsibilities of each party are clearly understood.

.4 During the construction process commissioning meetings will take place that will include attendance for all necessary trades or a company representative that are involve in the commissioning process. During the beginning of construction they will take place monthly and increase in frequency as the project progresses.

.5 The contractor(s) shall complete all phases of work so the system can be started, tested, balanced, and acceptance procedures undertaken. This includes the complete installation of all equipment, materials, pipe, duct, wire, insulation, controls, etc. per the Contract Documents and related directives, clarifications and change orders.

.6 The CxA shall develop the Commissioning Plan. The Draft Commissioning Plan has been included as part of the Contract Documents. The Contractor shall assist the Commissioning Authority in preparing and up-dating the Commissioning Plan by providing necessary information pertaining to the actual equipment and installation. If contractor initiated system changes have been made that alter the commissioning process; the Commissioning Authority shall notify the CM and Owner. The Commissioning Plan can be modified based on the construction schedule and can be done so after consolation with the OWNER at the discretion of the CxA.

.7 Acceptance procedures are normally intended to being prior to completion of a system and/or sub-system, and shall be coordinated with Division 15 and 16. Start of acceptance procedures before system completion does not relieve the contractor from completing those systems as per the schedule

.8 Engineer will issue Substantial Completion when:

.1 Completed Cx documentation has been received, reviewed for suitability and approved by CxA.

.2 Equipment, components and systems have been commissioned.

.3 O&M training has been completed.

1.7 Non-Conformance to Performance Verification Requirements

.1 The CxA will observe and document the results of all functional performance tests performed by the trade contractors using the test procedural forms developed for that purpose.

.2 The CxA will record the results of the functional test on the procedure or test form. All issues shall be noted and reported to the Owner, CM and Contractors on an issues log.

.3 As tests progress and an issue are identified, the CxA shall discuss the issue with the commissioning team, and the executing contractor.

.4 When there is no dispute on the deficiency and the contractor accepts responsibility to correct it:

.1 The CxA will document the deficiency and the contractor's response and intentions or corrections. The CxA and contractor then proceed to another test or sequence. The contractor corrects the issues, and confirms that equipment is ready to be retested.

.2 Once the contractor corrects the deficiency, the test is rescheduled and repeated in the anticipation of correct operation or function. If a deficiency is identified, the cost of retesting will be as called for in "Cost of Retesting".

.5 Should equipment, system components, and associated controls be incorrectly installed or malfunction during commissioning, correct documented deficiencies, re-verify equipment and components within the non-functional system, including related systems as deemed required by Engineer, to ensure effective performance.

.6 Costs for corrective work, additional tests, inspections, to determine acceptability and proper performance of such items to be borne by Contractor.

.7 Cost for the contractor to retest a Pre-functional or Functional test if they are responsible shall be borne by responsible contractor. The CxA shall be compensated for the additional testing and shall submit a change order to the Owner for the additional commissioning cost.

.8 For an issue identified, not related to any Pre-functional checklist or start- up fault, the following shall apply: The CxA will direct the retesting of the equipment once at no "charge". However, the CxA's and owner's time for a second retest will be charged to the CM who may choose to recover costs from the responsible contractor or subcontractor. Before retesting occurs, the CM will inspect the deficiency and respond to the CxA that the issue has been addressed.

.9 The time for the CxA and Owner to direct any retesting required because a specific Prefuntional checklist or startup test item, reported to have been successfully completed but determined during functional testing to be faulty, will be back charged to the CM who may choose to recover costs from the party responsible for misinformation or deficiency.

.10 The contractor shall submit in writing to the CxA and CM at least as often as commissioning meetings are being scheduled concerning the status of each apparent

outstanding discrepancy identified during commissioning. Discussion shall cover explanations of any disagreement and proposals for their resolutions.

.11 Any required retesting by any contractor shall not be considered a justified reason for a claim of delay or for an extension of time by the CM, contractors or subcontractors.

1.8 Submittals

.1 The CxA will review approved submittals related to the commissioned equipment for conformance to the contract documents as it relates to the commissioning process, to the performance of the equipment and adequacy for developing test procedures. This review is intended primarily to aid in the development of performance procedures and only secondarily to verify compliance with equipment specifications. The CxA will notify the Owner of items missing or areas that are not in conformance with contract documents and which requires resubmission.

.2 Include O&M manuals specific for each piece of equipment together with all equipment submitted for engineer review and approval.

.3 The CxA may request additional design narrative from the A/E and controls contractor, depending on the completeness of the OPR documentation and sequences provided with the specifications.

.4 The CxA will review the submittals once. The CxA will receive a copy of the final approved submittals.

1.9 Commissioning Schedule

.1 The Commissioning Schedule is generated based on information provided to the commissioning team regarding construction dates and project timelines as supplied by the project and commissioning teams. The Commissioning Schedule is a dynamic process and designed to incorporate updates from the ongoing construction process as they become available. The overall commissioning process is targeted to dovetail into the construction process wherever practical by following the construction completion and readiness milestones. As project construction milestones and projected completion updates are made available to the Commissioning Team, the Commissioning Schedule will be updated and resubmitted accordingly.

.2 The Commissioning Authority will update the Commissioning Schedule on regular intervals to show commissioning progress and whenever significant changes occur to the dates provided for commissioning activities. The Commissioning Schedules are sent to the Owner to be distributed.

1.10 Commissioning Meetings

.1 Convene Cx meetings following project meetings: 01 91 31 - Commissioning Plan and as specified herein.

.2 Purpose: to resolve issues, monitor progress, identify deficiencies, relating to Cx.

.3 Continue Cx meetings on regular basis until commissioning deliverables have been addressed.

.4 At 60% construction completion stage. Contractor to call a separate Cx scope meeting to review progress, discuss schedule of equipment start-up activities and prepare for Cx. Issues at meeting to include:

.1 Review duties and responsibilities of Contractor and subcontractors, addressing delays and potential problems.

.2 Determine the degree of involvement of trades and manufacturer's representatives in the commissioning process.

.5 Thereafter Cx meetings to be held until project completion and as required during equipment start-up and functional testing period.

.6 Meetings will be scheduled and chaired by Contractor, who will record and distribute minutes.

.7 Ensure subcontractors and relevant manufacturer representatives are present at 60% and subsequent Cx meetings and as required.

1.11 Starting and Testing

.1 Construction checklists are important to verify that the equipment and systems are fully connected and operational. It ensures that performance testing (in-depth system checkout) may proceed without unnecessary delays. The construction checklists for a given system must be successfully completed and approved prior to startup and formal performance testing of equipment or subsystems of the given system.

.2 Provide 14 days' notice prior to commencement.

.3 Engineer and/or Cx Agent may witness start-up and testing.

.4 Startup and Checkout Plan: The CxA will assist the project commissioning team members responsible for startup of any equipment. The primary role of the CxA in this process is to ensure that there is written documentation that each of the manufacturer-recommended procedures has been completed. The CxA shall provide construction checklists and startup shall be identified in the commissioning scoping meeting and on the checklist forms

.1 The construction checklists (draft/samples) are provided in the attachment section of the Commissioning Plan. These checklists indicate required procedures to be executed as part of startup and initial checkout of the systems and the party responsible for their execution.

.2 The contractor shall determine which trade is responsible for executing and documenting each of the line item tasks and transmit the checklists to the responsible subcontractors. Each form may have more than one trade responsible for its execution.

.3 The contractor/subcontractor with assistance from the CxA responsible for the purchase of the equipment shall develop the full startup plan by combining the manufacturer's detailed startup and checkout procedures and the construction checklists.

.4 The contractor/subcontractor shall submit the full startup plan to the CxA for review and approval.

.5 The contractor will transmit the full startup plan to the subcontractors for their review and use.

.6 Operation and Maintenance Data – Contractors will provide a copy of O & M literature within 45 days of each submittal acceptance for use during the commissioning process for all commissioned equipment systems. The CxA will review the O & M literature once for conformance to project requirements. The CxA will receive a copy of the final approved O & M literature once corrections have been made by the contractor.

.7 Demonstration and Training – Contractors, their sub-contractors, equipment manufacturers and vendors will provide demonstration and training as required by the specification and these commissioning requirements. A complete training plan and schedule must be submitted by the Contractor to the CxA four (4) weeks prior to any training. A training agenda for each training session must be submitted to the CxA two (2) weeks prior to the training session.

1.12 Manufacturer's Involvement

.1 Factory testing: manufacturer to:

.1 Coordinate time and location of testing.

.2 Provide testing documentation for approval by Engineer.

.3 Arrange for Engineer to witness tests.

.4 Obtain written approval of test results and documentation from Engineer before delivery to site.

.2 Obtain manufacturers installation, start-up and operations instructions prior to start-up of components, equipment and systems and review with Engineer and Cx Agent.

.1 Compare completed installation with manufacturer's published data, record discrepancies, and review with manufacturer.

.2 Modify procedures detrimental to equipment performance and review same with manufacturer before start-up.

.3 Integrity of warranties:

.1 Use manufacturers trained start-up personnel where specified elsewhere in other divisions or required to maintain integrity of warranty.

.2 Verify with manufacturer that testing as specified will not void warranties.

.4 Qualifications of manufacturer's personnel:

.1 Experienced in design, installation and operation of equipment and systems.

.2 Ability to interpret test results accurately.

.3 To report results in clear, concise, logical manner.

1.13 Operation and Maintenance of Equipment and Systems

.1 After start-up, operate and maintain equipment and systems as directed by equipment/system manufacturer.

.2 With assistance of manufacturer develop written maintenance program and submit to Engineer for approval before implementation.

.3 Operate and maintain systems for length of time required for commissioning to be completed.

.4 After completion of commissioning, operate and maintain systems until issuance of certificate of interim acceptance.

1.14 Test Results

.1 If start-up, or testing produce unacceptable results, repair, replace or repeat specified starting and/or PV procedures until acceptable results are achieved.

.2 Provide manpower and materials, assume costs for re-commissioning.

1.15 Instruments / Equipment

.1 Submit to Cx Agent for review and approval:

.1 Complete list of instruments proposed to be used.

.2 Listed data including; serial number, current calibration certificate, calibration date, and calibration expiry date and calibration accuracy.

.2 Provide the following equipment as required:

.1 2-way radios.

.2 Ladders

.3 Equipment as required to complete work.

1.16 Extrapolation of Results

.1 Where Cx of weather, occupancy, or seasonal-sensitive equipment or systems cannot be conducted under near-rated or near-design conditions, extrapolate part-load results to design conditions when approved by Engineer in accordance with equipment manufacturer's instructions, using manufacturer's data, with manufacturer's assistance and using approved formulae.

1.17 Completion of Commissioning

.1 Upon completion of Cx leave systems in normal operating mode.

.2 Except for warranty and seasonal verification activities specified in Cx specifications, complete Cx prior to issuance of Interim Certificate of Completion.

.3 Cx to be considered complete when contract Cx deliverables have been submitted and accepted by Engineer.

1.18 Activities Upon Completion of Commissioning

.1 When changes are made to baseline components or system settings established during Cx process, provide updated Cx form for affected item.

1.19 Training

.1 In accordance with Section 01 79 00 – Demonstration and Training

1.20 Occupancy

.1 Cooperate fully with Engineer during stages of acceptance and occupancy of facility.

END OF SECTION

1. General

1.1 Summary

.1 Section Includes:

.1 General requirements relating to commissioning of project's components and systems, specifying general requirements to performance verification of components, equipment, sub-systems, systems, and integrated systems.

.2 Applicable to the Red Deer Existing Building Renovation.

.2 Related Sections:

.1 Section 01 33 00 - Submittal Procedures

.2 Section 01 91 31 - Commissioning Plan

.3 Acronyms:

.1 Cx - Commissioning.

.2 CxA- Commissioning Authority

.3 EMCS - Energy Management and Control Systems.

.4 O&M - Operation and Maintenance.

.5 PI - Product Information.

.6 FPT - Functional Performance Testing.

.7 TAB - Testing, Adjusting and Balancing.

1.2 General

.1 Commissioning is a systematic verification, documentation and training process applied to all activities during the design, construction, static verification, start-up and functional performance testing of equipment and systems in a facility to ensure that the facility operates in conformity with the owner’s project requirements, the basis of design and the contract documents.. Objectives:

.1 Static Verification: The commissioning team shall verify and document that all identified commissionable equipment are in accordance with the design requirements and correctly installed, connected and labelled.

.2 Start-up: The commissioning team shall witness and document all start-up activities

.3 Functional Performance Testing: The commissioning team shall verify and document that the equipment and systems have been installed and activated in accordance the contract documents and manufacturer's instructions. Verification shall be completed and accepted before equipment or systems are handed over and or interim acceptance.

.4 Effectively train O&M staff.

.2 The commissioning process does not take away from or reduce the responsibility of the system designers or installing contractors to provide a finished, fully functioning product.

.3 The Commissioning Authority (CxA) is not responsible for primary quality assurance or quality control on the project. The role of the CxA is supplementary to the QA/QC role supplied by the Contractor and the Engineer of Record.

.4 The Commissioning Authority (CxA) is not responsible for the design concept, design criteria, compliance with codes design or general construction scheduling, cost estimating or construction management.

.5 The Commissioning Authority (CxA) is not responsible for system evaluations; adequacy of systems to meet owner's project requirements, capacity of systems, quality control checks, or any other elements and recommended final acceptance of systems to the Owner resides with the Engineer of Record.

.6 Corrective repairs should be completed prior to any scheduled testing.

1.3 Definitions

.1 The terms noted below will be used throughout the Cx process and within the Cx documentation. Any reference to these terms carries the stated and associated definition as outlined below.

.1 **Commissioning Authority (CxA) / Commissioning Manager** - Is the individual designated to organize, lead, and review the completion of commissioning process activities. The CxA facilitates communication among the Owner, Designer, and Contractors to ensure that complex systems are installed and function in accordance with the Owner's Project Requirements.

.2 **Commissioning Agents** - The internal technical resource staff of the Commissioning Authority that will be responsible for the execution of field reviews and the on-site "hands on" testing activities.

.3 **Commissioning Team** - Personnel that will be directly involved in the building commissioning process. The Commissioning Team will be made up of the Commissioning Agents, Contractors, Design Consultants, Owners' Representatives, Independent Third Party Testing Agencies, and Government of Alberta Representatives.

.4 **Commissioning Plan** - The Commissioning Plan is a document that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process. The Commissioning Plan is a dynamic document;

which is open to be updated by the Commissioning Team throughout the commissioning process to ensure accuracy and relevance as the project progresses. The final Commissioning Plan will be submitted in Commissioning Report.

.5 **Contractor's Site Cx Coordinator:** Personnel that represent the mechanical and electrical contractors that coordinate the commissioning process with the CxA.

.6 **Owner's Project Requirements** - Is a written document that details the ideas, concepts, and criteria that are determined by the Owner to be important to the success of the project.

.7 **Design Narrative** - The Design Narrative (DN) is where the design team describes in detail the concepts and features it intends to incorporate during schematic design.

.8 **Basis of Design** - Includes the necessary design information needed to accomplish the Owner's Project Requirements, including system descriptions, indoor environmental quality criteria, design assumptions and references to applicable codes, standards, regulations and guidelines.

.9 **Contractors** – Includes those responsible for physical construction of the project. This designation may include Prime Construction Contractors, and sub-contractors such as Electrical, Mechanical, and Controls firms.

.10 **Third Party Testing Firms** - Specialty firms or agencies retained to conduct acceptance tests on a system or component and provide a certificate of acceptance and conformance to governing standards.

.11 **Project Manager** - The individual or firm responsible for the overall management and delivery of the project to the Owner.

.12 **Consultants** - The Architects and Engineers responsible for producing the design drawings and specifications for this project, as well as the base contract administration inspection, quality assurance and acceptance activities.

.13 **User / Operator** - A User or Operator is an individual or group that will work in and operate various aspects of the facility once the project has been turned over.

.14 **In Contract Tests** - Testing requirements that are defined in the contract documents that are a Contractor's responsibility to carry out and document appropriately.

.15 **Out of Contract Tests** – Testing requirements that are not covered as part of the construction documents but are required to be carried out by certified agencies.

.16 **Commissioning Checksheets (Verification Forms)** – Mechanical and electrical equipment checksheets that are specific to each system, and its major components. These are used to verify system operation and are developed by the CxA with the support of the project team and OEM suppliers.

.17 **Static Installation Checks** – Systematic, detailed checks of mechanical and electrical system components. Contractors will utilize commissioning checksheets for recording installation compliance. The timing of the performance of static checks is tied to construction progress and occurs once the contractor's construction installation process and construction checks have been completed for the individual equipment components, or systems.

.18 **Contractor Start-Up Program** - Contractor start-up and verification program activities are conducted by the Contractors and/or their sub-trades and equipment vendors. Contractor / Vendor verification of the physical installation of equipment, and reviewing the completion of system installation and readiness, shall be completed prior to the Commissioning Agent's functional performance testing and verification activities.

.19 **Functional Performance Testing** - Functional performance tests are specific hands-on tests, used to verify that the equipment and associated systems meet the specified design parameters and operate as fully integrated components or systems through their respective level of automation. This testing also confirms the capabilities of each system to meet the requirements of the facility, and the Owner's Project Requirements. To test all systems under peak operating conditions, some functional performance testing may be deferred to times when peak operation occurs.

.20 **Acceptance Inspections** - A series of formal inspections carried out for systems that result in acceptance of the work as complete. These typically would consist of In-Wall, Above-Ceiling, and Semi-Final / Final site reviews.

1.4 Scope of Work

.1 Detailed testing shall be performed on identified commissionable installed equipment and systems to ensure that operation and performance conform to contract documents. All tests shall be performed by the responsible trade contractor, evaluated and witnessed by Commissioning Authority. After each grade of checklist and test are complete the system will be upgraded to the next test.

.2 Once a system(s) has been completed and passed all functional tests it will be ready for acceptance by the CxA and CM, with recommendation for turn-over to the Owner. The following testing is required as part of the commissioning process and is the responsibility of the appropriate trade contractor:

.1 Pre-Installation Checklists - completed for all equipment inspection for damage or compliance with an approved submittal upon arrival at the site from the supplier. Checklists are provided and completed and submitted by the respective manufacturer and/or contractor.

.2 Installation Checklists are comprised of a full range of checks developed to insure that all systems were actually installed correctly. This includes piping is complete, all electric is tied in and complete and all accessories are installed.

.3 Pre-functional checklists are comprised of a full range checks developed to insure that all systems were actually installed correctly. Following the installation

and vendor start-up, the installing contractor along with the manufacturer's representative are required to perform a series of physical installation checks, instrumentation inspections and control wiring verifications to ensure that the equipment is installed in accordance with the manufacturers recommendations, and all components, equipment, systems and interfaces between systems operate in accordance with the contract documents. This include piping is complete, all electric is tied-in and complete, all accessories are installed, interlocks verified. This includes all operating modes, interlocks, control responses, and specific responses to abnormal or emergency conditions.

.4 Functional Performance Tests (FPT) – Functional testing will not be permitted if any of the items are not completed as part of the start-up and pre-functional phases of the project. Functional performance testing phase is where operation of the equipment and/or systems is demonstrated to the CM, engineer and CxA for acceptance. This will include operation of the various components of the equipment as a complete system under load conditions in all operating modes, and determine if the mechanical and electrical systems are providing the required services in accordance with the finalized design intent. These tests shall also determine the installed capacity of the cooling and heating plant and the individual heat transfer components

.5 Integrated System Testing – Integrated testing shall not be permitted until all functional testing procedures have been completed and deficiencies corrected. This phase of the commissioning process will test the mechanical and emergency generator equipment/systems as complete systems to check interaction of systems and demonstrate integrated system operations during normal and failure scenarios.

.3 Comprehensive training O&M personnel shall be performed by the CM, MEP Contractors and where appropriate by other subcontractors and factory trained manufacturer's / vendor technicians prior to turnover of building to the Owner. The training shall include on-site classroom instruction, along with hands-on instruction on the installed equipment and systems

1.5 Equipment/Systems to be Commissioned

.1 The following equipment/systems will be commissioned as part of this project

.1 Mechanical

.1 Make up air unit

.2 Exhaust air fan

.3 Airflow distribution system, including air flow velocities

.4 Domestic water systems

.5 Air compressor

.6 Controls

.2 Electrical

.1 Lighting systems (interior)

1.6 Commissioning Overview

.1 Refer to Section 01 91 31 – Commissioning (Cx) Plan.

.2 For commissioning team responsibilities refer to the Commissioning (Cx) Plan.

.3 A commissioning kick-off meeting of all commissioning team members shall be held at a time and place designated by the CxA. The purpose shall be to familiarize all parties with the commissioning process, and to ensure that the responsibilities of each party are clearly understood.

.4 During the construction process commissioning meetings will take place that will include attendance for all necessary trades or a company representative that are involve in the commissioning process. During the beginning of construction they will take place monthly and increase in frequency as the project progresses.

.5 The contractor(s) shall complete all phases of work so the system can be started, tested, balanced, and acceptance procedures undertaken. This includes the complete installation of all equipment, materials, pipe, duct, wire, insulation, controls, etc. per the Contract Documents and related directives, clarifications and change orders.

.6 The CxA shall develop the Commissioning Plan. The Draft Commissioning Plan has been included as part of the Contract Documents. The Contractor shall assist the Commissioning Authority in preparing and up-dating the Commissioning Plan by providing necessary information pertaining to the actual equipment and installation. If contractor initiated system changes have been made that alter the commissioning process; the Commissioning Authority shall notify the CM and Owner. The Commissioning Plan can be modified based on the construction schedule and can be done so after consolation with the OWNER at the discretion of the CxA.

.7 Acceptance procedures are normally intended to being prior to completion of a system and/or sub-system, and shall be coordinated with Division 15 and 16. Start of acceptance procedures before system completion does not relieve the contractor from completing those systems as per the schedule

.8 Engineer will issue Substantial Completion when:

.1 Completed Cx documentation has been received, reviewed for suitability and approved by CxA.

.2 Equipment, components and systems have been commissioned.

.3 O&M training has been completed.

1.7 Non-Conformance to Performance Verification Requirements

.1 The CxA will observe and document the results of all functional performance tests performed by the trade contractors using the test procedural forms developed for that purpose.

.2 The CxA will record the results of the functional test on the procedure or test form. All issues shall be noted and reported to the Owner, CM and Contractors on an issues log.

.3 As tests progress and an issue are identified, the CxA shall discuss the issue with the commissioning team, and the executing contractor.

.4 When there is no dispute on the deficiency and the contractor accepts responsibility to correct it:

.1 The CxA will document the deficiency and the contractor's response and intentions or corrections. The CxA and contractor then proceed to another test or sequence. The contractor corrects the issues, and confirms that equipment is ready to be retested.

.2 Once the contractor corrects the deficiency, the test is rescheduled and repeated in the anticipation of correct operation or function. If a deficiency is identified, the cost of retesting will be as called for in "Cost of Retesting".

.5 Should equipment, system components, and associated controls be incorrectly installed or malfunction during commissioning, correct documented deficiencies, re-verify equipment and components within the non-functional system, including related systems as deemed required by Engineer, to ensure effective performance.

.6 Costs for corrective work, additional tests, inspections, to determine acceptability and proper performance of such items to be borne by Contractor.

.7 Cost for the contractor to retest a Pre-functional or Functional test if they are responsible shall be borne by responsible contractor. The CxA shall be compensated for the additional testing and shall submit a change order to the Owner for the additional commissioning cost.

.8 For an issue identified, not related to any Pre-functional checklist or start- up fault, the following shall apply: The CxA will direct the retesting of the equipment once at no "charge". However, the CxA's and owner's time for a second retest will be charged to the CM who may choose to recover costs from the responsible contractor or subcontractor. Before retesting occurs, the CM will inspect the deficiency and respond to the CxA that the issue has been addressed.

.9 The time for the CxA and Owner to direct any retesting required because a specific Prefuntional checklist or startup test item, reported to have been successfully completed but determined during functional testing to be faulty, will be back charged to the CM who may choose to recover costs from the party responsible for misinformation or deficiency.

.10 The contractor shall submit in writing to the CxA and CM at least as often as commissioning meetings are being scheduled concerning the status of each apparent

outstanding discrepancy identified during commissioning. Discussion shall cover explanations of any disagreement and proposals for their resolutions.

.11 Any required retesting by any contractor shall not be considered a justified reason for a claim of delay or for an extension of time by the CM, contractors or subcontractors.

1.8 Submittals

.1 The CxA will review approved submittals related to the commissioned equipment for conformance to the contract documents as it relates to the commissioning process, to the performance of the equipment and adequacy for developing test procedures. This review is intended primarily to aid in the development of performance procedures and only secondarily to verify compliance with equipment specifications. The CxA will notify the Owner of items missing or areas that are not in conformance with contract documents and which requires resubmission.

.2 Include O&M manuals specific for each piece of equipment together with all equipment submitted for engineer review and approval.

.3 The CxA may request additional design narrative from the A/E and controls contractor, depending on the completeness of the OPR documentation and sequences provided with the specifications.

.4 The CxA will review the submittals once. The CxA will receive a copy of the final approved submittals.

1.9 Commissioning Schedule

.1 The Commissioning Schedule is generated based on information provided to the commissioning team regarding construction dates and project timelines as supplied by the project and commissioning teams. The Commissioning Schedule is a dynamic process and designed to incorporate updates from the ongoing construction process as they become available. The overall commissioning process is targeted to dovetail into the construction process wherever practical by following the construction completion and readiness milestones. As project construction milestones and projected completion updates are made available to the Commissioning Team, the Commissioning Schedule will be updated and resubmitted accordingly.

.2 The Commissioning Authority will update the Commissioning Schedule on regular intervals to show commissioning progress and whenever significant changes occur to the dates provided for commissioning activities. The Commissioning Schedules are sent to the Owner to be distributed.

1.10 Commissioning Meetings

.1 Convene Cx meetings following project meetings: 01 91 31 - Commissioning Plan and as specified herein.

.2 Purpose: to resolve issues, monitor progress, identify deficiencies, relating to Cx.

.3 Continue Cx meetings on regular basis until commissioning deliverables have been addressed.

.4 At 60% construction completion stage. Contractor to call a separate Cx scope meeting to review progress, discuss schedule of equipment start-up activities and prepare for Cx. Issues at meeting to include:

.1 Review duties and responsibilities of Contractor and subcontractors, addressing delays and potential problems.

.2 Determine the degree of involvement of trades and manufacturer's representatives in the commissioning process.

.5 Thereafter Cx meetings to be held until project completion and as required during equipment start-up and functional testing period.

.6 Meetings will be scheduled and chaired by Contractor, who will record and distribute minutes.

.7 Ensure subcontractors and relevant manufacturer representatives are present at 60% and subsequent Cx meetings and as required.

1.11 Starting and Testing

.1 Construction checklists are important to verify that the equipment and systems are fully connected and operational. It ensures that performance testing (in-depth system checkout) may proceed without unnecessary delays. The construction checklists for a given system must be successfully completed and approved prior to startup and formal performance testing of equipment or subsystems of the given system.

.2 Provide 14 days' notice prior to commencement.

.3 Engineer and/or Cx Agent may witness start-up and testing.

.4 Startup and Checkout Plan: The CxA will assist the project commissioning team members responsible for startup of any equipment. The primary role of the CxA in this process is to ensure that there is written documentation that each of the manufacturer-recommended procedures has been completed. The CxA shall provide construction checklists and startup shall be identified in the commissioning scoping meeting and on the checklist forms

.1 The construction checklists (draft/samples) are provided in the attachment section of the Commissioning Plan. These checklists indicate required procedures to be executed as part of startup and initial checkout of the systems and the party responsible for their execution.

.2 The contractor shall determine which trade is responsible for executing and documenting each of the line item tasks and transmit the checklists to the responsible subcontractors. Each form may have more than one trade responsible for its execution.

.3 The contractor/subcontractor with assistance from the CxA responsible for the purchase of the equipment shall develop the full startup plan by combining the manufacturer's detailed startup and checkout procedures and the construction checklists.

.4 The contractor/subcontractor shall submit the full startup plan to the CxA for review and approval.

.5 The contractor will transmit the full startup plan to the subcontractors for their review and use.

.6 Operation and Maintenance Data – Contractors will provide a copy of O & M literature within 45 days of each submittal acceptance for use during the commissioning process for all commissioned equipment systems. The CxA will review the O & M literature once for conformance to project requirements. The CxA will receive a copy of the final approved O & M literature once corrections have been made by the contractor.

.7 Demonstration and Training – Contractors, their sub-contractors, equipment manufacturers and vendors will provide demonstration and training as required by the specification and these commissioning requirements. A complete training plan and schedule must be submitted by the Contractor to the CxA four (4) weeks prior to any training. A training agenda for each training session must be submitted to the CxA two (2) weeks prior to the training session.

1.12 Manufacturer's Involvement

.1 Factory testing: manufacturer to:

.1 Coordinate time and location of testing.

.2 Provide testing documentation for approval by Engineer.

.3 Arrange for Engineer to witness tests.

.4 Obtain written approval of test results and documentation from Engineer before delivery to site.

.2 Obtain manufacturers installation, start-up and operations instructions prior to start-up of components, equipment and systems and review with Engineer and Cx Agent.

.1 Compare completed installation with manufacturer's published data, record discrepancies, and review with manufacturer.

.2 Modify procedures detrimental to equipment performance and review same with manufacturer before start-up.

.3 Integrity of warranties:

.1 Use manufacturers trained start-up personnel where specified elsewhere in other divisions or required to maintain integrity of warranty.

.2 Verify with manufacturer that testing as specified will not void warranties.

.4 Qualifications of manufacturer's personnel:

.1 Experienced in design, installation and operation of equipment and systems.

.2 Ability to interpret test results accurately.

.3 To report results in clear, concise, logical manner.

1.13 Operation and Maintenance of Equipment and Systems

.1 After start-up, operate and maintain equipment and systems as directed by equipment/system manufacturer.

.2 With assistance of manufacturer develop written maintenance program and submit to Engineer for approval before implementation.

.3 Operate and maintain systems for length of time required for commissioning to be completed.

.4 After completion of commissioning, operate and maintain systems until issuance of certificate of interim acceptance.

1.14 Test Results

.1 If start-up, or testing produce unacceptable results, repair, replace or repeat specified starting and/or PV procedures until acceptable results are achieved.

.2 Provide manpower and materials, assume costs for re-commissioning.

1.15 Instruments / Equipment

.1 Submit to Cx Agent for review and approval:

.1 Complete list of instruments proposed to be used.

.2 Listed data including; serial number, current calibration certificate, calibration date, and calibration expiry date and calibration accuracy.

.2 Provide the following equipment as required:

.1 2-way radios.

.2 Ladders

.3 Equipment as required to complete work.

1.16 Extrapolation of Results

.1 Where Cx of weather, occupancy, or seasonal-sensitive equipment or systems cannot be conducted under near-rated or near-design conditions, extrapolate part-load results to design conditions when approved by Engineer in accordance with equipment manufacturer's instructions, using manufacturer's data, with manufacturer's assistance and using approved formulae.

1.17 Completion of Commissioning

.1 Upon completion of Cx leave systems in normal operating mode.

.2 Except for warranty and seasonal verification activities specified in Cx specifications, complete Cx prior to issuance of Interim Certificate of Completion.

.3 Cx to be considered complete when contract Cx deliverables have been submitted and accepted by Engineer.

1.18 Activities Upon Completion of Commissioning

.1 When changes are made to baseline components or system settings established during Cx process, provide updated Cx form for affected item.

1.19 Training

.1 In accordance with Section 01 79 00 – Demonstration and Training

1.20 Occupancy

.1 Cooperate fully with Engineer during stages of acceptance and occupancy of facility.

END OF SECTION

1. General

1.1 Summary

.1 Section Includes:

.1 General requirements relating to commissioning of project's components and systems, specifying general requirements to performance verification of components, equipment, sub-systems, systems, and integrated systems.

.2 Applicable to the Edmonton Existing Building Renovation.

.2 Related Sections:

.1 Section 01 33 00 - Submittal Procedures

.2 Section 01 91 31 - Commissioning Plan

.3 Acronyms:

.1 Cx - Commissioning.

.2 CxA- Commissioning Authority

.3 EMCS - Energy Management and Control Systems.

.4 O&M - Operation and Maintenance.

.5 PI - Product Information.

.6 FPT - Functional Performance Testing.

.7 TAB - Testing, Adjusting and Balancing.

1.2 General

.1 Commissioning is a systematic verification, documentation and training process applied to all activities during the design, construction, static verification, start-up and functional performance testing of equipment and systems in a facility to ensure that the facility operates in conformity with the owner’s project requirements, the basis of design and the contract documents.. Objectives:

.1 Static Verification: The commissioning team shall verify and document that all identified commissionable equipment are in accordance with the design requirements and correctly installed, connected and labelled.

.2 Start-up: The commissioning team shall witness and document all start-up activities

.3 Functional Performance Testing: The commissioning team shall verify and document that the equipment and systems have been installed and activated in accordance the contract documents and manufacturer's instructions. Verification shall be completed and accepted before equipment or systems are handed over and or interim acceptance.

.4 Effectively train O&M staff.

.2 The commissioning process does not take away from or reduce the responsibility of the system designers or installing contractors to provide a finished, fully functioning product.

.3 The Commissioning Authority (CxA) is not responsible for primary quality assurance or quality control on the project. The role of the CxA is supplementary to the QA/QC role supplied by the Contractor and the Engineer of Record.

.4 The Commissioning Authority (CxA) is not responsible for the design concept, design criteria, compliance with codes design or general construction scheduling, cost estimating or construction management.

.5 The Commissioning Authority (CxA) is not responsible for system evaluations; adequacy of systems to meet owner's project requirements, capacity of systems, quality control checks, or any other elements and recommended final acceptance of systems to the Owner resides with the Engineer of Record.

.6 Corrective repairs should be completed prior to any scheduled testing.

1.3 Definitions

.1 The terms noted below will be used throughout the Cx process and within the Cx documentation. Any reference to these terms carries the stated and associated definition as outlined below.

.1 **Commissioning Authority (CxA) / Commissioning Manager** - Is the individual designated to organize, lead, and review the completion of commissioning process activities. The CxA facilitates communication among the Owner, Designer, and Contractors to ensure that complex systems are installed and function in accordance with the Owner's Project Requirements.

.2 **Commissioning Agents** - The internal technical resource staff of the Commissioning Authority that will be responsible for the execution of field reviews and the on-site "hands on" testing activities.

.3 **Commissioning Team** - Personnel that will be directly involved in the building commissioning process. The Commissioning Team will be made up of the Commissioning Agents, Contractors, Design Consultants, Owners' Representatives, Independent Third Party Testing Agencies, and Government of Alberta Representatives.

.4 **Commissioning Plan** - The Commissioning Plan is a document that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process. The Commissioning Plan is a dynamic document;

which is open to be updated by the Commissioning Team throughout the commissioning process to ensure accuracy and relevance as the project progresses. The final Commissioning Plan will be submitted in Commissioning Report.

.5 **Contractor's Site Cx Coordinator:** Personnel that represent the mechanical and electrical contractors that coordinate the commissioning process with the CxA.

.6 **Owner's Project Requirements** - Is a written document that details the ideas, concepts, and criteria that are determined by the Owner to be important to the success of the project.

.7 **Design Narrative** - The Design Narrative (DN) is where the design team describes in detail the concepts and features it intends to incorporate during schematic design.

.8 **Basis of Design** - Includes the necessary design information needed to accomplish the Owner's Project Requirements, including system descriptions, indoor environmental quality criteria, design assumptions and references to applicable codes, standards, regulations and guidelines.

.9 **Contractors** – Includes those responsible for physical construction of the project. This designation may include Prime Construction Contractors, and sub-contractors such as Electrical, Mechanical, and Controls firms.

.10 **Third Party Testing Firms** - Specialty firms or agencies retained to conduct acceptance tests on a system or component and provide a certificate of acceptance and conformance to governing standards.

.11 **Project Manager** - The individual or firm responsible for the overall management and delivery of the project to the Owner.

.12 **Consultants** - The Architects and Engineers responsible for producing the design drawings and specifications for this project, as well as the base contract administration inspection, quality assurance and acceptance activities.

.13 **User / Operator** - A User or Operator is an individual or group that will work in and operate various aspects of the facility once the project has been turned over.

.14 **In Contract Tests** - Testing requirements that are defined in the contract documents that are a Contractor's responsibility to carry out and document appropriately.

.15 **Out of Contract Tests** – Testing requirements that are not covered as part of the construction documents but are required to be carried out by certified agencies.

.16 **Commissioning Checksheets (Verification Forms)** – Mechanical and electrical equipment checksheets that are specific to each system, and its major components. These are used to verify system operation and are developed by the CxA with the support of the project team and OEM suppliers.

.17 **Static Installation Checks** – Systematic, detailed checks of mechanical and electrical system components. Contractors will utilize commissioning checksheets for recording installation compliance. The timing of the performance of static checks is tied to construction progress and occurs once the contractor's construction installation process and construction checks have been completed for the individual equipment components, or systems.

.18 **Contractor Start-Up Program** - Contractor start-up and verification program activities are conducted by the Contractors and/or their sub-trades and equipment vendors. Contractor / Vendor verification of the physical installation of equipment, and reviewing the completion of system installation and readiness, shall be completed prior to the Commissioning Agent's functional performance testing and verification activities.

.19 **Functional Performance Testing** - Functional performance tests are specific hands-on tests, used to verify that the equipment and associated systems meet the specified design parameters and operate as fully integrated components or systems through their respective level of automation. This testing also confirms the capabilities of each system to meet the requirements of the facility, and the Owner's Project Requirements. To test all systems under peak operating conditions, some functional performance testing may be deferred to times when peak operation occurs.

.20 **Acceptance Inspections** - A series of formal inspections carried out for systems that result in acceptance of the work as complete. These typically would consist of In-Wall, Above-Ceiling, and Semi-Final / Final site reviews.

1.4 Scope of Work

.1 Detailed testing shall be performed on identified commissionable installed equipment and systems to ensure that operation and performance conform to contract documents. All tests shall be performed by the responsible trade contractor, evaluated and witnessed by Commissioning Authority. After each grade of checklist and test are complete the system will be upgraded to the next test.

.2 Once a system(s) has been completed and passed all functional tests it will be ready for acceptance by the CxA and CM, with recommendation for turn-over to the Owner. The following testing is required as part of the commissioning process and is the responsibility of the appropriate trade contractor:

.1 Pre-Installation Checklists - completed for all equipment inspection for damage or compliance with an approved submittal upon arrival at the site from the supplier. Checklists are provided and completed and submitted by the respective manufacturer and/or contractor.

.2 Installation Checklists are comprised of a full range of checks developed to insure that all systems were actually installed correctly. This includes piping is complete, all electric is tied in and complete and all accessories are installed.

.3 Pre-functional checklists are comprised of a full range checks developed to insure that all systems were actually installed correctly. Following the installation

and vendor start-up, the installing contractor along with the manufacturer's representative are required to perform a series of physical installation checks, instrumentation inspections and control wiring verifications to ensure that the equipment is installed in accordance with the manufacturers recommendations, and all components, equipment, systems and interfaces between systems operate in accordance with the contract documents. This include piping is complete, all electric is tied-in and complete, all accessories are installed, interlocks verified. This includes all operating modes, interlocks, control responses, and specific responses to abnormal or emergency conditions.

.4 Functional Performance Tests (FPT) – Functional testing will not be permitted if any of the items are not completed as part of the start-up and pre-functional phases of the project. Functional performance testing phase is where operation of the equipment and/or systems is demonstrated to the CM, engineer and CxA for acceptance. This will include operation of the various components of the equipment as a complete system under load conditions in all operating modes, and determine if the mechanical and electrical systems are providing the required services in accordance with the finalized design intent. These tests shall also determine the installed capacity of the cooling and heating plant and the individual heat transfer components

.5 Integrated System Testing – Integrated testing shall not be permitted until all functional testing procedures have been completed and deficiencies corrected. This phase of the commissioning process will test the mechanical and emergency generator equipment/systems as complete systems to check interaction of systems and demonstrate integrated system operations during normal and failure scenarios.

.3 Comprehensive training O&M personnel shall be performed by the CM, MEP Contractors and where appropriate by other subcontractors and factory trained manufacturer's / vendor technicians prior to turnover of building to the Owner. The training shall include on-site classroom instruction, along with hands-on instruction on the installed equipment and systems

1.5 Equipment/Systems to be Commissioned

.1 The following equipment/systems will be commissioned as part of this project

.1 Mechanical

.1 Existing air handling unit

.2 Existing exhaust air fan

.3 Transfer air fan

.4 Airflow distribution system, including air flow velocities

.5 Domestic water systems

.6 Air compressor

.7 Fire protection systems (preaction system)

.8 Controls

.2 Electrical

.1 Lighting systems (interior)

1.6 Commissioning Overview

.1 Refer to Section 01 91 31 – Commissioning (Cx) Plan.

.2 For commissioning team responsibilities refer to the Commissioning (Cx) Plan.

.3 A commissioning kick-off meeting of all commissioning team members shall be held at a time and place designated by the CxA. The purpose shall be to familiarize all parties with the commissioning process, and to ensure that the responsibilities of each party are clearly understood.

.4 During the construction process commissioning meetings will take place that will include attendance for all necessary trades or a company representative that are involve in the commissioning process. During the beginning of construction they will take place monthly and increase in frequency as the project progresses.

.5 The contractor(s) shall complete all phases of work so the system can be started, tested, balanced, and acceptance procedures undertaken. This includes the complete installation of all equipment, materials, pipe, duct, wire, insulation, controls, etc. per the Contract Documents and related directives, clarifications and change orders.

.6 The CxA shall develop the Commissioning Plan. The Draft Commissioning Plan has been included as part of the Contract Documents. The Contractor shall assist the Commissioning Authority in preparing and up-dating the Commissioning Plan by providing necessary information pertaining to the actual equipment and installation. If contractor initiated system changes have been made that alter the commissioning process; the Commissioning Authority shall notify the CM and Owner. The Commissioning Plan can be modified based on the construction schedule and can be done so after consolation with the OWNER at the discretion of the CxA.

.7 Acceptance procedures are normally intended to being prior to completion of a system and/or sub-system, and shall be coordinated with Division 15 and 16. Start of acceptance procedures before system completion does not relieve the contractor from completing those systems as per the schedule

.8 Engineer will issue Substantial Completion when:

.1 Completed Cx documentation has been received, reviewed for suitability and approved by CxA.

.2 Equipment, components and systems have been commissioned.

.3 O&M training has been completed.

1.7 Non-Conformance to Performance Verification Requirements

.1 The CxA will observe and document the results of all functional performance tests performed by the trade contractors using the test procedural forms developed for that purpose.

.2 The CxA will record the results of the functional test on the procedure or test form. All issues shall be noted and reported to the Owner, CM and Contractors on an issues log.

.3 As tests progress and an issue are identified, the CxA shall discuss the issue with the commissioning team, and the executing contractor.

.4 When there is no dispute on the deficiency and the contractor accepts responsibility to correct it:

.1 The CxA will document the deficiency and the contractor's response and intentions or corrections. The CxA and contractor then proceed to another test or sequence. The contractor corrects the issues, and confirms that equipment is ready to be retested.

.2 Once the contractor corrects the deficiency, the test is rescheduled and repeated in the anticipation of correct operation or function. If a deficiency is identified, the cost of retesting will be as called for in "Cost of Retesting".

.5 Should equipment, system components, and associated controls be incorrectly installed or malfunction during commissioning, correct documented deficiencies, re-verify equipment and components within the non-functional system, including related systems as deemed required by Engineer, to ensure effective performance.

.6 Costs for corrective work, additional tests, inspections, to determine acceptability and proper performance of such items to be borne by Contractor.

.7 Cost for the contractor to retest a Pre-functional or Functional test if they are responsible shall be borne by responsible contractor. The CxA shall be compensated for the additional testing and shall submit a change order to the Owner for the additional commissioning cost.

.8 For an issue identified, not related to any Pre-functional checklist or start- up fault, the following shall apply: The CxA will direct the retesting of the equipment once at no "charge". However, the CxA's and owner's time for a second retest will be charged to the CM who may choose to recover costs from the responsible contractor or subcontractor. Before retesting occurs, the CM will inspect the deficiency and respond to the CxA that the issue has been addressed.

.9 The time for the CxA and Owner to direct any retesting required because a specific Prefuntional checklist or startup test item, reported to have been successfully completed but determined during functional testing to be faulty, will be back charged to the CM who may choose to recover costs from the party responsible for misinformation or deficiency.

.10 The contractor shall submit in writing to the CxA and CM at least as often as commissioning meetings are being scheduled concerning the status of each apparent

outstanding discrepancy identified during commissioning. Discussion shall cover explanations of any disagreement and proposals for their resolutions.

.11 Any required retesting by any contractor shall not be considered a justified reason for a claim of delay or for an extension of time by the CM, contractors or subcontractors.

1.8 Submittals

.1 The CxA will review approved submittals related to the commissioned equipment for conformance to the contract documents as it relates to the commissioning process, to the performance of the equipment and adequacy for developing test procedures. This review is intended primarily to aid in the development of performance procedures and only secondarily to verify compliance with equipment specifications. The CxA will notify the Owner of items missing or areas that are not in conformance with contract documents and which requires resubmission.

.2 Include O&M manuals specific for each piece of equipment together with all equipment submitted for engineer review and approval.

.3 The CxA may request additional design narrative from the A/E and controls contractor, depending on the completeness of the OPR documentation and sequences provided with the specifications.

.4 The CxA will review the submittals once. The CxA will receive a copy of the final approved submittals.

1.9 Commissioning Schedule

.1 The Commissioning Schedule is generated based on information provided to the commissioning team regarding construction dates and project timelines as supplied by the project and commissioning teams. The Commissioning Schedule is a dynamic process and designed to incorporate updates from the ongoing construction process as they become available. The overall commissioning process is targeted to dovetail into the construction process wherever practical by following the construction completion and readiness milestones. As project construction milestones and projected completion updates are made available to the Commissioning Team, the Commissioning Schedule will be updated and resubmitted accordingly.

.2 The Commissioning Authority will update the Commissioning Schedule on regular intervals to show commissioning progress and whenever significant changes occur to the dates provided for commissioning activities. The Commissioning Schedules are sent to the Owner to be distributed.

1.10 Commissioning Meetings

.1 Convene Cx meetings following project meetings: 01 91 31 - Commissioning Plan and as specified herein.

.2 Purpose: to resolve issues, monitor progress, identify deficiencies, relating to Cx.

.3 Continue Cx meetings on regular basis until commissioning deliverables have been addressed.

.4 At 60% construction completion stage. Contractor to call a separate Cx scope meeting to review progress, discuss schedule of equipment start-up activities and prepare for Cx. Issues at meeting to include:

.1 Review duties and responsibilities of Contractor and subcontractors, addressing delays and potential problems.

.2 Determine the degree of involvement of trades and manufacturer's representatives in the commissioning process.

.5 Thereafter Cx meetings to be held until project completion and as required during equipment start-up and functional testing period.

.6 Meetings will be scheduled and chaired by Contractor, who will record and distribute minutes.

.7 Ensure subcontractors and relevant manufacturer representatives are present at 60% and subsequent Cx meetings and as required.

1.11 Starting and Testing

.1 Construction checklists are important to verify that the equipment and systems are fully connected and operational. It ensures that performance testing (in-depth system checkout) may proceed without unnecessary delays. The construction checklists for a given system must be successfully completed and approved prior to startup and formal performance testing of equipment or subsystems of the given system.

.2 Provide 14 days' notice prior to commencement.

.3 Engineer and/or Cx Agent may witness start-up and testing.

.4 Startup and Checkout Plan: The CxA will assist the project commissioning team members responsible for startup of any equipment. The primary role of the CxA in this process is to ensure that there is written documentation that each of the manufacturer-recommended procedures has been completed. The CxA shall provide construction checklists and startup shall be identified in the commissioning scoping meeting and on the checklist forms

.1 The construction checklists (draft/samples) are provided in the attachment section of the Commissioning Plan. These checklists indicate required procedures to be executed as part of startup and initial checkout of the systems and the party responsible for their execution.

.2 The contractor shall determine which trade is responsible for executing and documenting each of the line item tasks and transmit the checklists to the responsible subcontractors. Each form may have more than one trade responsible for its execution.

.3 The contractor/subcontractor with assistance from the CxA responsible for the purchase of the equipment shall develop the full startup plan by combining the manufacturer's detailed startup and checkout procedures and the construction checklists.

.4 The contractor/subcontractor shall submit the full startup plan to the CxA for review and approval.

.5 The contractor will transmit the full startup plan to the subcontractors for their review and use.

.6 Operation and Maintenance Data – Contractors will provide a copy of O & M literature within 45 days of each submittal acceptance for use during the commissioning process for all commissioned equipment systems. The CxA will review the O & M literature once for conformance to project requirements. The CxA will receive a copy of the final approved O & M literature once corrections have been made by the contractor.

.7 Demonstration and Training – Contractors, their sub-contractors, equipment manufacturers and vendors will provide demonstration and training as required by the specification and these commissioning requirements. A complete training plan and schedule must be submitted by the Contractor to the CxA four (4) weeks prior to any training. A training agenda for each training session must be submitted to the CxA two (2) weeks prior to the training session.

1.12 Manufacturer's Involvement

.1 Factory testing: manufacturer to:

.1 Coordinate time and location of testing.

.2 Provide testing documentation for approval by Engineer.

.3 Arrange for Engineer to witness tests.

.4 Obtain written approval of test results and documentation from Engineer before delivery to site.

.2 Obtain manufacturers installation, start-up and operations instructions prior to start-up of components, equipment and systems and review with Engineer and Cx Agent.

.1 Compare completed installation with manufacturer's published data, record discrepancies, and review with manufacturer.

.2 Modify procedures detrimental to equipment performance and review same with manufacturer before start-up.

.3 Integrity of warranties:

.1 Use manufacturers trained start-up personnel where specified elsewhere in other divisions or required to maintain integrity of warranty.

.2 Verify with manufacturer that testing as specified will not void warranties.

.4 Qualifications of manufacturer's personnel:

.1 Experienced in design, installation and operation of equipment and systems.

.2 Ability to interpret test results accurately.

.3 To report results in clear, concise, logical manner.

1.13 Operation and Maintenance of Equipment and Systems

.1 After start-up, operate and maintain equipment and systems as directed by equipment/system manufacturer.

.2 With assistance of manufacturer develop written maintenance program and submit to Engineer for approval before implementation.

.3 Operate and maintain systems for length of time required for commissioning to be completed.

.4 After completion of commissioning, operate and maintain systems until issuance of certificate of interim acceptance.

1.14 Test Results

.1 If start-up, or testing produce unacceptable results, repair, replace or repeat specified starting and/or PV procedures until acceptable results are achieved.

.2 Provide manpower and materials, assume costs for re-commissioning.

1.15 Instruments / Equipment

.1 Submit to Cx Agent for review and approval:

.1 Complete list of instruments proposed to be used.

.2 Listed data including; serial number, current calibration certificate, calibration date, and calibration expiry date and calibration accuracy.

.2 Provide the following equipment as required:

.1 2-way radios.

.2 Ladders

.3 Equipment as required to complete work.

1.16 Extrapolation of Results

.1 Where Cx of weather, occupancy, or seasonal-sensitive equipment or systems cannot be conducted under near-rated or near-design conditions, extrapolate part-load results to design conditions when approved by Engineer in accordance with equipment manufacturer's instructions, using manufacturer's data, with manufacturer's assistance and using approved formulae.

1.17 Completion of Commissioning

.1 Upon completion of Cx leave systems in normal operating mode.

.2 Except for warranty and seasonal verification activities specified in Cx specifications, complete Cx prior to issuance of Interim Certificate of Completion.

.3 Cx to be considered complete when contract Cx deliverables have been submitted and accepted by Engineer.

1.18 Activities Upon Completion of Commissioning

.1 When changes are made to baseline components or system settings established during Cx process, provide updated Cx form for affected item.

1.19 Training

.1 In accordance with Section 01 79 00 – Demonstration and Training

1.20 Occupancy

.1 Cooperate fully with Engineer during stages of acceptance and occupancy of facility.

END OF SECTION

Government of Canada Existing Building Renovation, St. Paul, AB
COMMISSIONING PLAN
144202775.200

DRAFT

Prepared for:
RCMP Procurement and Contracting

Prepared by:
Stantec Consulting Ltd.

26T
Rev 0

Sign-off Sheet

This document entitled Government of Canada Existing Building Renovation, St. Paul, AB COMMISSIONING PLAN144202775.200 was prepared by Stantec Consulting Ltd. for the account of the Government of Canada. The material in it reflects Stantec's best judgment in light of the information available to it at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions made based on it, are the responsibilities of such third parties. Stantec Consulting Ltd. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

Reviewed by _____
(signature)

Stantec
200 - 325 25th Street SE Calgary AB T2A 7H8

Table of Contents

LIST OF TABLES

LIST OF APPENDICES

1.0 Introduction - Brief Overview of the Commissioning Process

The project consists of an extensive renovation to the basement space of an existing facility in St Paul, Alberta. Construction will result in renovations to an area of approximately 225m².

Commissioning is a quality assurance process continued throughout the entire project life cycle (Schematic through to Post Occupancy) in which the functional requirements and the operational requirements of the Project are tested, verified and proven to function as intended and documented.

System performance will be verified to meet the design parameters set out for it by the designer, and appropriate documentation will be produced to record the results of the verification tests. The final performance data will then be used to benchmark the systems operations that can be referenced in the years to follow to maintain system efficiencies**.**

Good lines of communication will be maintained throughout the project to keep all parties informed on the commissioning program progress. This will be done by keeping the commissioning documentation concise and facilitating all commissioning team members keeping an active dialogue going throughout the project. The focus for the project will to be to identify and resolve issues on the project as early as possible in the commissioning process through cooperation by all parties.

1.1 DEFINITIONS

The terms noted below will be used throughout the Cx process and within the Cx documentation. Any reference to these terms carries the stated and associated definition as outlined below.

Commissioning Authority (CxA) / Commissioning Manager - Is the individual designated to organize, lead, and review the completion of commissioning process activities. The CxA facilitates communication among the Owner, Designer, and Contractors to ensure that complex systems are installed and function in accordance with the Owner's Project Requirements.

Commissioning Agents - The internal technical resource staff of the Commissioning Authority that will be responsible for the execution of field reviews and the on-site "hands on" testing activities.

Commissioning Team - Personnel that will be directly involved in the building commissioning process. The Commissioning Team will be made up of the Commissioning Agents, Contractors, Design Consultants, Owners' Representatives, Independent Third
Party Testing Agencies, and Government of Canada Representatives.

Commissioning Plan - The Commissioning Plan is a document that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process. The Commissioning Plan is a dynamic document; which is open to be updated by the Commissioning Team throughout the commissioning process to ensure accuracy and relevance as the project progresses. The final Commissioning Plan will be submitted in Commissioning Report.

Contractor's Site Cx Coordinator: Personnel that represent the mechanical and electrical contractors that coordinate the commissioning process with the CxA.

Owner's Project Requirements - Is a written document that details the ideas, concepts, and criteria that are determined by the Owner to be important to the success of the project.

Design Narrative - The Design Narrative (DN) is where the design team describes in detail the concepts and features it intends to incorporate during schematic design.

Basis of Design - Includes the necessary design information needed to accomplish the Owner's Project Requirements, including system descriptions, indoor environmental quality criteria, design assumptions and references to applicable codes, standards, regulations and guidelines.

Contractors – Includes those responsible for physical construction of the project. This designation may include Prime Construction Contractors, and sub-contractors such as Electrical, Mechanical, and Controls firms.

Third Party Testing Firms - Specialty firms or agencies retained to conduct acceptance tests on a system or component and provide a certificate of acceptance and conformance to governing standards.

Project Manager - The individual or firm responsible for the overall management and delivery of the project to the Owner.

Consultants - The Architects and Engineers responsible for producing the design drawings and specifications for this project, as well as the base contract administration inspection, quality assurance and acceptance activities.

User / Operator - A User or Operator is an individual or group that will work in and operate various aspects of the facility once the project has been turned over.

In Contract Tests - Testing requirements that are defined in the contract documents that are a Contractor's responsibility to carry out and document appropriately.

Out of Contract Tests – Testing requirements that are not covered as part of the construction documents but are required to be carried out by certified agencies.

Commissioning Checksheets (Verification Forms) – Mechanical and electrical equipment checksheets that are specific to each system, and its major components. These are used to verify system operation and are developed by the CxA with the support of the project team and OEM suppliers.

Static Installation Checks – Systematic, detailed checks of mechanical and electrical system components. Contractors will utilize commissioning checksheets for recording installation compliance. The timing of the performance of static checks is tied to construction progress and occurs once the contractor's construction installation process and construction checks have been completed for the individual equipment components, or systems.

Contractor Start-Up Program - Contractor start-up and verification program activities are conducted by the Contractors and/or their sub-trades and equipment vendors. Contractor / Vendor verification of the physical installation of equipment, and reviewing the completion of system installation and readiness, shall be completed **prior** to the Commissioning Agent's functional performance testing and verification activities.

Functional Performance Testing - Functional performance tests are specific hands-on tests, used to verify that the equipment and associated systems meet the specified design parameters and operate as fully integrated components or systems through their respective level of automation. This testing also confirms the capabilities of each system to meet the requirements of the facility, and the Owner's Project Requirements. To test all systems under peak operating conditions, some functional performance testing may be deferred to times when peak operation occurs.

Acceptance Inspections - A series of formal inspections carried out for systems that result in acceptance of the work as complete. These typically would consist of In-Wall, Above-Ceiling, and Semi-Final / Final site reviews.

2.0 Building Information

Project Name: GOVERNMENT OF CANADA – EXISTING BUILDING RENOVATION
Location: St. Paul, Alberta
Building Type: _
Square Footage: 225 m2

3.0 Project Team

Table 1: Project Team Information

Title	Name / Company	Contact information
Owners Representative	Chuck Koch Project Manager NWR Project Management Office	Tel: (780) 412-5326
Owner		Tel:
Commissioning Team Lead	Stantec Consulting Jason Hancock	Tel: (403) 806-1564
Design Consultant	Enzo Vicenzino	Tel: (403) 569-5355
Mechanical Designer	Jason Hancock	Tel: (403) 806-1564
Electrical Designer	Ron Bonnett	Tel: (403) 716-1493
General Contractor		Tel:
Mechanical Contractor	--- ---	Tel: ---

Electrical Contractor	--- ---	Tel: --- ---
Control Contractor	--- ---	Tel: --- ---

3.1 COMMISSIONING TEAM'S RESPONSIBILITIES AND LIST OF COMMISSIONING PROCESS MILESTONES

3.1.1 Commissioning Authority

Commissioning Authority will:

Develop and implement a Commissioning Plan referencing CSA Z320-11 and as lead of the Commissioning Team, assist the Commissioning Team throughout the project to ensure that all systems work with one another specific to components, systems and integrated systems within the fit-up space to produce a functional and integrated facility including:

- Commissioning Plan and specifications
- Method of verification, check sheets, forms, system / component matrix and commissioning issues log;
- Resources required to complete commissioning responsibly;
- Final commissioning Report
- Verify user training and orientation

The Contractor will:

- Provide any available information to the CxA needed to develop the Check Sheets.
- Provide any clarifications or required information on any design related issues as requested by the CxA.
- Verify that sufficient materials and manpower are scheduled and available to carry out the commissioning activities; including subcontractors, specific equipment vendors/manufacturers, and individual testing agents/specialists.
- Provide all services requiring tools or the use of tools to start-up, test, adjust, or otherwise bring the equipment and systems into a fully operational state.

- Integrate the key commissioning events/activities from the Commissioning Plan (CP) into the construction schedule, including timelines indicating when the Seasonal or Deferred Commissioning Plan (SDCP) will be completed.

- Participate in all Commissioning Meetings (include representatives of the design team, equipment vendors, and individual testing agents as may be required). Carry out all commissioning activities; as described in the CP and the Contract documents.

- The Design Team and Owner shall be the vehicle to determine systems are ready. Additional commissioning cost shall:

    - Cost for Cx and Owner personnel to reschedule a functional performance test, made necessary because an item certified by a Certificate of Readiness signee is found in fault or incomplete, shall be charged to the responsible party.

    - A deficiency identified during functional testing not identified during installation inspection, shall be re-tested once at no Cx or Owner charge. All costs for subsequent re-testing shall be charge to the responsible party.

    - Items that are left incomplete by a contractor or vendor and later causing deficiencies or delays during functional testing may result in back-charges to the responsible party.

- Sub-Trades to provide written notification to the Construction Manager and Commissioning Authority that the following work has been completed in accordance with the contract documents, and that the equipment, systems and sub-systems are operating as required:

    - All MEP equipment and systems called for in the Scope of Work and all other equipment are furnished under the contract documents.

    - Heating and cooling equipment,

    - Fire stopping in the fire rated construction, including fire damper installation, caulking, gasketing and sealing of smoke barriers.

- Fire detection and smoke detection devices furnished under the divisions of this specification as they affect the operations of the smoke controls system

- The building control systems are functioning to control MEP equipment.

Documentation Requirements:

- Collaborate with the CxA to ensure that all equipment, installation and performance checks are fully documented.

- In consultation with subcontractors, equipment suppliers, and vendors ensure that Equipment Start-Up and Acceptance Reports are completed.

- Issue a statement and certify that testing and balancing work has been completed; and submit the final testing and balancing reports for review.

- Issue a statement and certify that BMS system controls have been calibrated, checked- out, and that the control of equipment and systems are fully operational and functionally tested in all sequences and operating modes.

- Issue a certificate of readiness that will be provided by the CxA that functional test performed by trade contractors have been completed and tested including all BMS control requirements and other control or monitoring systems have been reviewed and observed and are fully operational, functionally tested and ready for demonstration to the commissioning authority.

Review:

- All construction and manufacturer submittals (including Shop Drawings).

- Testing procedures, as identified in the Design-Build Contract, prior to the execution of tests.

- Operating / maintenance data prior to submission.

3.1.2 Design Consultants

Design Consultants will:

- Work in co-operation with the Commissioning Authority to produce design documentation that includes project specific Commissioning activities.

- On-Going Field Reviews – Visits to the site to observe progress for claim approval and to determine if the installations generally comply with the intent of the Contract Documents. This is not a quality control function, but a sampling for quality assurance. Ultimately, all quality control is the responsibility of the contractors. As part of the contract responsibilities, the Consultants are to provide interpretations of the Contract Documents when required and resolution of construction-related issues.

- Provide clarification and/or required information as requested by the Commissioning Agent

- Be provided with all Commissioning reports and schedules. They shall review all recommendations in the reports, and provide direction.

- Witness (at their discretion) Functional Performance tests as conducted by the Commissioning Agent. This however, is not a requirement of the Consultant.

- Provide copies of all Inspection Reports to the Commissioning Authority to allow for better tracking of the construction progress and issues.

Project Team

Table 2 gives a brief task breakdown of the Commissioning Process and lists the responsible parties. The completion of each of the following commissioning tasks is considered a Commissioning Process Milestone.

Table 2: Project Team Responsibilities

Commissioning Tasks	Contractor	Commissioning Agent	Architect	Mechanical Designer	Electrical Designer	Builders' Cx Coordinator	Owner / Owner's Rep.
Develop Commissioning and equipment testing required specifications			x	x	x		x
Develop the Commissioning Plan and update as necessary		x					
Develop Commissioning installation check sheets		x					
Review Commissioning installation check sheets		x		x	x	x	
Complete installation check sheets	x	x					
Complete equipment startup	x						
Witness equipment startup	x	x				x	x
Develop Functional Performance Testing procedures	x	x				x	
Review Functional Performance Testing procedures	x	x				x	
Perform Functional Performance Testing procedures	x	x					
Organize O&M manual	x					x	
Complete Final Commissioning Report		x					
Perform seasonal functional testing (if applicable)	x	x					

3.2 LIST OF KEY COMMISSIONING MILESTONES

The major commissioning milestones for this project are as follows:

Pre-Construction

Commissioning Specifications generated ---

Prepare Commissioning Plan / Org Chart (Final Issue) ---

Construction

Commissioning Kick-off Meeting (65% Construction) ---

Develop the Equipment Installation Checksheets ---

Begin Equipment Installation Checks ---

Develop Functional Performance Testing Procedures ---

M&E System Start-up ---

Verification of Installation Procedure ---

Functional Performance Testing ---

Operations and Maintenance Manuals submitted for review ---

Post Construction

Issue Resolution/Deferred Testing ---

Lessons Learned ---

Final Commissioning Report Issued ---

Performing a post occupancy review with the Tenant Representative ---

4.0 Description of the Management, Communication and Reporting Aspects of the Commissioning Process

The Commissioning Team shall follow the following communication protocol in the event that issues arise. Table 3 is an identification tool for proper management, communication and reporting to be used

by the Commissioning Team. The Project Team shall understand the following to insure their responsibility in the event of an issue is understood.

All communication and management throughout the commissioning process is structured as follows. If there is a request for information or a formal document requested the Commissioning Authority first approaches the Project Manager for resolution. If the Commissioning Authority requires verbal information for clarification they are to go directly to the informed party. If the Commissioning Authority needs to notify contractors of deficiencies they are to document deficiencies through the Project Manager. When the Commissioning Authority requires training or functional testing to be scheduled they can supply some input but do not do any scheduling. The Commissioning Authority does not have the authority to issue any change orders. Should Subcontractors disagree with the requests or interpretations by the Commissioning Authority, the Subcontractor should try to resolve the issue with the Commissioning Authority and notify the Project Manager. For further reference see Table 3.

4.1 DESCRIPTION OF REPORTING WITHIN THE COMMISSIONING PROCESS

All reporting from the Commissioning Authority is sent to the Project Manager and Owner. The Project Manager is then responsible for distributing appropriate contents to other parties and subcontractors. For further reference see Table 3.

Table 3: Description of management, communication and reporting within the commissioning process

Issue	Protocol
For requests for information (RFI) or formal documentation requests.	Request goes to Builders' Commissioning Coordinator who coordinates accordingly
For verbal information or clarification.	The CxA / Agents goes directly to the informed party.
For notifying contractors of construction deficiencies or the Design Consultants on design issues.	The CxA / Agents will verbally discuss issues of note on site with the installing contractors and then document all observations, including deficiencies, in field commissioning reports copied to the Project Team first hand to speed up the process for issue resolve.
For scheduling of field reviews and functional tests.	The CxA may provide input and do some coordination, but scheduling the timing of the commissioning reviews is based on dates provided by the contractors working with the Builders' Commissioning Coordinator.
For making requests for significant changes.	The CxA has no authority to issue change orders. If a design change is required, action will be directed to the Design Consultants.
Subcontractors disagreeing with requests or interpretations by the CxA shall:	The Subcontractor may review this issue directly with the CxA / and his Agents, but the Builders' Commissioning Coordinator to be informed of all issues that require additional input for resolve.
Issue Sign-off	The CxA / Agents follow up on all documented commissioning issues for sign-off and issues a summary

Table 3: Description of management, communication and reporting within the commissioning process

Issue	Protocol
	log report noted how each issued was resolved or highlights the status of all issues that remain open in the logs.

5.0 Commissioning Scope of Work

5.1 LISTING OF THE SYSTEMS AND ASSEMBLIES INCLUDED IN THE COMMISSIONING AUTHORITY'S SCOPE OF WORK.

The facility systems and sampling rate of systems to be commissioned are as follows:

1. MECHANICAL SYSTEMS

1.1 Air Systems

- Make Up Air Unit 100%
- Exhaust Fans 100%
- Ductwork 20%
- Duct Cleaning 10%
- Fire Dampers 100%

1.2 Air and Water Balancing 25%

2. PLUMBING SYSTEMS

2.1 Plumbing Fixtures 50%

2.2 Drainage Systems

- Sanitary Piping 10%

3. BUILDING AUTOMATED CONTROL SYSTEM (BACS)

3.1 Sequence of Operation 100%

3.2 Every connected physical point and end devices including:

- Temperature 100%
- Pressure Sensors and Controllers 100%
- Damper/Valve Actuators 100%
- Meters 100%

4. ELECTRICAL SYSTEMS

4.1 Interior Lighting

- Illumination Levels 80%
- Lighting Controls 100%

4.2 Exit Lights 100%

4.3 Emergency Lighting Battery Units 100%

4.4 Fire Alarm System (Collect paperwork from Engineer performing verification)

- Fire alarm verification worksheets 100%
- Fire alarm verification certificate 100%

4.5 Target Systems (Collect paperwork from range installer)

- Target System Commissioning 100%

5. BUILDING INTEGRATED SYSTEM TEST 100%

6. ARCHITECTURAL SYSTEMS

6.1 Operation of Doors and Hardware 100%

Systems not included in this Commissioning Plan – The following building systems are not required to be commissioned under LEED 2009 EAp1 and therefore are not included with the Commissioning Agent's scope of work:

- Commissioning scope is limited to confirming that the Automation Controls from the renovated space are communicating with the Base Building Controls System. The Builder and the sub-contractors are responsible for completing the start-up checks for the equipment and submitting a report.
- Building Envelope
- CATV Systems
- Intercom System
- Public Address

6.0 Commissioning Process

6.1 DEFINITION OF COMMISSIONING

"Building Commissioning" is the process of bringing a facility from a static operating state to a dynamic operating state, while also meeting the specific building requirements for the intended use of the facility. More specifically, commissioning includes bringing the facility to a working and fully operational condition that is in compliance with the design intent. Commissioning is a systematic process to ensure that all building systems perform interactively according to the contract documents, the design intent and the Owner's operational needs.

6.2 ELEMENTS OF COMMISSIONING

The Fundamental Commissioning procedures must be planned well in advance of construction and implemented throughout the pre-design, design, construction, and installation phases of the project. The commissioning process is closely associated with the construction of the building, specifically the timing, and is grossly 'driven' by the construction schedule.

During construction, the Commissioning Authority, in accordance with the Commissioning Plan, will coordinate the commissioning activities and track the completion of testing for each component, and building system.

Commissioning activities:

- **Commissioning Kick-Off Meeting** – After all major shop drawings submittals have been approved and the commissioning checksheets have been prepared, the Commissioning Authority will arrange for a Commissioning Meeting to kick-off the commissioning process in the field. This meeting will be used to go over in detail, the process for completing the commissioning checksheets, review roles and responsibilities, and begin to establish a commissioning schedule of activities. Typically, this meeting takes place around the 65% Construction Phase. The Commissioning Authority will coordinate additional Commissioning Meetings with the Project Construction Team as required, to provide updates on commissioning progress along with reviews of any issues or potential concerns.

- **Installation of Building Equipment** – After notification from the contractors that a system's equipment components have been installed and are ready for review, the Commissioning Team conducts dynamic functional checks to verify performance. Following each commissioning site review, the Commissioning Agents will prepare and issue a Witnessing Report documenting findings and potential issues.

- **Schedule** – The Commissioning Schedule is generated based on information provided to the commissioning team regarding construction dates and project timelines as supplied by the project and commissioning teams. The Commissioning Schedule is a dynamic process and

designed to incorporate updates from the ongoing construction process as they become available. The overall commissioning process is targeted to dovetail into the construction process wherever practical by following the construction completion and readiness milestones. As project construction milestones and projected completion updates are made available to the Commissioning Team, the Commissioning Schedule will be updated and resubmitted accordingly.

The Commissioning Authority will update the Commissioning Schedule on regular intervals to show commissioning progress and whenever significant changes occur to the dates provided for commissioning activities. The Commissioning Schedules are sent to the Owner to be distributed.

- **Start-Up/Activation** – Following dates established in the commissioning schedule, the Commissioning Agents witness contractor start-up of selected equipment and review all Contractor start-up reports of all commissioned equipment.

- **Functional Performance Testing**– After notification from the Contractors that system adjustments and balancing have been completed, the Commissioning Agents will verify equipment and system performance. In many cases, hands-on functional performance testing can be completed with minimal assistance from the Contractors.

7. **Post-Construction** – Commissioning Authority will complete a final schedule which is developed to ensure all seasonal performance verifications are completed prior to warranty end. The Commissioning Authority will provide a Final Commissioning Report to the Owner, certifying that commissioning has been completed.

6.3 INSTALLATION CHECKS

Prior to the startup of the equipment, all equipment shall be checked and correct installation shall be verified. This is done to reduce delays and damage to the equipment during startup.

Every piece of equipment is inspected by the Installing Contractor. There is to be no sampling at this step. The CxA does not need to be present during each installation, but should be present for startup of central pieces of equipment, and has the right to check a sample of additional equipment of his/her choosing.

The commissioning checksheets are to be supplied by the CxA, contractor or manufacturer for each piece of energy consuming equipment and when necessary, submitted to the CxA for inclusion into Appendix A.

All deficiencies are to be recorded and addressed before functional testing will begin.

6.4 COMMISSIONING CHECKSHEETS

The Commissioning Check Sheet Manual contains the Mechanical and Electrical checksheets that are specific to the Commissioning activities. Specified and shop drawing information for each major piece of

equipment will be entered on a checksheet. The technical data (including specified, shop drawing and installed equipment data) will be completed by the Contractors and the Commissioning Agents. Functional or Dynamic checks will be completed by the Commissioning Agents in the field.

All commissioning checksheets must be completed and signed off by the Contractors. (Refer to Appendix B for sample check sheets.)

The commissioning checksheets are designed to act as a tool for the Contractor to ensure the installed equipment aligns with the approved shop drawings and that each installation is complete before start-up to reduce the number of deficiencies associated with system start-ups.

The project commissioning documentation status can be reviewed on-line by all project team members once a password is provided by the Commissioning Authority.

Technical Data	Specified Data	Commissioning Agent
	Submitted Data	Commissioning Agent
	Installed Data	Contractors
Installation Checks	Static Checks	Contractors
Functional Checks	Dynamic Checks	Completed by Commissioning Agent with the assistance of the contractors as field testing of the equipment progresses.
Date/Checked by		Automatically documented on to the commissioning checksheets

6.5 FINAL REPORT

The CxA will supply the Project Manager with a Final Commissioning Report. The contents of the report shall be as follows:

- Final Commissioning Plan
- Project Commissioning Specifications
- Verification of Installation (Construction Checklists)
- Factory Start-Up and Vendor Test Reports
- Functional Performance Testing Forms organized on a building system basis
- Outstanding Issues / Issue Resolution Reports
- Remediation / Retest Reports
- Records of Training

Appendix A SAMPLE COMMISSIONING CHECKSHEETS

Appendix B SAMPLE FUNCTIONAL TEST PROCEDURES

Appendix C COMMISSIONING TEAM ORGANIZATION CHART

Government of Canada Existing Building Renovation, Edson, AB
COMMISSIONING PLAN
144202775.205

DRAFT

Prepared by:
Stantec Consulting Ltd.

26T
Rev 0

Sign-off Sheet

This document entitled Government of Canada Existing Building Renovation, Edson, AB COMMISSIONING PLAN144202775.205 was prepared by Stantec Consulting Ltd. for the account of the Government of Canada. The material in it reflects Stantec's best judgment in light of the information available to it at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions made based on it, are the responsibilities of such third parties. Stantec Consulting Ltd. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

Reviewed by _____
(signature)

Stantec
200 - 325 25th Street SE Calgary AB T2A 7H8

Table of Contents

LIST OF TABLES

LIST OF APPENDICES

1.0 Introduction - Brief Overview of the Commissioning Process

The project consists of an extensive renovation to the basement space of an existing facility in Edson, Alberta. Construction will result in renovations to an area of approximately 180m².

Commissioning is a quality assurance process continued throughout the entire project life cycle (Schematic through to Post Occupancy) in which the functional requirements and the operational requirements of the Project are tested, verified and proven to function as intended and documented.

System performance will be verified to meet the design parameters set out for it by the designer, and appropriate documentation will be produced to record the results of the verification tests. The final performance data will then be used to benchmark the systems operations that can be referenced in the years to follow to maintain system efficiencies**.**

Good lines of communication will be maintained throughout the project to keep all parties informed on the commissioning program progress. This will be done by keeping the commissioning documentation concise and facilitating all commissioning team members keeping an active dialogue going throughout the project. The focus for the project will to be to identify and resolve issues on the project as early as possible in the commissioning process through cooperation by all parties.

1.1 DEFINITIONS

The terms noted below will be used throughout the Cx process and within the Cx documentation. Any reference to these terms carries the stated and associated definition as outlined below.

Commissioning Authority (CxA) / Commissioning Manager - Is the individual designated to organize, lead, and review the completion of commissioning process activities. The CxA facilitates communication among the Owner, Designer, and Contractors to ensure that complex systems are installed and function in accordance with the Owner's Project Requirements.

Commissioning Agents - The internal technical resource staff of the Commissioning Authority that will be responsible for the execution of field reviews and the on-site "hands on" testing activities.

Commissioning Team - Personnel that will be directly involved in the building commissioning process. The Commissioning Team will be made up of the Commissioning Agents, Contractors, Design Consultants, Owners' Representatives, Independent Third
Party Testing Agencies, and Government of Canada Representatives.

Commissioning Plan - The Commissioning Plan is a document that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process. The Commissioning Plan is a dynamic document; which is open to be updated by the Commissioning Team throughout the commissioning process to ensure accuracy and relevance as the project progresses. The final Commissioning Plan will be submitted in Commissioning Report.

Contractor's Site Cx Coordinator: Personnel that represent the mechanical and electrical contractors that coordinate the commissioning process with the CxA.

Owner's Project Requirements - Is a written document that details the ideas, concepts, and criteria that are determined by the Owner to be important to the success of the project.

Design Narrative - The Design Narrative (DN) is where the design team describes in detail the concepts and features it intends to incorporate during schematic design.

Basis of Design - Includes the necessary design information needed to accomplish the Owner's Project Requirements, including system descriptions, indoor environmental quality criteria, design assumptions and references to applicable codes, standards, regulations and guidelines.

Contractors – Includes those responsible for physical construction of the project. This designation may include Prime Construction Contractors, and sub-contractors such as Electrical, Mechanical, and Controls firms.

Third Party Testing Firms - Specialty firms or agencies retained to conduct acceptance tests on a system or component and provide a certificate of acceptance and conformance to governing standards.

Project Manager - The individual or firm responsible for the overall management and delivery of the project to the Owner.

Consultants - The Architects and Engineers responsible for producing the design drawings and specifications for this project, as well as the base contract administration inspection, quality assurance and acceptance activities.

User / Operator - A User or Operator is an individual or group that will work in and operate various aspects of the facility once the project has been turned over.

In Contract Tests - Testing requirements that are defined in the contract documents that are a Contractor's responsibility to carry out and document appropriately.

Out of Contract Tests – Testing requirements that are not covered as part of the construction documents but are required to be carried out by certified agencies.

Commissioning Checksheets (Verification Forms) – Mechanical and electrical equipment checksheets that are specific to each system, and its major components. These are used to verify system operation and are developed by the CxA with the support of the project team and OEM suppliers.

Static Installation Checks – Systematic, detailed checks of mechanical and electrical system components. Contractors will utilize commissioning checksheets for recording installation compliance. The timing of the performance of static checks is tied to construction progress and occurs once the contractor's construction installation process and construction checks have been completed for the individual equipment components, or systems.

Contractor Start-Up Program - Contractor start-up and verification program activities are conducted by the Contractors and/or their sub-trades and equipment vendors. Contractor / Vendor verification of the physical installation of equipment, and reviewing the completion of system installation and readiness, shall be completed **prior** to the Commissioning Agent's functional performance testing and verification activities.

Functional Performance Testing - Functional performance tests are specific hands-on tests, used to verify that the equipment and associated systems meet the specified design parameters and operate as fully integrated components or systems through their respective level of automation. This testing also confirms the capabilities of each system to meet the requirements of the facility, and the Owner's Project Requirements. To test all systems under peak operating conditions, some functional performance testing may be deferred to times when peak operation occurs.

Acceptance Inspections - A series of formal inspections carried out for systems that result in acceptance of the work as complete. These typically would consist of In-Wall, Above-Ceiling, and Semi-Final / Final site reviews.

2.0 Building Information

Project Name: GOVERNMENT OF CANADA – EXISTING BUILDING RENOVATION
Location: Edson, Alberta
Building Type: _
Square Footage: 180 m2

3.0 Project Team

Table 1: Project Team Information

Title	Name / Company	Contact information
Owners Representative	Chuck Koch Project Manager NWR Project Management Office	Tel: (780) 412-5326
Owner		Tel:
Commissioning Team Lead	Stantec Consulting Jason Hancock	Tel: (403) 806-1564
Design Consultant	Enzo Vicenzino	Tel: (403) 569-5355
Mechanical Designer	Jason Hancock	Tel: (403) 806-1564
Electrical Designer	Ron Bonnett	Tel: (403) 716-1493
General Contractor		Tel:
Mechanical Contractor	--- ---	Tel: ---

Electrical Contractor	--- ---	Tel: --- ---
Control Contractor	--- ---	Tel: --- ---

3.1 COMMISSIONING TEAM'S RESPONSIBILITIES AND LIST OF COMMISSIONING PROCESS MILESTONES

3.1.1 Commissioning Authority

Commissioning Authority will:

Develop and implement a Commissioning Plan referencing CSA Z320-11 and as lead of the Commissioning Team, assist the Commissioning Team throughout the project to ensure that all systems work with one another specific to components, systems and integrated systems within the fit-up space to produce a functional and integrated facility including:

- Commissioning Plan and specifications
- Method of verification, check sheets, forms, system / component matrix and commissioning issues log;
- Resources required to complete commissioning responsibly;
- Final commissioning Report
- Verify user training and orientation

The Contractor will:

- Provide any available information to the CxA needed to develop the Check Sheets.
- Provide any clarifications or required information on any design related issues as requested by the CxA.
- Verify that sufficient materials and manpower are scheduled and available to carry out the commissioning activities; including subcontractors, specific equipment vendors/manufacturers, and individual testing agents/specialists.
- Provide all services requiring tools or the use of tools to start-up, test, adjust, or otherwise bring the equipment and systems into a fully operational state.

- Integrate the key commissioning events/activities from the Commissioning Plan (CP) into the construction schedule, including timelines indicating when the Seasonal or Deferred Commissioning Plan (SDCP) will be completed.

- Participate in all Commissioning Meetings (include representatives of the design team, equipment vendors, and individual testing agents as may be required). Carry out all commissioning activities; as described in the CP and the Contract documents.

- The Design Team and Owner shall be the vehicle to determine systems are ready. Additional commissioning cost shall:

    - Cost for Cx and Owner personnel to reschedule a functional performance test, made necessary because an item certified by a Certificate of Readiness signee is found in fault or incomplete, shall be charged to the responsible party.

    - A deficiency identified during functional testing not identified during installation inspection, shall be re-tested once at no Cx or Owner charge. All costs for subsequent re-testing shall be charge to the responsible party.

    - Items that are left incomplete by a contractor or vendor and later causing deficiencies or delays during functional testing may result in back-charges to the responsible party.

- Sub-Trades to provide written notification to the Construction Manager and Commissioning Authority that the following work has been completed in accordance with the contract documents, and that the equipment, systems and sub-systems are operating as required:

    - All MEP equipment and systems called for in the Scope of Work and all other equipment are furnished under the contract documents.

    - Heating and cooling equipment,

    - Fire stopping in the fire rated construction, including fire damper installation, caulking, gasketing and sealing of smoke barriers.

- Fire detection and smoke detection devices furnished under the divisions of this specification as they affect the operations of the smoke controls system

- The building control systems are functioning to control MEP equipment.

Documentation Requirements:

- Collaborate with the CxA to ensure that all equipment, installation and performance checks are fully documented.

- In consultation with subcontractors, equipment suppliers, and vendors ensure that Equipment Start-Up and Acceptance Reports are completed.

- Issue a statement and certify that testing and balancing work has been completed; and submit the final testing and balancing reports for review.

- Issue a statement and certify that BMS system controls have been calibrated, checked- out, and that the control of equipment and systems are fully operational and functionally tested in all sequences and operating modes.

- Issue a certificate of readiness that will be provided by the CxA that functional test performed by trade contractors have been completed and tested including all BMS control requirements and other control or monitoring systems have been reviewed and observed and are fully operational, functionally tested and ready for demonstration to the commissioning authority.

Review:

- All construction and manufacturer submittals (including Shop Drawings).

- Testing procedures, as identified in the Design-Build Contract, prior to the execution of tests.

- Operating / maintenance data prior to submission.

3.1.2 Design Consultants

Design Consultants will:

- Work in co-operation with the Commissioning Authority to produce design documentation that includes project specific Commissioning activities.

- On-Going Field Reviews – Visits to the site to observe progress for claim approval and to determine if the installations generally comply with the intent of the Contract Documents. This is not a quality control function, but a sampling for quality assurance. Ultimately, all quality control is the responsibility of the contractors. As part of the contract responsibilities, the Consultants are to provide interpretations of the Contract Documents when required and resolution of construction-related issues.

- Provide clarification and/or required information as requested by the Commissioning Agent

- Be provided with all Commissioning reports and schedules. They shall review all recommendations in the reports, and provide direction.

- Witness (at their discretion) Functional Performance tests as conducted by the Commissioning Agent. This however, is not a requirement of the Consultant.

- Provide copies of all Inspection Reports to the Commissioning Authority to allow for better tracking of the construction progress and issues.

Project Team

Table 2 gives a brief task breakdown of the Commissioning Process and lists the responsible parties. The completion of each of the following commissioning tasks is considered a Commissioning Process Milestone.

Table 2: Project Team Responsibilities

Commissioning Tasks	Contractor	Commissioning Agent	Architect	Mechanical Designer	Electrical Designer	Builders' Cx Coordinator	Owner / Owner's Rep.
Develop Commissioning and equipment testing required specifications			x	x	x		x
Develop the Commissioning Plan and update as necessary		x					
Develop Commissioning installation check sheets		x					
Review Commissioning installation check sheets		x		x	x	x	
Complete installation check sheets	x	x					
Complete equipment startup	x						
Witness equipment startup	x	x				x	x
Develop Functional Performance Testing procedures	x	x				x	
Review Functional Performance Testing procedures	x	x				x	
Perform Functional Performance Testing procedures	x	x					
Organize O&M manual	x					x	
Complete Final Commissioning Report		x					
Perform seasonal functional testing (if applicable)	x	x					

3.2 LIST OF KEY COMMISSIONING MILESTONES

The major commissioning milestones for this project are as follows:

Pre-Construction

Commissioning Specifications generated ---

Prepare Commissioning Plan / Org Chart (Final Issue) ---

Construction

Commissioning Kick-off Meeting (65% Construction) ---

Develop the Equipment Installation Checksheets ---

Begin Equipment Installation Checks ---

Develop Functional Performance Testing Procedures ---

M&E System Start-up ---

Verification of Installation Procedure ---

Functional Performance Testing ---

Operations and Maintenance Manuals submitted for review ---

Post Construction

Issue Resolution/Deferred Testing ---

Lessons Learned ---

Final Commissioning Report Issued ---

Performing a post occupancy review with the Tenant Representative ---

4.0 Description of the Management, Communication and Reporting Aspects of the Commissioning Process

The Commissioning Team shall follow the following communication protocol in the event that issues arise. Table 3 is an identification tool for proper management, communication and reporting to be used

by the Commissioning Team. The Project Team shall understand the following to insure their responsibility in the event of an issue is understood.

All communication and management throughout the commissioning process is structured as follows. If there is a request for information or a formal document requested the Commissioning Authority first approaches the Project Manager for resolution. If the Commissioning Authority requires verbal information for clarification they are to go directly to the informed party. If the Commissioning Authority needs to notify contractors of deficiencies they are to document deficiencies through the Project Manager. When the Commissioning Authority requires training or functional testing to be scheduled they can supply some input but do not do any scheduling. The Commissioning Authority does not have the authority to issue any change orders. Should Subcontractors disagree with the requests or interpretations by the Commissioning Authority, the Subcontractor should try to resolve the issue with the Commissioning Authority and notify the Project Manager. For further reference see Table 3.

4.1 DESCRIPTION OF REPORTING WITHIN THE COMMISSIONING PROCESS

All reporting from the Commissioning Authority is sent to the Project Manager and Owner. The Project Manager is then responsible for distributing appropriate contents to other parties and subcontractors. For further reference see Table 3.

Table 3: Description of management, communication and reporting within the commissioning process

Issue	Protocol
For requests for information (RFI) or formal documentation requests.	Request goes to Builders' Commissioning Coordinator who coordinates accordingly
For verbal information or clarification.	The CxA / Agents goes directly to the informed party.
For notifying contractors of construction deficiencies or the Design Consultants on design issues.	The CxA / Agents will verbally discuss issues of note on site with the installing contractors and then document all observations, including deficiencies, in field commissioning reports copied to the Project Team first hand to speed up the process for issue resolve.
For scheduling of field reviews and functional tests.	The CxA may provide input and do some coordination, but scheduling the timing of the commissioning reviews is based on dates provided by the contractors working with the Builders' Commissioning Coordinator.
For making requests for significant changes.	The CxA has no authority to issue change orders. If a design change is required, action will be directed to the Design Consultants.
Subcontractors disagreeing with requests or interpretations by the CxA shall:	The Subcontractor may review this issue directly with the CxA / and his Agents, but the Builders' Commissioning Coordinator to be informed of all issues that require additional input for resolve.
Issue Sign-off	The CxA / Agents follow up on all documented commissioning issues for sign-off and issues a summary

Table 3: Description of management, communication and reporting within the commissioning process

Issue	Protocol
	log report noted how each issued was resolved or highlights the status of all issues that remain open in the logs.

5.0 Commissioning Scope of Work

5.1 LISTING OF THE SYSTEMS AND ASSEMBLIES INCLUDED IN THE COMMISSIONING AUTHORITY'S SCOPE OF WORK.

The facility systems and sampling rate of systems to be commissioned are as follows:

1. MECHANICAL SYSTEMS

1.1 Air Systems

- Make Up Air Unit 100%
- Exhaust Fans 100%
- Ductwork 20%
- Duct Cleaning 10%
- Fire Dampers 100%

1.2 Air and Water Balancing 25%

2. PLUMBING SYSTEMS

2.1 Plumbing Fixtures 50%

2.2 Drainage Systems

- Sanitary Piping 10%

3. BUILDING AUTOMATED CONTROL SYSTEM (BACS)

3.1 Sequence of Operation 100%

3.2 Every connected physical point and end devices including:

- Temperature 100%
- Pressure Sensors and Controllers 100%
- Damper/Valve Actuators 100%
- Meters 100%

4. ELECTRICAL SYSTEMS

4.1 Interior Lighting

- Illumination Levels 100%
- Lighting Controls 100%

4.2 Exit Lights 100%

4.3 Emergency Lighting Battery Units 100%

4.4 Fire Alarm System (Collect paperwork from Engineer performing verification)

- Fire alarm verification worksheets 100%
- Fire alarm verification certificate 100%

4.5 Target Systems (Collect paperwork from range installer)

- Target System Commissioning 100%

5. BUILDING INTEGRATED SYSTEM TEST 100%

6. ARCHITECTURAL SYSTEMS

6.1 Operation of Doors and Hardware 100%

Systems not included in this Commissioning Plan – The following building systems are not required to be commissioned under LEED 2009 EAp1 and therefore are not included with the Commissioning Agent's scope of work:

- Commissioning scope is limited to confirming that the Automation Controls from the renovated space are communicating with the Base Building Controls System. The Builder and the sub-contractors are responsible for completing the start-up checks for the equipment and submitting a report.
- Building Envelope
- CATV Systems
- Intercom System
- Public Address

6.0 Commissioning Process

6.1 DEFINITION OF COMMISSIONING

"Building Commissioning" is the process of bringing a facility from a static operating state to a dynamic operating state, while also meeting the specific building requirements for the intended use of the facility. More specifically, commissioning includes bringing the facility to a working and fully operational condition that is in compliance with the design intent. Commissioning is a systematic process to ensure that all building systems perform interactively according to the contract documents, the design intent and the Owner's operational needs.

6.2 ELEMENTS OF COMMISSIONING

The Fundamental Commissioning procedures must be planned well in advance of construction and implemented throughout the pre-design, design, construction, and installation phases of the project. The commissioning process is closely associated with the construction of the building, specifically the timing, and is grossly 'driven' by the construction schedule.

During construction, the Commissioning Authority, in accordance with the Commissioning Plan, will coordinate the commissioning activities and track the completion of testing for each component, and building system.

Commissioning activities:

- **Commissioning Kick-Off Meeting** – After all major shop drawings submittals have been approved and the commissioning checksheets have been prepared, the Commissioning Authority will arrange for a Commissioning Meeting to kick-off the commissioning process in the field. This meeting will be used to go over in detail, the process for completing the commissioning checksheets, review roles and responsibilities, and begin to establish a commissioning schedule of activities. Typically, this meeting takes place around the 65% Construction Phase. The Commissioning Authority will coordinate additional Commissioning Meetings with the Project Construction Team as required, to provide updates on commissioning progress along with reviews of any issues or potential concerns.

- **Installation of Building Equipment** – After notification from the contractors that a system's equipment components have been installed and are ready for review, the Commissioning Team conducts dynamic functional checks to verify performance. Following each commissioning site review, the Commissioning Agents will prepare and issue a Witnessing Report documenting findings and potential issues.

- **Schedule** – The Commissioning Schedule is generated based on information provided to the commissioning team regarding construction dates and project timelines as supplied by the project and commissioning teams. The Commissioning Schedule is a dynamic process and

designed to incorporate updates from the ongoing construction process as they become available. The overall commissioning process is targeted to dovetail into the construction process wherever practical by following the construction completion and readiness milestones. As project construction milestones and projected completion updates are made available to the Commissioning Team, the Commissioning Schedule will be updated and resubmitted accordingly.

The Commissioning Authority will update the Commissioning Schedule on regular intervals to show commissioning progress and whenever significant changes occur to the dates provided for commissioning activities. The Commissioning Schedules are sent to the Owner to be distributed.

- **Start-Up/Activation** – Following dates established in the commissioning schedule, the Commissioning Agents witness contractor start-up of selected equipment and review all Contractor start-up reports of all commissioned equipment.

- **Functional Performance Testing**– After notification from the Contractors that system adjustments and balancing have been completed, the Commissioning Agents will verify equipment and system performance. In many cases, hands-on functional performance testing can be completed with minimal assistance from the Contractors.

7. **Post-Construction** – Commissioning Authority will complete a final schedule which is developed to ensure all seasonal performance verifications are completed prior to warranty end. The Commissioning Authority will provide a Final Commissioning Report to the Owner, certifying that commissioning has been completed.

6.3 INSTALLATION CHECKS

Prior to the startup of the equipment, all equipment shall be checked and correct installation shall be verified. This is done to reduce delays and damage to the equipment during startup.

Every piece of equipment is inspected by the Installing Contractor. There is to be no sampling at this step. The CxA does not need to be present during each installation, but should be present for startup of central pieces of equipment, and has the right to check a sample of additional equipment of his/her choosing.

The commissioning checksheets are to be supplied by the CxA, contractor or manufacturer for each piece of energy consuming equipment and when necessary, submitted to the CxA for inclusion into Appendix A.

All deficiencies are to be recorded and addressed before functional testing will begin.

6.4 COMMISSIONING CHECKSHEETS

The Commissioning Check Sheet Manual contains the Mechanical and Electrical checksheets that are specific to the Commissioning activities. Specified and shop drawing information for each major piece of

equipment will be entered on a checksheet. The technical data (including specified, shop drawing and installed equipment data) will be completed by the Contractors and the Commissioning Agents. Functional or Dynamic checks will be completed by the Commissioning Agents in the field.

All commissioning checksheets must be completed and signed off by the Contractors. (Refer to Appendix B for sample check sheets.)

The commissioning checksheets are designed to act as a tool for the Contractor to ensure the installed equipment aligns with the approved shop drawings and that each installation is complete before start-up to reduce the number of deficiencies associated with system start-ups.

The project commissioning documentation status can be reviewed on-line by all project team members once a password is provided by the Commissioning Authority.

Technical Data	Specified Data	Commissioning Agent
	Submitted Data	Commissioning Agent
	Installed Data	Contractors
Installation Checks	Static Checks	Contractors
Functional Checks	Dynamic Checks	Completed by Commissioning Agent with the assistance of the contractors as field testing of the equipment progresses.
Date/Checked by		Automatically documented on to the commissioning checksheets

6.5 FINAL REPORT

The CxA will supply the Project Manager with a Final Commissioning Report. The contents of the report shall be as follows:

- Final Commissioning Plan
- Project Commissioning Specifications
- Verification of Installation (Construction Checklists)
- Factory Start-Up and Vendor Test Reports
- Functional Performance Testing Forms organized on a building system basis
- Outstanding Issues / Issue Resolution Reports
- Remediation / Retest Reports
- Records of Training

Appendix A SAMPLE COMMISSIONING CHECKSHEETS

Appendix B SAMPLE FUNCTIONAL TEST PROCEDURES

Appendix C COMMISSIONING TEAM ORGANIZATION CHART

Government of Canada Existing Building Renovation, Red Deer, AB
COMMISSIONING PLAN
144202775.215

DRAFT

Prepared by:
Stantec Consulting Ltd.

Sign-off Sheet

This document entitled Government of Canada Existing Building Renovation, Red Deer, AB COMMISSIONING PLAN144202775.215 was prepared by Stantec Consulting Ltd. for the account of the Government of Canada. The material in it reflects Stantec's best judgment in light of the information available to it at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions made based on it, are the responsibilities of such third parties. Stantec Consulting Ltd. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

Reviewed by _____

(signature)

Stantec
200 - 325 25th Street SE Calgary AB T2A 7H8

Table of Contents

LIST OF TABLES

LIST OF APPENDICES

1.0 Introduction - Brief Overview of the Commissioning Process

The project consists of an extensive renovation to the basement space of an existing facility in Red Deer, Alberta. Construction will result in renovations to an area of approximately 205m².

Commissioning is a quality assurance process continued throughout the entire project life cycle (Schematic through to Post Occupancy) in which the functional requirements and the operational requirements of the Project are tested, verified and proven to function as intended and documented.

System performance will be verified to meet the design parameters set out for it by the designer, and appropriate documentation will be produced to record the results of the verification tests. The final performance data will then be used to benchmark the systems operations that can be referenced in the years to follow to maintain system efficiencies**.**

Good lines of communication will be maintained throughout the project to keep all parties informed on the commissioning program progress. This will be done by keeping the commissioning documentation concise and facilitating all commissioning team members keeping an active dialogue going throughout the project. The focus for the project will to be to identify and resolve issues on the project as early as possible in the commissioning process through cooperation by all parties.

1.1 DEFINITIONS

The terms noted below will be used throughout the Cx process and within the Cx documentation. Any reference to these terms carries the stated and associated definition as outlined below.

Commissioning Authority (CxA) / Commissioning Manager - Is the individual designated to organize, lead, and review the completion of commissioning process activities. The CxA facilitates communication among the Owner, Designer, and Contractors to ensure that complex systems are installed and function in accordance with the Owner's Project Requirements.

Commissioning Agents - The internal technical resource staff of the Commissioning Authority that will be responsible for the execution of field reviews and the on-site "hands on" testing activities.

Commissioning Team - Personnel that will be directly involved in the building commissioning process. The Commissioning Team will be made up of the Commissioning Agents, Contractors, Design Consultants, Owners' Representatives, Independent Third
Party Testing Agencies, and Government of Canada Representatives.

Commissioning Plan - The Commissioning Plan is a document that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process. The Commissioning Plan is a dynamic document; which is open to be updated by the Commissioning Team throughout the commissioning process to ensure accuracy and relevance as the project progresses. The final Commissioning Plan will be submitted in Commissioning Report.

Contractor's Site Cx Coordinator: Personnel that represent the mechanical and electrical contractors that coordinate the commissioning process with the CxA.

Owner's Project Requirements - Is a written document that details the ideas, concepts, and criteria that are determined by the Owner to be important to the success of the project.

Design Narrative - The Design Narrative (DN) is where the design team describes in detail the concepts and features it intends to incorporate during schematic design.

Basis of Design - Includes the necessary design information needed to accomplish the Owner's Project Requirements, including system descriptions, indoor environmental quality criteria, design assumptions and references to applicable codes, standards, regulations and guidelines.

Contractors – Includes those responsible for physical construction of the project. This designation may include Prime Construction Contractors, and sub-contractors such as Electrical, Mechanical, and Controls firms.

Third Party Testing Firms - Specialty firms or agencies retained to conduct acceptance tests on a system or component and provide a certificate of acceptance and conformance to governing standards.

Project Manager - The individual or firm responsible for the overall management and delivery of the project to the Owner.

Consultants - The Architects and Engineers responsible for producing the design drawings and specifications for this project, as well as the base contract administration inspection, quality assurance and acceptance activities.

User / Operator - A User or Operator is an individual or group that will work in and operate various aspects of the facility once the project has been turned over.

In Contract Tests - Testing requirements that are defined in the contract documents that are a Contractor's responsibility to carry out and document appropriately.

Out of Contract Tests – Testing requirements that are not covered as part of the construction documents but are required to be carried out by certified agencies.

Commissioning Checksheets (Verification Forms) – Mechanical and electrical equipment checksheets that are specific to each system, and its major components. These are used to verify system operation and are developed by the CxA with the support of the project team and OEM suppliers.

Static Installation Checks – Systematic, detailed checks of mechanical and electrical system components. Contractors will utilize commissioning checksheets for recording installation compliance. The timing of the performance of static checks is tied to construction progress and occurs once the contractor's construction installation process and construction checks have been completed for the individual equipment components, or systems.

Contractor Start-Up Program - Contractor start-up and verification program activities are conducted by the Contractors and/or their sub-trades and equipment vendors. Contractor / Vendor verification of the physical installation of equipment, and reviewing the completion of system installation and readiness, shall be completed **prior** to the Commissioning Agent's functional performance testing and verification activities.

Functional Performance Testing - Functional performance tests are specific hands-on tests, used to verify that the equipment and associated systems meet the specified design parameters and operate as fully integrated components or systems through their respective level of automation. This testing also confirms the capabilities of each system to meet the requirements of the facility, and the Owner's Project Requirements. To test all systems under peak operating conditions, some functional performance testing may be deferred to times when peak operation occurs.

Acceptance Inspections - A series of formal inspections carried out for systems that result in acceptance of the work as complete. These typically would consist of In-Wall, Above-Ceiling, and Semi-Final / Final site reviews.

2.0 Building Information

Project Name: GOVERNMENT OF CANADA – EXISTING BUILDING RENOVATION
Location: Red Deer, Alberta
Building Type: _
Square Footage: 205 m2

3.0 Project Team

Table 1: Project Team Information

Title	Name / Company	Contact information
Owners Representative	Chuck Koch Project Manager NWR Project Management Office	Tel: (780) 412-5326
Owner		Tel:
Commissioning Team Lead	Stantec Consulting Jason Hancock	Tel: (403) 806-1564
Design Consultant	Enzo Vicenzino	Tel: (403) 569-5355
Mechanical Designer	Jason Hancock	Tel: (403) 806-1564
Electrical Designer	Ron Bonnett	Tel: (403) 716-1493
General Contractor		Tel:
Mechanical Contractor	--- ---	Tel: ---

Electrical Contractor	--- ---	Tel: --- ---
Control Contractor	--- ---	Tel: --- ---

3.1 COMMISSIONING TEAM'S RESPONSIBILITIES AND LIST OF COMMISSIONING PROCESS MILESTONES

3.1.1 Commissioning Authority

Commissioning Authority will:

Develop and implement a Commissioning Plan referencing CSA Z320-11 and as lead of the Commissioning Team, assist the Commissioning Team throughout the project to ensure that all systems work with one another specific to components, systems and integrated systems within the fit-up space to produce a functional and integrated facility including:

- Commissioning Plan and specifications
- Method of verification, check sheets, forms, system / component matrix and commissioning issues log;
- Resources required to complete commissioning responsibly;
- Final commissioning Report
- Verify user training and orientation

The Contractor will:

- Provide any available information to the CxA needed to develop the Check Sheets.
- Provide any clarifications or required information on any design related issues as requested by the CxA.
- Verify that sufficient materials and manpower are scheduled and available to carry out the commissioning activities; including subcontractors, specific equipment vendors/manufacturers, and individual testing agents/specialists.
- Provide all services requiring tools or the use of tools to start-up, test, adjust, or otherwise bring the equipment and systems into a fully operational state.

- Integrate the key commissioning events/activities from the Commissioning Plan (CP) into the construction schedule, including timelines indicating when the Seasonal or Deferred Commissioning Plan (SDCP) will be completed.

- Participate in all Commissioning Meetings (include representatives of the design team, equipment vendors, and individual testing agents as may be required). Carry out all commissioning activities; as described in the CP and the Contract documents.

- The Design Team and Owner shall be the vehicle to determine systems are ready. Additional commissioning cost shall:

    - Cost for Cx and Owner personnel to reschedule a functional performance test, made necessary because an item certified by a Certificate of Readiness signee is found in fault or incomplete, shall be charged to the responsible party.

    - A deficiency identified during functional testing not identified during installation inspection, shall be re-tested once at no Cx or Owner charge. All costs for subsequent re-testing shall be charge to the responsible party.

    - Items that are left incomplete by a contractor or vendor and later causing deficiencies or delays during functional testing may result in back-charges to the responsible party.

- Sub-Trades to provide written notification to the Construction Manager and Commissioning Authority that the following work has been completed in accordance with the contract documents, and that the equipment, systems and sub-systems are operating as required:

    - All MEP equipment and systems called for in the Scope of Work and all other equipment are furnished under the contract documents.

    - Heating and cooling equipment,

    - Fire stopping in the fire rated construction, including fire damper installation, caulking, gasketing and sealing of smoke barriers.

- Fire detection and smoke detection devices furnished under the divisions of this specification as they affect the operations of the smoke controls system

- The building control systems are functioning to control MEP equipment.

Documentation Requirements:

- Collaborate with the CxA to ensure that all equipment, installation and performance checks are fully documented.

- In consultation with subcontractors, equipment suppliers, and vendors ensure that Equipment Start-Up and Acceptance Reports are completed.

- Issue a statement and certify that testing and balancing work has been completed; and submit the final testing and balancing reports for review.

- Issue a statement and certify that BMS system controls have been calibrated, checked- out, and that the control of equipment and systems are fully operational and functionally tested in all sequences and operating modes.

- Issue a certificate of readiness that will be provided by the CxA that functional test performed by trade contractors have been completed and tested including all BMS control requirements and other control or monitoring systems have been reviewed and observed and are fully operational, functionally tested and ready for demonstration to the commissioning authority.

Review:

- All construction and manufacturer submittals (including Shop Drawings).

- Testing procedures, as identified in the Design-Build Contract, prior to the execution of tests.

- Operating / maintenance data prior to submission.

3.1.2 Design Consultants

Design Consultants will:

- Work in co-operation with the Commissioning Authority to produce design documentation that includes project specific Commissioning activities.

- On-Going Field Reviews – Visits to the site to observe progress for claim approval and to determine if the installations generally comply with the intent of the Contract Documents. This is not a quality control function, but a sampling for quality assurance. Ultimately, all quality control is the responsibility of the contractors. As part of the contract responsibilities, the Consultants are to provide interpretations of the Contract Documents when required and resolution of construction-related issues.

- Provide clarification and/or required information as requested by the Commissioning Agent

- Be provided with all Commissioning reports and schedules. They shall review all recommendations in the reports, and provide direction.

- Witness (at their discretion) Functional Performance tests as conducted by the Commissioning Agent. This however, is not a requirement of the Consultant.

- Provide copies of all Inspection Reports to the Commissioning Authority to allow for better tracking of the construction progress and issues.

Project Team

Table 2 gives a brief task breakdown of the Commissioning Process and lists the responsible parties. The completion of each of the following commissioning tasks is considered a Commissioning Process Milestone.

Table 2: Project Team Responsibilities

Commissioning Tasks	Contractor	Commissioning Agent	Architect	Mechanical Designer	Electrical Designer	Builders' Cx Coordinator	Owner / Owner's Rep.
Develop Commissioning and equipment testing required specifications			x	x	x		x
Develop the Commissioning Plan and update as necessary		x					
Develop Commissioning installation check sheets		x					
Review Commissioning installation check sheets		x		x	x	x	
Complete installation check sheets	x	x					
Complete equipment startup	x						
Witness equipment startup	x	x				x	x
Develop Functional Performance Testing procedures	x	x				x	
Review Functional Performance Testing procedures	x	x				x	
Perform Functional Performance Testing procedures	x	x					
Organize O&M manual	x					x	
Complete Final Commissioning Report		x					
Perform seasonal functional testing (if applicable)	x	x					

3.2 LIST OF KEY COMMISSIONING MILESTONES

The major commissioning milestones for this project are as follows:

Pre-Construction

Commissioning Specifications generated ---

Prepare Commissioning Plan / Org Chart (Final Issue) ---

Construction

Commissioning Kick-off Meeting (65% Construction) ---

Develop the Equipment Installation Checksheets ---

Begin Equipment Installation Checks ---

Develop Functional Performance Testing Procedures ---

M&E System Start-up ---

Verification of Installation Procedure ---

Functional Performance Testing ---

Operations and Maintenance Manuals submitted for review ---

Post Construction

Issue Resolution/Deferred Testing ---

Lessons Learned ---

Final Commissioning Report Issued ---

Performing a post occupancy review with the Tenant Representative ---

4.0 Description of the Management, Communication and Reporting Aspects of the Commissioning Process

The Commissioning Team shall follow the following communication protocol in the event that issues arise. Table 3 is an identification tool for proper management, communication and reporting to be used

by the Commissioning Team. The Project Team shall understand the following to insure their responsibility in the event of an issue is understood.

All communication and management throughout the commissioning process is structured as follows. If there is a request for information or a formal document requested the Commissioning Authority first approaches the Project Manager for resolution. If the Commissioning Authority requires verbal information for clarification they are to go directly to the informed party. If the Commissioning Authority needs to notify contractors of deficiencies they are to document deficiencies through the Project Manager. When the Commissioning Authority requires training or functional testing to be scheduled they can supply some input but do not do any scheduling. The Commissioning Authority does not have the authority to issue any change orders. Should Subcontractors disagree with the requests or interpretations by the Commissioning Authority, the Subcontractor should try to resolve the issue with the Commissioning Authority and notify the Project Manager. For further reference see Table 3.

4.1 DESCRIPTION OF REPORTING WITHIN THE COMMISSIONING PROCESS

All reporting from the Commissioning Authority is sent to the Project Manager and Owner. The Project Manager is then responsible for distributing appropriate contents to other parties and subcontractors. For further reference see Table 3.

Table 3: Description of management, communication and reporting within the commissioning process

Issue	Protocol
For requests for information (RFI) or formal documentation requests.	Request goes to Builders' Commissioning Coordinator who coordinates accordingly
For verbal information or clarification.	The CxA / Agents goes directly to the informed party.
For notifying contractors of construction deficiencies or the Design Consultants on design issues.	The CxA / Agents will verbally discuss issues of note on site with the installing contractors and then document all observations, including deficiencies, in field commissioning reports copied to the Project Team first hand to speed up the process for issue resolve.
For scheduling of field reviews and functional tests.	The CxA may provide input and do some coordination, but scheduling the timing of the commissioning reviews is based on dates provided by the contractors working with the Builders' Commissioning Coordinator.
For making requests for significant changes.	The CxA has no authority to issue change orders. If a design change is required, action will be directed to the Design Consultants.
Subcontractors disagreeing with requests or interpretations by the CxA shall:	The Subcontractor may review this issue directly with the CxA / and his Agents, but the Builders' Commissioning Coordinator to be informed of all issues that require additional input for resolve.
Issue Sign-off	The CxA / Agents follow up on all documented commissioning issues for sign-off and issues a summary

Table 3: Description of management, communication and reporting within the commissioning process

Issue	Protocol
	log report noted how each issued was resolved or highlights the status of all issues that remain open in the logs.

5.0 Commissioning Scope of Work

5.1 LISTING OF THE SYSTEMS AND ASSEMBLIES INCLUDED IN THE COMMISSIONING AUTHORITY'S SCOPE OF WORK.

The facility systems and sampling rate of systems to be commissioned are as follows:

1. MECHANICAL SYSTEMS

1.1 Air Systems

- Make up Air Unit 100%
- Exhaust Fan 100%
- Ductwork 20%
- Duct Cleaning 10%
- Fire Dampers 100%

1.2 Air Balancing 25%

2. PLUMBING SYSTEMS

2.1 Plumbing Fixtures 50%

2.2 Drainage Systems

- Sanitary Piping 10%

3. BUILDING AUTOMATED CONTROL SYSTEM (BACS)

3.1 Sequence of Operation 100%

3.2 Every connected physical point and end devices including:

- Temperature 100%
- Pressure Sensors and Controllers 100%
- Damper/Valve Actuators 100%
- Meters 100%

3.3 Fire Protection Systems 100%

4. ELECTRICAL SYSTEMS

4.1 Interior Lighting

- Illumination Levels 80%
- Lighting Controls 100%

4.2 Exit Lights 100%

4.3 Emergency Lighting Battery Units 100%

4.4 Fire Alarm System (Collect paperwork from Engineer performing verification)

- Fire alarm verification worksheets 100%
- Fire alarm verification certificate 100%

4.5 Target Systems (Collect paperwork from range installer)

- Target System Commissioning 100%

5. BUILDING INTEGRATED SYSTEM TEST 100%

6. ARCHITECTURAL SYSTEMS

6.1 Operation of Doors and Hardware 100%

Systems not included in this Commissioning Plan – The following building systems are not required to be commissioned under LEED 2009 EAp1 and therefore are not included with the Commissioning Agent's scope of work:

- Commissioning scope is limited to confirming that the Automation Controls from the renovated space are communicating with the Base Building Controls System. The Builder and the sub-contractors are responsible for completing the start-up checks for the equipment and submitting a report.
- Building Envelope
- CATV Systems
- Intercom System
- Public Address

6.0 Commissioning Process

6.1 DEFINITION OF COMMISSIONING

"Building Commissioning" is the process of bringing a facility from a static operating state to a dynamic operating state, while also meeting the specific building requirements for the intended use of the facility. More specifically, commissioning includes bringing the facility to a working and fully operational condition that is in compliance with the design intent. Commissioning is a systematic process to ensure that all building systems perform interactively according to the contract documents, the design intent and the Owner's operational needs.

6.2 ELEMENTS OF COMMISSIONING

The Fundamental Commissioning procedures must be planned well in advance of construction and implemented throughout the pre-design, design, construction, and installation phases of the project. The commissioning process is closely associated with the construction of the building, specifically the timing, and is grossly 'driven' by the construction schedule.

During construction, the Commissioning Authority, in accordance with the Commissioning Plan, will coordinate the commissioning activities and track the completion of testing for each component, and building system.

Commissioning activities:

- **Commissioning Kick-Off Meeting** – After all major shop drawings submittals have been approved and the commissioning checksheets have been prepared, the Commissioning Authority will arrange for a Commissioning Meeting to kick-off the commissioning process in the field. This meeting will be used to go over in detail, the process for completing the commissioning checksheets, review roles and responsibilities, and begin to establish a commissioning schedule of activities. Typically, this meeting takes place around the 65% Construction Phase. The Commissioning Authority will coordinate additional Commissioning Meetings with the Project Construction Team as required, to provide updates on commissioning progress along with reviews of any issues or potential concerns.

- **Installation of Building Equipment** – After notification from the contractors that a system's equipment components have been installed and are ready for review, the Commissioning Team conducts dynamic functional checks to verify performance. Following each commissioning site review, the Commissioning Agents will prepare and issue a Witnessing Report documenting findings and potential issues.

- **Schedule** – The Commissioning Schedule is generated based on information provided to the commissioning team regarding construction dates and project timelines as supplied by the project and commissioning teams. The Commissioning Schedule is a dynamic process and

designed to incorporate updates from the ongoing construction process as they become available. The overall commissioning process is targeted to dovetail into the construction process wherever practical by following the construction completion and readiness milestones. As project construction milestones and projected completion updates are made available to the Commissioning Team, the Commissioning Schedule will be updated and resubmitted accordingly.

The Commissioning Authority will update the Commissioning Schedule on regular intervals to show commissioning progress and whenever significant changes occur to the dates provided for commissioning activities. The Commissioning Schedules are sent to the Owner to be distributed.

- **Start-Up/Activation** – Following dates established in the commissioning schedule, the Commissioning Agents witness contractor start-up of selected equipment and review all Contractor start-up reports of all commissioned equipment.

- **Functional Performance Testing**– After notification from the Contractors that system adjustments and balancing have been completed, the Commissioning Agents will verify equipment and system performance. In many cases, hands-on functional performance testing can be completed with minimal assistance from the Contractors.

7. **Post-Construction** – Commissioning Authority will complete a final schedule which is developed to ensure all seasonal performance verifications are completed prior to warranty end. The Commissioning Authority will provide a Final Commissioning Report to the Owner, certifying that commissioning has been completed.

6.3 INSTALLATION CHECKS

Prior to the startup of the equipment, all equipment shall be checked and correct installation shall be verified. This is done to reduce delays and damage to the equipment during startup.

Every piece of equipment is inspected by the Installing Contractor. There is to be no sampling at this step. The CxA does not need to be present during each installation, but should be present for startup of central pieces of equipment, and has the right to check a sample of additional equipment of his/her choosing.

The commissioning checksheets are to be supplied by the CxA, contractor or manufacturer for each piece of energy consuming equipment and when necessary, submitted to the CxA for inclusion into Appendix A.

All deficiencies are to be recorded and addressed before functional testing will begin.

6.4 COMMISSIONING CHECKSHEETS

The Commissioning Check Sheet Manual contains the Mechanical and Electrical checksheets that are specific to the Commissioning activities. Specified and shop drawing information for each major piece of

equipment will be entered on a checksheet. The technical data (including specified, shop drawing and installed equipment data) will be completed by the Contractors and the Commissioning Agents. Functional or Dynamic checks will be completed by the Commissioning Agents in the field.

All commissioning checksheets must be completed and signed off by the Contractors. (Refer to Appendix B for sample check sheets.)

The commissioning checksheets are designed to act as a tool for the Contractor to ensure the installed equipment aligns with the approved shop drawings and that each installation is complete before start-up to reduce the number of deficiencies associated with system start-ups.

The project commissioning documentation status can be reviewed on-line by all project team members once a password is provided by the Commissioning Authority.

Technical Data	Specified Data	Commissioning Agent
	Submitted Data	Commissioning Agent
	Installed Data	Contractors
Installation Checks	Static Checks	Contractors
Functional Checks	Dynamic Checks	Completed by Commissioning Agent with the assistance of the contractors as field testing of the equipment progresses.
Date/Checked by		Automatically documented on to the commissioning checksheets

6.5 FINAL REPORT

The CxA will supply the Project Manager with a Final Commissioning Report. The contents of the report shall be as follows:

- Final Commissioning Plan
- Project Commissioning Specifications
- Verification of Installation (Construction Checklists)
- Factory Start-Up and Vendor Test Reports
- Functional Performance Testing Forms organized on a building system basis
- Outstanding Issues / Issue Resolution Reports
- Remediation / Retest Reports
- Records of Training

Appendix A SAMPLE COMMISSIONING CHECKSHEETS

Appendix B SAMPLE FUNCTIONAL TEST PROCEDURES

Appendix C COMMISSIONING TEAM ORGANIZATION CHART

Government of Canada Existing Building Renovation, Edmonton, AB
COMMISSIONING PLAN
144202775.215

DRAFT

Prepared by:
Stantec Consulting Ltd.

26T
Rev 0

Sign-off Sheet

This document entitled Government of Canada Existing Building Renovation, Edmonton, AB COMMISSIONING PLAN144202775.215 was prepared by Stantec Consulting Ltd. for the account of the Government of Canada. The material in it reflects Stantec's best judgment in light of the information available to it at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions made based on it, are the responsibilities of such third parties. Stantec Consulting Ltd. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

Reviewed by _____

(signature)

Stantec
200 - 325 25th Street SE Calgary AB T2A 7H8

Table of Contents

LIST OF TABLES

LIST OF APPENDICES

1.0 Introduction - Brief Overview of the Commissioning Process

The project consists of an extensive renovation to the basement space of an existing facility in Edmonton, Alberta. Construction will result in renovations to an area of approximately 350m².

Commissioning is a quality assurance process continued throughout the entire project life cycle (Schematic through to Post Occupancy) in which the functional requirements and the operational requirements of the Project are tested, verified and proven to function as intended and documented.

System performance will be verified to meet the design parameters set out for it by the designer, and appropriate documentation will be produced to record the results of the verification tests. The final performance data will then be used to benchmark the systems operations that can be referenced in the years to follow to maintain system efficiencies**.**

Good lines of communication will be maintained throughout the project to keep all parties informed on the commissioning program progress. This will be done by keeping the commissioning documentation concise and facilitating all commissioning team members keeping an active dialogue going throughout the project. The focus for the project will to be to identify and resolve issues on the project as early as possible in the commissioning process through cooperation by all parties.

1.1 DEFINITIONS

The terms noted below will be used throughout the Cx process and within the Cx documentation. Any reference to these terms carries the stated and associated definition as outlined below.

Commissioning Authority (CxA) / Commissioning Manager - Is the individual designated to organize, lead, and review the completion of commissioning process activities. The CxA facilitates communication among the Owner, Designer, and Contractors to ensure that complex systems are installed and function in accordance with the Owner's Project Requirements.

Commissioning Agents - The internal technical resource staff of the Commissioning Authority that will be responsible for the execution of field reviews and the on-site "hands on" testing activities.

Commissioning Team - Personnel that will be directly involved in the building commissioning process. The Commissioning Team will be made up of the Commissioning Agents, Contractors, Design Consultants, Owners' Representatives, Independent Third
Party Testing Agencies, and Government of Canada Representatives.

Commissioning Plan - The Commissioning Plan is a document that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process. The Commissioning Plan is a dynamic document; which is open to be updated by the Commissioning Team throughout the commissioning process to ensure accuracy and relevance as the project progresses. The final Commissioning Plan will be submitted in Commissioning Report.

Contractor's Site Cx Coordinator: Personnel that represent the mechanical and electrical contractors that coordinate the commissioning process with the CxA.

Owner's Project Requirements - Is a written document that details the ideas, concepts, and criteria that are determined by the Owner to be important to the success of the project.

Design Narrative - The Design Narrative (DN) is where the design team describes in detail the concepts and features it intends to incorporate during schematic design.

Basis of Design - Includes the necessary design information needed to accomplish the Owner's Project Requirements, including system descriptions, indoor environmental quality criteria, design assumptions and references to applicable codes, standards, regulations and guidelines.

Contractors – Includes those responsible for physical construction of the project. This designation may include Prime Construction Contractors, and sub-contractors such as Electrical, Mechanical, and Controls firms.

Third Party Testing Firms - Specialty firms or agencies retained to conduct acceptance tests on a system or component and provide a certificate of acceptance and conformance to governing standards.

Project Manager - The individual or firm responsible for the overall management and delivery of the project to the Owner.

Consultants - The Architects and Engineers responsible for producing the design drawings and specifications for this project, as well as the base contract administration inspection, quality assurance and acceptance activities.

User / Operator - A User or Operator is an individual or group that will work in and operate various aspects of the facility once the project has been turned over.

In Contract Tests - Testing requirements that are defined in the contract documents that are a Contractor's responsibility to carry out and document appropriately.

Out of Contract Tests – Testing requirements that are not covered as part of the construction documents but are required to be carried out by certified agencies.

Commissioning Checksheets (Verification Forms) – Mechanical and electrical equipment checksheets that are specific to each system, and its major components. These are used to verify system operation and are developed by the CxA with the support of the project team and OEM suppliers.

Static Installation Checks – Systematic, detailed checks of mechanical and electrical system components. Contractors will utilize commissioning checksheets for recording installation compliance. The timing of the performance of static checks is tied to construction progress and occurs once the contractor's construction installation process and construction checks have been completed for the individual equipment components, or systems.

Contractor Start-Up Program - Contractor start-up and verification program activities are conducted by the Contractors and/or their sub-trades and equipment vendors. Contractor / Vendor verification of the physical installation of equipment, and reviewing the completion of system installation and readiness, shall be completed **prior** to the Commissioning Agent's functional performance testing and verification activities.

Functional Performance Testing - Functional performance tests are specific hands-on tests, used to verify that the equipment and associated systems meet the specified design parameters and operate as fully integrated components or systems through their respective level of automation. This testing also confirms the capabilities of each system to meet the requirements of the facility, and the Owner's Project Requirements. To test all systems under peak operating conditions, some functional performance testing may be deferred to times when peak operation occurs.

Acceptance Inspections - A series of formal inspections carried out for systems that result in acceptance of the work as complete. These typically would consist of In-Wall, Above-Ceiling, and Semi-Final / Final site reviews.

2.0 Building Information

Project Name: GOVERNMENT OF CANADA – EXISTING BUILDING RENOVATION
Location: Edmonton, Alberta
Building Type: _
Square Footage: 350 m2

3.0 Project Team

Table 1: Project Team Information

Title	Name / Company	Contact information
Owners Representative	Chuck Koch Project Manager NWR Project Management Office	Tel: (780) 412-5326
Owner		Tel:
Commissioning Team Lead	Stantec Consulting Jason Hancock	Tel: (403) 806-1564
Design Consultant	Enzo Vicenzino	Tel: (403) 569-5355
Mechanical Designer	Jason Hancock	Tel: (403) 806-1564
Electrical Designer	Ron Bonnett	Tel: (403) 716-1493
General Contractor		Tel:
Mechanical Contractor	--- ---	Tel: ---

Electrical Contractor	--- ---	Tel: --- ---
Control Contractor	--- ---	Tel: --- ---

3.1 COMMISSIONING TEAM'S RESPONSIBILITIES AND LIST OF COMMISSIONING PROCESS MILESTONES

3.1.1 Commissioning Authority

Commissioning Authority will:

Develop and implement a Commissioning Plan referencing CSA Z320-11 and as lead of the Commissioning Team, assist the Commissioning Team throughout the project to ensure that all systems work with one another specific to components, systems and integrated systems within the fit-up space to produce a functional and integrated facility including:

- Commissioning Plan and specifications
- Method of verification, check sheets, forms, system / component matrix and commissioning issues log;
- Resources required to complete commissioning responsibly;
- Final commissioning Report
- Verify user training and orientation

The Contractor will:

- Provide any available information to the CxA needed to develop the Check Sheets.
- Provide any clarifications or required information on any design related issues as requested by the CxA.
- Verify that sufficient materials and manpower are scheduled and available to carry out the commissioning activities; including subcontractors, specific equipment vendors/manufacturers, and individual testing agents/specialists.
- Provide all services requiring tools or the use of tools to start-up, test, adjust, or otherwise bring the equipment and systems into a fully operational state.

- Integrate the key commissioning events/activities from the Commissioning Plan (CP) into the construction schedule, including timelines indicating when the Seasonal or Deferred Commissioning Plan (SDCP) will be completed.

- Participate in all Commissioning Meetings (include representatives of the design team, equipment vendors, and individual testing agents as may be required). Carry out all commissioning activities; as described in the CP and the Contract documents.

- The Design Team and Owner shall be the vehicle to determine systems are ready. Additional commissioning cost shall:

    - Cost for Cx and Owner personnel to reschedule a functional performance test, made necessary because an item certified by a Certificate of Readiness signee is found in fault or incomplete, shall be charged to the responsible party.

    - A deficiency identified during functional testing not identified during installation inspection, shall be re-tested once at no Cx or Owner charge. All costs for subsequent re-testing shall be charge to the responsible party.

    - Items that are left incomplete by a contractor or vendor and later causing deficiencies or delays during functional testing may result in back-charges to the responsible party.

- Sub-Trades to provide written notification to the Construction Manager and Commissioning Authority that the following work has been completed in accordance with the contract documents, and that the equipment, systems and sub-systems are operating as required:

    - All MEP equipment and systems called for in the Scope of Work and all other equipment are furnished under the contract documents.

    - Heating and cooling equipment,

    - Fire stopping in the fire rated construction, including fire damper installation, caulking, gasketing and sealing of smoke barriers.

- Fire detection and smoke detection devices furnished under the divisions of this specification as they affect the operations of the smoke controls system

- The building control systems are functioning to control MEP equipment.

Documentation Requirements:

- Collaborate with the CxA to ensure that all equipment, installation and performance checks are fully documented.

- In consultation with subcontractors, equipment suppliers, and vendors ensure that Equipment Start-Up and Acceptance Reports are completed.

- Issue a statement and certify that testing and balancing work has been completed; and submit the final testing and balancing reports for review.

- Issue a statement and certify that BMS system controls have been calibrated, checked- out, and that the control of equipment and systems are fully operational and functionally tested in all sequences and operating modes.

- Issue a certificate of readiness that will be provided by the CxA that functional test performed by trade contractors have been completed and tested including all BMS control requirements and other control or monitoring systems have been reviewed and observed and are fully operational, functionally tested and ready for demonstration to the commissioning authority.

Review:

- All construction and manufacturer submittals (including Shop Drawings).

- Testing procedures, as identified in the Design-Build Contract, prior to the execution of tests.

- Operating / maintenance data prior to submission.

3.1.2 Design Consultants

Design Consultants will:

- Work in co-operation with the Commissioning Authority to produce design documentation that includes project specific Commissioning activities.

- On-Going Field Reviews – Visits to the site to observe progress for claim approval and to determine if the installations generally comply with the intent of the Contract Documents. This is not a quality control function, but a sampling for quality assurance. Ultimately, all quality control is the responsibility of the contractors. As part of the contract responsibilities, the Consultants are to provide interpretations of the Contract Documents when required and resolution of construction-related issues.

- Provide clarification and/or required information as requested by the Commissioning Agent

- Be provided with all Commissioning reports and schedules. They shall review all recommendations in the reports, and provide direction.

- Witness (at their discretion) Functional Performance tests as conducted by the Commissioning Agent. This however, is not a requirement of the Consultant.

- Provide copies of all Inspection Reports to the Commissioning Authority to allow for better tracking of the construction progress and issues.

Project Team

Table 2 gives a brief task breakdown of the Commissioning Process and lists the responsible parties. The completion of each of the following commissioning tasks is considered a Commissioning Process Milestone.

Table 2: Project Team Responsibilities

Commissioning Tasks	Contractor	Commissioning Agent	Architect	Mechanical Designer	Electrical Designer	Builders' Cx Coordinator	Owner / Owner's Rep.
Develop Commissioning and equipment testing required specifications			x	x	x		x
Develop the Commissioning Plan and update as necessary		x					
Develop Commissioning installation check sheets		x					
Review Commissioning installation check sheets		x		x	x	x	
Complete installation check sheets	x	x					
Complete equipment startup	x						
Witness equipment startup	x	x				x	x
Develop Functional Performance Testing procedures	x	x				x	
Review Functional Performance Testing procedures	x	x				x	
Perform Functional Performance Testing procedures	x	x					
Organize O&M manual	x					x	
Complete Final Commissioning Report		x					
Perform seasonal functional testing (if applicable)	x	x					

3.2 LIST OF KEY COMMISSIONING MILESTONES

The major commissioning milestones for this project are as follows:

Pre-Construction

Commissioning Specifications generated ---

Prepare Commissioning Plan / Org Chart (Final Issue) ---

Construction

Commissioning Kick-off Meeting (65% Construction) ---

Develop the Equipment Installation Checksheets ---

Begin Equipment Installation Checks ---

Develop Functional Performance Testing Procedures ---

M&E System Start-up ---

Verification of Installation Procedure ---

Functional Performance Testing ---

Operations and Maintenance Manuals submitted for review ---

Post Construction

Issue Resolution/Deferred Testing ---

Lessons Learned ---

Final Commissioning Report Issued ---

Performing a post occupancy review with the Tenant Representative ---

4.0 Description of the Management, Communication and Reporting Aspects of the Commissioning Process

The Commissioning Team shall follow the following communication protocol in the event that issues arise. Table 3 is an identification tool for proper management, communication and reporting to be used by the Commissioning Team. The Project Team shall understand the following to insure their responsibility in the event of an issue is understood.

All communication and management throughout the commissioning process is structured as follows. If there is a request for information or a formal document requested the Commissioning Authority first approaches the Project Manager for resolution. If the Commissioning Authority requires verbal information for clarification they are to go directly to the informed party. If the Commissioning Authority needs to notify contractors of deficiencies they are to document deficiencies through the Project Manager. When the Commissioning Authority requires training or functional testing to be scheduled they can supply some input but do not do any scheduling. The Commissioning Authority does not have the authority to issue any change orders. Should Subcontractors disagree with the requests or interpretations by the Commissioning Authority, the Subcontractor should try to resolve the issue with the Commissioning Authority and notify the Project Manager. For further reference see Table 3.

4.1 DESCRIPTION OF REPORTING WITHIN THE COMMISSIONING PROCESS

All reporting from the Commissioning Authority is sent to the Project Manager and Owner. The Project Manager is then responsible for distributing appropriate contents to other parties and subcontractors. For further reference see Table 3.

Table 3: Description of management, communication and reporting within the commissioning process

Issue	Protocol
For requests for information (RFI) or formal documentation requests.	Request goes to Builders' Commissioning Coordinator who coordinates accordingly
For verbal information or clarification.	The CxA / Agents goes directly to the informed party.
For notifying contractors of construction deficiencies or the Design Consultants on design issues.	The CxA / Agents will verbally discuss issues of note on site with the installing contractors and then document all observations, including deficiencies, in field commissioning reports copied to the Project Team first hand to speed up the process for issue resolve.
For scheduling of field reviews and functional tests.	The CxA may provide input and do some coordination, but scheduling the timing of the commissioning reviews is based on dates provided by the contractors working with the Builders' Commissioning Coordinator.

Table 3: Description of management, communication and reporting within the commissioning process

Issue	Protocol
For making requests for significant changes.	The CxA has no authority to issue change orders. If a design change is required, action will be directed to the Design Consultants.
Subcontractors disagreeing with requests or interpretations by the CxA shall:	The Subcontractor may review this issue directly with the CxA / and his Agents, but the Builders' Commissioning Coordinator to be informed of all issues that require additional input for resolve.
Issue Sign-off	The CxA / Agents follow up on all documented commissioning issues for sign-off and issues a summary log report noted how each issued was resolved or highlights the status of all issues that remain open in the logs.

5.0 Commissioning Scope of Work

5.1 LISTING OF THE SYSTEMS AND ASSEMBLIES INCLUDED IN THE COMMISSIONING AUTHORITY'S SCOPE OF WORK.

The facility systems and sampling rate of systems to be commissioned are as follows:

1. MECHANICAL SYSTEMS

1.1 Air Systems

- Make Up Air Unit 100%
- Exhaust Fan 100%
- Ductwork 20%
- Duct Cleaning 10%
- Fire Dampers 100%

1.2 Variable Frequency Drives (VFDs) 100%

1.3 Air and Water Balancing 25%

2. PLUMBING SYSTEMS

2.1 Plumbing Fixtures 50%

2.2 Drainage Systems

- Sanitary Piping 10%

3. BUILDING AUTOMATED CONTROL SYSTEM (BACS)

3.1 Sequence of Operation 100%

3.2 Every connected physical point and end devices including:

- Temperature 100%
- Pressure Sensors and Controllers 100%
- Damper/Valve Actuators 100%
- Meters 100%

3.3 Fire Protection Systems 100%

4. ELECTRICAL SYSTEMS

4.1 Interior Lighting

- Illumination Levels 100%
- Lighting Controls 100%

4.2 Exit Lights 100%

4.3 Emergency Lighting Battery Units 100%

4.4 Fire Alarm System (Collect paperwork from Engineer performing verification)

- Fire alarm verification worksheets 100%
- Fire alarm verification certificate 100%

4.5 Target Systems (Collect paperwork from installer)

- Target System Commissioning 100%

5. BUILDING INTEGRATED SYSTEM TEST 100%

6. ARCHITECTURAL SYSTEMS

6.1 Operation of Doors and Hardware 100%

Systems not included in this Commissioning Plan – The following building systems are not required to be commissioned under LEED 2009 EAp1 and therefore are not included with the Commissioning Agent's scope of work:

- Commissioning scope is limited to confirming that the Automation Controls from the renovated space are communicating with the Base Building Controls System. The Builder and the sub-contractors are responsible for completing the start-up checks for the equipment and submitting a report.
- Building Envelope
- CATV Systems
- Intercom System
- Public Address

6.0 Commissioning Process

6.1 DEFINITION OF COMMISSIONING

"Building Commissioning" is the process of bringing a facility from a static operating state to a dynamic operating state, while also meeting the specific building requirements for the intended use of the facility. More specifically, commissioning includes bringing the facility to a working and fully operational condition that is in compliance with the design intent. Commissioning is a systematic process to ensure that all building systems perform interactively according to the contract documents, the design intent and the Owner's operational needs.

6.2 ELEMENTS OF COMMISSIONING

The Fundamental Commissioning procedures must be planned well in advance of construction and implemented throughout the pre-design, design, construction, and installation phases of the project. The commissioning process is closely associated with the construction of the building, specifically the timing, and is grossly 'driven' by the construction schedule.

During construction, the Commissioning Authority, in accordance with the Commissioning Plan, will coordinate the commissioning activities and track the completion of testing for each component, and building system.

Commissioning activities:

- **Commissioning Kick-Off Meeting** – After all major shop drawings submittals have been approved and the commissioning checksheets have been prepared, the Commissioning Authority will arrange for a Commissioning Meeting to kick-off the commissioning process in

the field. This meeting will be used to go over in detail, the process for completing the commissioning checksheets, review roles and responsibilities, and begin to establish a commissioning schedule of activities. Typically, this meeting takes place around the 65% Construction Phase. The Commissioning Authority will coordinate additional Commissioning Meetings with the Project Construction Team as required, to provide updates on commissioning progress along with reviews of any issues or potential concerns.

- **Installation of Building Equipment** – After notification from the contractors that a system's equipment components have been installed and are ready for review, the Commissioning Team conducts dynamic functional checks to verify performance. Following each commissioning site review, the Commissioning Agents will prepare and issue a Witnessing Report documenting findings and potential issues.

- **Schedule** – The Commissioning Schedule is generated based on information provided to the commissioning team regarding construction dates and project timelines as supplied by the project and commissioning teams. The Commissioning Schedule is a dynamic process and designed to incorporate updates from the ongoing construction process as they become available. The overall commissioning process is targeted to dovetail into the construction process wherever practical by following the construction completion and readiness milestones. As project construction milestones and projected completion updates are made available to the Commissioning Team, the Commissioning Schedule will be updated and resubmitted accordingly.

  The Commissioning Authority will update the Commissioning Schedule on regular intervals to show commissioning progress and whenever significant changes occur to the dates provided for commissioning activities. The Commissioning Schedules are sent to the Owner to be distributed.

- **Start-Up/Activation** – Following dates established in the commissioning schedule, the Commissioning Agents witness contractor start-up of selected equipment and review all Contractor start-up reports of all commissioned equipment.

- **Functional Performance Testing**– After notification from the Contractors that system adjustments and balancing have been completed, the Commissioning Agents will verify equipment and system performance. In many cases, hands-on functional performance testing can be completed with minimal assistance from the Contractors.

7. **Post-Construction** – Commissioning Authority will complete a final schedule which is developed to ensure all seasonal performance verifications are completed prior to warranty end. The Commissioning Authority will provide a Final Commissioning Report to the Owner, certifying that commissioning has been completed.

6.3 INSTALLATION CHECKS

Prior to the startup of the equipment, all equipment shall be checked and correct installation shall be verified. This is done to reduce delays and damage to the equipment during startup.

Every piece of equipment is inspected by the Installing Contractor. There is to be no sampling at this step. The CxA does not need to be present during each installation, but should be present for startup of central pieces of equipment, and has the right to check a sample of additional equipment of his/her choosing.

The commissioning checksheets are to be supplied by the CxA, contractor or manufacturer for each piece of energy consuming equipment and when necessary, submitted to the CxA for inclusion into Appendix A.

All deficiencies are to be recorded and addressed before functional testing will begin.

6.4 COMMISSIONING CHECKSHEETS

The Commissioning Check Sheet Manual contains the Mechanical and Electrical checksheets that are specific to the Commissioning activities. Specified and shop drawing information for each major piece of equipment will be entered on a checksheet. The technical data (including specified, shop drawing and installed equipment data) will be completed by the Contractors and the Commissioning Agents. Functional or Dynamic checks will be completed by the Commissioning Agents in the field.

All commissioning checksheets must be completed and signed off by the Contractors. (Refer to Appendix B for sample check sheets.)

The commissioning checksheets are designed to act as a tool for the Contractor to ensure the installed equipment aligns with the approved shop drawings and that each installation is complete before start-up to reduce the number of deficiencies associated with system start-ups.

The project commissioning documentation status can be reviewed on-line by all project team members once a password is provided by the Commissioning Authority.

Technical Data	Specified Data	Commissioning Agent
	Submitted Data	Commissioning Agent
	Installed Data	Contractors
Installation Checks	Static Checks	Contractors
Functional Checks	Dynamic Checks	Completed by Commissioning Agent with the assistance of the contractors as field testing of the equipment progresses.
Date/Checked by		Automatically documented on to the

commissioning checksheets

6.5 FINAL REPORT

The CxA will supply the Project Manager with a Final Commissioning Report. The contents of the report shall be as follows:

- Final Commissioning Plan
- Project Commissioning Specifications
- Verification of Installation (Construction Checklists)
- Factory Start-Up and Vendor Test Reports
- Functional Performance Testing Forms organized on a building system basis
- Outstanding Issues / Issue Resolution Reports
- Remediation / Retest Reports
- Records of Training

Appendix A SAMPLE COMMISSIONING CHECKSHEETS

Appendix B SAMPLE FUNCTIONAL TEST PROCEDURES

Appendix C COMMISSIONING TEAM ORGANIZATION CHART

1 General

1.1 SUMMARY

.1 Section Includes:
.1 This Section specifies roles and responsibilities of Commissioning Training.

.2 Related Requirements

.1 Section 01 79 00 - Demonstration and Training.

1.2 TRAINEES

.1 Trainees: personnel selected for operating and maintaining this facility. Includes Facility Manager, building operators, maintenance staff, security staff, and technical specialists as required.

.2 Trainees will be available for training during later stages of construction for purposes of familiarization with systems.

1.3 INSTRUCTORS

.1 Departmental Representative will provide:
.1 Descriptions of systems.
.2 Instruction on design philosophy, design criteria, and design intent.

.2 Contractor and certified factory-trained manufacturers' personnel: to provide instruction on the following:
.1 Start-Up, operation, shut-down of equipment, components and systems.
.2 Control features, reasons for, results of, implications on associated systems of, adjustment of set points of control and safety devices.
.3 Instructions on servicing, maintenance and adjustment of systems, equipment and components.

.3 Contractor and equipment manufacturer to provide instruction on:
.1 Start-up, operation, maintenance and shut-down of equipment they have certified installation, started up and carried out PV tests.

1.4 TRAINING OBJECTIVES

.1 Training to be detailed and duration to ensure:
.1 Safe, reliable, cost-effective, energy-efficient operation of systems in normal and emergency modes under all conditions.
.2 Effective on-going inspection, measurements of system performance.
.3 Proper preventive maintenance, diagnosis and trouble-shooting.
.4 Ability to update documentation.
.5 Ability to operate equipment and systems under emergency conditions until appropriate qualified assistance arrives.

1.5 TRAINING MATERIALS

.1 Instructors to be responsible for content and quality.

.2 Training materials to include:
- .1 "As-Built" Contract Documents.
- .2 Operating Manual.
- .3 Maintenance Manual.
- .4 Management Manual.
- .5 TAB and PV Reports.

.3 Project Manager, Commissioning Manager and Facility Manager will review training manuals.

.4 Training materials to be in a format that permits future training procedures to same degree of detail.

.5 Supplement training materials:
- .1 Transparencies for overhead projectors.
- .2 Multimedia presentations.
- .3 Manufacturer's training videos.
- .4 Equipment models.

1.6 SCHEDULING

.1 Include in Commissioning Schedule time for training.

.2 Deliver training during regular working hours, training sessions to be 3 hours in length.

.3 Training to be completed prior to acceptance of facility.

1.7 RESPONSIBILITIES

.1 Be responsible for:
- .1 Implementation of training activities,
- .2 Coordination among instructors,
- .3 Quality of training, training materials,

.2 Departmental Representative will evaluate training and materials.

.3 Upon completion of training, provide written report, signed by Instructors, witnessed by Departmental Representative.

1.8 TRAINING CONTENT

.1 Training to include demonstrations by Instructors using the installed equipment and systems.

.2 Content includes:
- .1 Review of facility and occupancy profile.

.2 Functional requirements.
.3 System philosophy, limitations of systems and emergency procedures.
.4 Review of system layout, equipment, components and controls.
.5 Equipment and system start-up, operation, monitoring, servicing, maintenance and shut-down procedures.
.6 System operating sequences, including step-by-step directions for starting up, shut-down, operation of valves, dampers, switches, adjustment of control settings and emergency procedures.
.7 Maintenance and servicing.
.8 Trouble-shooting diagnosis.
.9 Inter-Action among systems during integrated operation.
.10 Review of O M documentation.

.3 Provide specialized training as specified in relevant Technical Sections of the construction specifications.

1.9 VIDEO-BASED TRAINING

.1 Manufacturer's videotapes to be used as training tool with Departmental Representative's review and written approval 3 months prior to commencement of scheduled training.

.2 On-Site training videos:
.1 Videotape training sessions for use during future training.
.2 To be performed after systems are fully commissioned.
.3 Organize into several short modules to permit incorporation of changes.

.3 Production methods to be high quality.

2 Products

2.1 NOT USED

.1 Not Used.

3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

1 General

1.1 SUMMARY

.1 Section Includes:
  .1 This section is limited to portions of the Building Management Manual (BMM) provided to Departmental Representative by Contractor.

.2 Acronyms:
  .1 BMM - Building Management Manual.
  .2 Cx - Commissioning.
  .3 HVAC - Heating, Ventilation and Air Conditioning.
  .4 PI - Product Information.
  .5 PV - Performance Verification.
  .6 TAB - Testing, Adjusting and Balancing.
  .7 WHMIS - Workplace Hazardous Materials Information System.

1.2 GENERAL REQUIREMENTS

.1 Standard letter size paper 216 mm x 279 mm.

.2 Methodology used to facilitate updating.

.3 Drawings, diagrams and schematics to be professionally developed.

.4 Electronic copy of data to be in a format accepted and approved by Departmental Representative.

1.3 APPROVALS

.1 Prior to commencement, co-ordinate requirements for preparation, submission and approval with Departmental Representative.

1.4 GENERAL INFORMATION

.1 Provide Departmental Representative the following for insertion into appropriate Part and Section of BMM:
  .1 Complete list of names, addresses, telephone and fax numbers of contractor, sub-contractors that participated in delivery of project - as indicated in Section 1.2 of BMM.
  .2 Summary of architectural, structural, fire protection, mechanical and electrical systems installed and commissioned - as indicated in Section 1.4 of BMM.
    .1 Including sequence of operation as finalized after commissioning is complete as indicated in Section 2.0 of BMM.
  .3 Description of building operation under conditions of heightened security and emergencies as indicated in Section 2.0 of BMM.
  .4 System, equipment and components Maintenance Management System (MMS) identification - Section 2.1 of BMM..

.5 Information on operation and maintenance of architectural systems and equipment installed and commissioned - Section 2.0 of BMM.
.6 Information on operation and maintenance of fire protection and life safety systems and equipment installed and commissioned - Section 2.0 of BMM.
.7 Information on operation and maintenance of mechanical systems and equipment installed and commissioned - Section 2.0 of BMM.
.8 Operating and maintenance manual - Section 3.2 of BMM.
.9 Final commissioning plan as actually implemented.
.10 Completed commissioning checklists.
.11 Commissioning test procedures employed.
.12 Completed Product Information (PI) and Performance Verification (PV) report forms, approved and accepted by Departmental Representative.
.13 Commissioning reports.

1.5 CONTENTS OF OPERATING AND MAINTENANCE MANUAL

.1 For detailed requirements refer to Section 01 78 00 - Closeout Submittals.

.2 Departmental Representative to review and approve format and organization within 12 weeks of award of contract.

.3 Include original manufactures brochures and written information on products and equipment installed on this project.

.4 Record and organize for easy access and retrieval of information contained in BMM.

.5 Include completed PI report forms, data and information from other sources as required.

.6 Inventory directory relating to information on installed systems, equipment and components.

.7 Approved project shop-drawings, product and maintenance data.

.8 Manufacturer's data and recommendations relating: manufacturing process, installation, commissioning, start-up, O M, shutdown and training materials.

.9 Inventory and location of spare parts, special tools and maintenance materials.

.10 Warranty information.

.11 Inspection certificates with expiration dates, which require on-going re-certification inspections.

.12 Maintenance program supporting information including:
.1 Recommended maintenance procedures and schedule.
.2 Information to removal and replacement of equipment including, required equipment, points of lift and means of entry and egress.

1.6 LIFE SAFETY COMPLIANCE (LSC) MANUAL

.1 Samples of LSC Manual will be available from Departmental Representative.

.2 Content of Manual:
- .1 All possible Emergency situations modes including: presence of fire and smoke, power failure, lose of water or pressure, chemical spills and refrigerant release.
- .2 Failure of elevators and escalators.
- .3 HVAC emergencies and fuel supply failures.
- .4 Intrusion and security breach.
- .5 Emergency provisions for natural disasters, bomb threats and other disruptive situations.
- .6 Dedicated emergency generators for high security projects, medical facilities and computer systems.
- .7 Emergency control procedures for fire, power and major equipment failure.
- .8 Emergency contacts and numbers.
- .9 Manual to be readily available and comprehensible to non- technical readers.

1.7 SUPPORTING DOCUMENTATION FOR INSERTION INTO SUPPORTING APPENDICES

.1 Provide Departmental Representative supporting documentation relating to installed equipment and system, including:
- .1 General:
  - .1 Finalized commissioning plan.
  - .2 WHMIS information manual.
  - .3 Approved "as-built" drawings and specifications.
  - .4 Procedures used during commissioning.
  - .5 Cross-Reference to specification sections.
- .2 Architectural and structural:
  - .1 Inspection certificates, construction permits.
  - .2 Roof anchor log books.
  - .3 PV reports.
- .3 Fire prevention, suppression and protection:
  - .1 Test reports.
  - .2 Smoke test reports.
  - .3 PV reports.
- .4 Mechanical:
  - .1 Installation permits, inspection certificates.
  - .2 Piping pressure test certificates.
  - .3 Ducting leakage test reports.
  - .4 TAB and PV reports.
  - .5 Charts of valves and steam traps.
  - .6 Copies of posted instructions.
- .5 Electrical:
  - .1 Installation permits, inspection certificates.
  - .2 TAB and PV reports.
  - .3 Electrical work log book.
  - .4 Charts and schedules.
  - .5 Locations of cables and components.
  - .6 Copies of posted instructions.

1.8 LANGUAGE

.1 English and French Language to be in separate binders.

1.9 IDENTIFICATION OF FACILITY

.1 When submitting information to Departmental Representative for incorporation into BMM, use following system for identification of documentation:
.1 Government of Canada, Existing Building Renovation, Lac La Biche, Alberta.

1.10 USE OF CURRENT TECHNOLOGY

.1 Use current technology for production of documentation. Emphasis on ease of accessibility at all times, maintain in up-to-date state, compatibility with user's requirements.

.2 Obtain Departmental Representative's approval before starting Work.

2 Products

2.1 NOT USED

.1 Not used.

3 Execution

3.1 NOT USED

.1 Not used.

END OF SECTION