

## **Part 1        General**

### **1.1        Work Covered By Contract Documents**

- .1        Work of this Contract comprises replacement of Boilers at the National Hydrology Research Centre in Saskatoon, Saskatchewan.

### **1.2        Contract Method**

- .1        Construct Work under stipulated price contract.
- .2        Relations and responsibilities between Contractor and subcontractors assigned by Owner are as defined in Conditions of Contract. Assigned Subcontractors must, in addition:
  - .1        Furnish to Contractor, bonds covering faithful performance of subcontracted work and payment of obligations thereunder.
  - .2        Purchase and maintain liability insurance to protect Contractor from claims for not less than limits of liability which Contractor is required to provide to the Departmental Representative.

### **1.3        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        Required stages:
  - .1        Provide openings in concrete masonry unit walls to facilitate the transportation of removed and new material. Install new double doors.
  - .2        Activate galaxy boilers in the 3rd floor Fan Room to supply heating for the building. Provide auxiliary heating as required.
  - .3        Removal of old equipment and piping in the 2nd floor boiler room, shop area and warehouse.
  - .4        Install new catwalk and build mechanical room 2640 A in the Shop Area. Provide new door to mezzanine 2630 as to facilitate access and maintenance of "S" Units in the Shop Area.
  - .5        Provide new humidifier for "S" Units in the Shop Area and associated systems.
  - .6        Install and commission new boilers in the 2nd floor Boiler Room. Provide new pumps, piping and associated systems.
  - .7        Deactivate and remove temporary heating and old galaxy boiler system, including piping and circulation pump, in the 3rd floor Fan Room.
  - .8        Provide new humidifiers in the 3rd floor Fan Room and associated systems.
- .4        Maintain fire access/control.

#### **1.4 Contractor Use Of Premises**

- .1 Limit use of premises for storage, for Work, for access, to allow:
  - .1 Owner occupancy.
  - .2 Work by other contractors.
  - .3 Public usage.
- .2 Co-ordinate use of premises under direction of the 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 the Departmental Representative.
- .6 At completion of operations condition of existing work: equal to or better than that which existed before new work started.

#### **1.5 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.

#### **1.6 Alterations, Additions Or Repairs To Existing Building**

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

#### **1.7 Existing Services**

- .1 Notify, the 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 the 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 tenant operations.
- .3 Provide alternative routes for personnel and vehicular traffic.
- .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 the 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 when directed by the Departmental Representative to maintain critical building and tenant systems.
- .7 Provide adequate bridging over trenches which cross sidewalks or roads to permit normal traffic.
- .8 Where unknown services are encountered, immediately advise the 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.

## **1.8 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.

## **Part 2 Products**

### **2.1 Not Used**

- .1 Not used.

## **Part 3 Execution**

### **3.1 Not Used**

- .1 Not used.

**END OF SECTION**

## **Part 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 Execute work with least possible interference or disturbance to normal use of premises. Make arrangements with Departmental Representative to facilitate work as stated.
- .2 Maintain existing services to building and provide for personnel and vehicle access.
- .3 Where security is reduced by work provide temporary means to maintain security.
- .4 Departmental Representative will assign sanitary facilities for use by Contractor's personnel. Keep facilities clean.
- .5 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 occupants, 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 personnel and vehicular traffic.
- .4 Construct barriers in accordance with Section 01 56 00- Temporary Barriers and Enclosures.

### **1.5        Special Requirements**

- .1 Paint occupied areas Monday to Friday from 18:00to 07:00 hours only and on Saturdays, Sundays, and statutory holidays.
- .2 Carry out noise generating Work Monday to Friday from 18:00to 07:00 hours and on Sundays, Saturdays, and statutory holidays.
- .3 Submit schedule in accordance with Section 01 32 16- Construction Progress Schedule - Bar (GANTT) Chart.

- .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 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 Building Smoking Environment**

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

**Part 2 Products**

**2.1 Not Used**

- .1 Not Used.

**Part 3 Execution**

**3.1 Not Used**

- .1 Not Used.

**END OF SECTION**

## **Part 1           General**

### **1.1               Administrative**

- .1     Schedule and administer project meetings throughout the progress of the work.
- .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, Consultant, 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     Consultant, Departmental Representative, Senior representatives of, 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 - 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     Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements.
  - .7     Owner provided products.

- .8 Record drawings in accordance with Section 01 33 00- Submittal Procedures.
- .9 Maintenance manuals in accordance with Section 01 78 00- Closeout Submittals.
- .10 Take-over procedures, acceptance, warranties in accordance with Section 01 78 00- Closeout Submittals.
- .11 Monthly progress claims, administrative procedures, photographs, hold backs.
- .12 Appointment of inspection and testing agencies or firms.
- .13 Insurances, transcript of policies.

### **1.3 Progress Meetings**

- .1 During course of Work and biweekly
- .2 Contractor, major Subcontractors involved in Work, Departmental Representative are to be in attendance.
- .3 Record minutes of meetings and circulate to attending parties and affected parties not in attendance within 3 days
- .4 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.

### **Part 2 Products**

#### **2.1 Not Used**

- .1 Not Used.

### **Part 3 Execution**

#### **3.1 Not Used**

- .1 Not Used.

**END OF SECTION**

## **Part 1            General**

### **1.1                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. Generally, Bar Chart should be derived from commercially available computerized project management system.
- .3      Baseline: original approved plan (for project, work package, or activity), plus or minus approved scope changes.
- .4      Construction Work Week: Monday to Friday, inclusive, will provide five-day work week and define schedule calendar working days as part of Bar (GANTT) Chart submission.
- .5      Duration: number of work periods (not including holidays or other nonworking periods) required to complete activity or another project element. Usually expressed as workdays or workweeks.
- .6      Master Plan: summary-level schedule that identifies major activities and key milestones.
- .7      Milestone: significant event in project, usually completion of major deliverable.
- .8      Project Schedule: planned dates for performing activities and the planned dates for meeting milestones. Dynamic, detailed record of tasks or activities that must be accomplished to satisfy Project objectives. Monitoring and control process involves using Project Schedule in executing and controlling activities and is used as basis for decision making throughout project life cycle.
- .9      Project Planning, Monitoring, and Control System: overall system operated by Departmental Representative to enable monitoring of project work in relation to established milestones.

### **1.2                REQUIREMENTS**

- .1      Ensure Master Plan and Detail Schedules are practical and remain within specified Contract duration.
- .2      Plan to complete Work in accordance with prescribed milestones and time frame.
- .3      Limit activity durations to maximum of approximately 10 working days, to allow for progress reporting.
- .4      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 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit to Departmental Representative within 10 working days of Award of Contract Bar (GANTT) Chart as Master Plan for planning, monitoring, and reporting of project progress.
- .3 Submit Project Schedule to Departmental Representative within 5 working days of receipt of acceptance of Master Plan.

### **1.4 MASTER PLAN**

- .1 Structure schedule to allow orderly planning, organizing and execution of Work as Bar Chart (GANTT).
- .2 Departmental Representative will review and return revised schedules within 5 working days.
- .3 Revise impractical schedule and resubmit within 5 working days.
- .4 Accepted revised schedule will become Master Plan and be used as baseline for updates.

### **1.5 PROJECT SCHEDULE**

- .1 Develop detailed Project Schedule derived from Master Plan.
- .2 Ensure detailed Project Schedule includes as minimum milestone and activity types as follows:
  - .1 Award.
  - .2 Shop Drawings, Samples.
  - .3 Permits.
  - .4 Mobilization.
  - .5 Structural Steel.
  - .6 Plumbing.
  - .7 Electrical.
  - .8 Piping.
  - .9 Controls.
  - .10 Heating, Ventilating, and Air Conditioning.
  - .11 Testing and Commissioning.
  - .12 Supplied equipment long delivery items.
  - .13 Engineer supplied equipment required dates.

### **1.6 PROJECT SCHEDULE REPORTING**

- .1 Update Project Schedule on weekly basis reflecting activity changes and completions, as well as activities in progress.
- .2 Include as part of Project Schedule, narrative report identifying Work status to date, comparing current progress to baseline, presenting current forecasts, defining problem areas, anticipated delays and impact with possible mitigation.

**1.7 PROJECT MEETINGS**

- .1 Discuss Project Schedule at regular site meetings, identify activities that are behind schedule and provide measures to regain slippage. Activities considered behind schedule are those with projected start or completion dates later than current approved dates shown on baseline schedule.
- .2 Weather related delays with their remedial measures will be discussed and negotiated.

**Part 2 Products**

**2.1 NOT USED**

- .1 Not used.

**Part 3 Execution**

**3.1 NOT USED**

- .1 Not used.

**END OF SECTION**

## **Part 1           General**

### **1.1               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.

### **1.2               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 Saskatchewan, Canada.
- .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 5 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 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 and 6 paper 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 Public Works and Government Services Canada (PSPC) is for sole purpose of ascertaining conformance with general concept.
  - .1 This review shall not mean that PSPC 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.

**1.3 Photographic Documentation**

- .1 Submit electronic copy of colour digital photography in jpg format, fine resolution monthly with progress statement.
- .2 Project identification: name and number of project and date of exposure indicated.
- .3 Number of viewpoints: 4 locations.
  - .1 Viewpoints and their location as determined by Departmental Representative.
- .4 Frequency of photographic documentation: weekly.
  - .1 Upon completion of: framing and services before concealment of Work, as directed by Departmental Representative.

**1.4 Certificates And Transcripts**

- .1 Immediately after award of Contract, submit Workers' Compensation Board status.
- .2 Submit transcription of insurance immediately after award of Contract.

**Part 2 Products**

**2.1 Not Used**

- .1 Not Used.

**Part 3 Execution**

**3.1 Not Used**

- .1 Not Used.

**END OF SECTION**

## **Part 1           General**

### **1.1           References**

- .1   Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations
- .2   Province of Saskatchewan
  - .1   Occupational Health and Safety Act, 1993, S.S. - Updated 2012.

### **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 found in work plan.
- .3   Submit electronic copies of Contractor's authorized representative's work site health and safety inspection reports to authority having jurisdiction, weekly to Departmental Representative.
- .4   Submit copies of reports or directions issued by Federal, Provincial health and safety inspectors.
- .5   Submit copies of incident and accident reports.
- .6   Submit WHMIS MSDS - Material Safety Data Sheets
- .7   Departmental Representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within 7 days after receipt of plan. Revise plan as appropriate and resubmit plan to Departmental Representative within 5 days after receipt of comments from Departmental Representative.
- .8   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.
- .9   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.
- .10   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.

- .3 Contractor shall agree to install proper site separation and identification 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.
- .2 Contractor will be responsible and assume the role Constructor as described in the Ontario Occupational Health and Safety Act and Regulations for Construction Projects.
- .3 Contractor shall be the Principal Contractor as described in the Quebec Act Respecting Health and Safety code for the Construction for only their scope and areas of work as defined and described this project specification.
- .4 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**

- .1 Comply with R.S.Q., c. S-2.1, an Act respecting Health and Safety, and c. S-2.1, r.4 Safety Code for the Construction Industry.
- .2 Comply with Occupational Health and Safety Regulations, 1996.
- .3 Comply with Canada Labour Code, Canada Occupational Safety and Health Regulations.

### **1.10 Unforeseen Hazards**

- .1 When 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**

- .1 Employ and assign to Work, competent and authorized representative as Health and Safety Co-ordinator. Health and Safety Co-ordinator must:
  - .1 Have working knowledge of occupational safety and health regulations.
  - .2 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.
  - .3 Be responsible for implementing, enforcing daily and monitoring site-specific Contractor's Health and Safety Plan.
  - .4 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 Powder Actuated Devices**

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

### **1.15 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.

**Part 2            Products**

**2.1                Not Used**

.1                Not used.

**Part 3            Execution**

**3.1                Not Used**

.1                Not used.

**END OF SECTION**

**Part 1            General**

**1.1                References And Codes**

- .1        Perform Work in accordance with National Building Code of Canada (NBC) 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                Hazardous Material Discovery**

- .1        Asbestos: demolition of spray or trowel-applied asbestos is hazardous to health. Stop work immediately when material resembling spray or trowel-applied asbestos is encountered during demolition work. Notify Departmental Representative.
- .2        PCB: Polychlorinated Biphenyl: stop work immediately when material resembling Polychlorinated Biphenyl is encountered during demolition work. Notify Departmental Representative.
- .3        Mould: stop work immediately when material resembling mould is encountered during demolition work. Notify Departmental Representative.

**1.3                Building Smoking Environment**

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

**1.4                National Parks Act**

- .1        Perform Work in accordance with National Parks Act when projects are located within boundaries of National Park.

**Part 2            Products**

**2.1                Not Used**

- .1        Not Used.

**Part 3            Execution**

**3.1                Not Used**

- .1        Not Used.

**END OF SECTION**

## **Part 1        General**

### **1.1        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 timely 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.

### **1.2        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.

### **1.3        Procedures**

- .1        Notify 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.

### **1.4        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 Departmental Representative.

**1.5 Reports**

- .1 Submit electronic copies of inspection and test reports to Departmental Representative.
- .2 Provide copies to subcontractor of work being inspected or tested, manufacturer or fabricator of material being inspected or tested.

**1.6 Equipment And Systems**

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

**Part 2 Products**

**2.1 Not Used**

- .1 Not Used.

**Part 3 Execution**

**3.1 Not Used**

- .1 Not Used.

**END OF SECTION**

**Part 1            General**

**1.1                Action And Informational Submittals**

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

**1.2                Installation And Removal**

- .1        Provide temporary utilities controls in order to execute work expeditiously.
- .2        Remove from site all such work after use.

**1.3                Temporary Power And Light**

- .1        Departmental Representative will pay for temporary power during construction for temporary lighting and operating of power tools, to a maximum supply of 208volts 30 amps.
- .2        Arrange for connection with appropriate utility company. Pay costs for installation, maintenance and removal.
- .3        Temporary power for electric cranes and other equipment requiring in excess of above is responsibility of Contractor.
- .4        Provide and maintain temporary lighting throughout project. Ensure level of illumination on all floors and stairs is not less than 162 lx.
- .5        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.

**1.4                Temporary Communication Facilities**

- .1        Provide and pay for temporary telephone and data hook up, for own use.

**1.5                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.

**Part 2            Products**

**2.1                Not Used**

- .1        Not Used.

**Part 3            Execution**

**3.1                Not Used**

.1                Not Used

**END OF SECTION**

## **Part 1        General**

### **1.1        Reference Standards**

- .1    City of Regina
  - .1    Temporary Traffic Control Measure Manual - [04].
- .2    U.S. Department of Transportation
  - .1    Manual of Uniform Traffic Control Devices for Streets and Highways (UTCD) - [2009].

### **1.2        Protection Of Public Traffic**

- .1    Comply with requirements of Acts, Regulations and By-Laws in force for regulation of traffic or use of roadways upon or over which it is necessary to carry out Work or haul materials or equipment.
- .2    When working on travelled way:
  - .1    Place equipment in position to minimize interference and hazard to travelling public.
  - .2    Keep equipment units as close together as working conditions permit and preferably on same side of travelled way.
  - .3    Do not leave equipment on travelled way overnight.
- .3    Close lanes of road only after receipt of written approval from Departmental Representative.
  - .1    Before re-routing traffic erect suitable signs and devices to Traffic Accommodation in Work Zones
- .4    Provide and maintain road access and egress to property fronting along Work under Contract and in other areas as indicated, except where other means of road access exist that meet approval of Departmental Representative.

### **1.3        Informational And Warning Devices**

- .1    Meet with Departmental Representative prior to commencement of Work to prepare list of signs and other devices required for project. If situation on site changes, revise list to approval of Departmental Representative.
- .2    Continually maintain traffic control devices in use:
  - .1    Check signs daily for legibility, damage, suitability and location. Clean, repair or replace to ensure clarity and reflectance.
  - .2    Remove or cover signs which do not apply to conditions existing from day to day.

### **1.4        Operational Requirements**

- .1    Maintain existing conditions for traffic throughout period of contract except that, when required for construction under contract and when measures have been taken as

specified and approved by Departmental Representative to protect and control public traffic, existing conditions for traffic.

- .2 Maintain existing conditions for traffic crossing right-of-way.

**Part 2 Products**

**2.1 Not Used**

- .1 Not Used.

**Part 3 Execution**

**3.1 Not Used**

- .1 Not Used.

**END OF SECTION**

## **Part 1        General**

### **1.1        Reference Standards**

- .1 Canadian General Standards Board (CGSB)
  - .1 CGSB 1.59-97, Alkyd Exterior Gloss Enamel.
  - .2 CAN/CGSB 1.189-00, Exterior Alkyd Primer for Wood.
- .2 Canadian Standards Association (CSA International)
  - .1 CSA-O121-M1978(R2003), Douglas Fir Plywood.
- .3 Public Works Government Services Canada (PSPC) 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 temporary site enclosures using 38 x 89 mm construction grade lumber framing at 600 mm centres and 1200 x 2400 x 13 mm exterior grade fir plywood to CSA O121.
- .2 Apply plywood panels vertically flush and butt jointed.
- .3 Provide barriers around trees and plants designated to remain. Protect from damage by equipment and construction procedures.

### **1.4        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.

### **1.5        Access To Site**

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

### **1.6        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.

### **1.7        Fire Routes**

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

**1.8 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.

**1.9 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 3 days prior to installation.
- .4 Be responsible for damage incurred due to lack of or improper protection.

**1.10 Waste Management And Disposal**

- .1 Separate waste materials for recycling in accordance with Section 01 74 21- Construction/Demolition Waste Management And Disposal.

**Part 2 Products**

**2.1 Not Used**

- .1 Not Used.

**Part 3 Execution**

**3.1 Not Used**

- .1 Not Used.

**END OF SECTION**

## **Part 1        General**

### **1.1        Reference Standards**

- .1        Within text of each specifications section, reference may be made to reference standards.
- .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 born 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 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.
- .6 Remove and replace damaged products at own expense and to satisfaction of Departmental Representative.
- .7 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.

#### **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.
- .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.

**Part 2 Products**

**2.1 Not Used**

- .1 Not Used.

**Part 3 Execution**

**3.1 Not Used**

- .1 Not Used.

**END OF SECTION**

**Part 1            General**

**1.1                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.

**1.2                Records**

- .1        Maintain a complete, accurate log of control and survey work as it progresses.
- .2        On completion of foundations and major site improvements, prepare a certified survey showing dimensions, locations, angles and elevations of Work.
- .3        Record locations of maintained, re-routed and abandoned service lines.

**Part 2            Products**

**2.1                Not Used**

- .1        Not Used.

**Part 3            Execution**

**3.1                Not Used**

- .1        Not Used.

**END OF SECTION**

## **Part 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, 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 Provide openings in non-structural elements of Work for penetrations of mechanical and electrical Work.
- .6 Execute Work by methods to avoid damage to other Work, and which will provide proper surfaces to receive patching and finishing.
- .7 Employ original installer to perform cutting and patching for weather-exposed and moisture-resistant elements, and sight-exposed surfaces.
- .8 Cut rigid materials using masonry saw or core drill. Pneumatic or impact tools not allowed on masonry work without prior approval.
- .9 Restore work with new products in accordance with requirements of Contract Documents.
- .10 Fit Work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- .11 At penetration of fire rated wall, ceiling, or floor construction, completely seal voids with firestopping material, full thickness of the construction element.
- .12 Refinish surfaces to match adjacent finishes: Refinish continuous surfaces to nearest intersection. Refinish assemblies by refinishing entire unit.
- .13 Conceal pipes, ducts and wiring in floor, wall and ceiling construction of finished areas except where indicated otherwise.

**1.5 Waste Management And Disposal**

- .1 Separate waste materials for recycling in accordance with Section 01 74 21- Construction/Demolition Waste Management And Disposal.

**Part 2 Products**

**2.1 Not Used**

- .1 Not Used.

**Part 3 Execution**

**3.1 Not Used**

- .1 Not Used.

**END OF SECTION**

## **Part 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        Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .4        Provide and use marked separate bins for recycling. Refer to Section 01 74 21- Construction/Demolition Waste Management and Disposal.
- .5        Clean interior areas prior to start of finishing work, and maintain areas free of dust and other contaminants during finishing operations.
- .6        Store volatile waste in covered metal containers, and remove from premises at end of each working day.
- .7        Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.
- .8        Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.
- .9        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, floors.

- .9 Clean lighting reflectors, lenses, and other lighting surfaces.
- .10 Vacuum clean and dust building interiors, behind grilles, louvres and screens.
- .11 Wax, seal, shampoo 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 Clean equipment and fixtures to sanitary condition; clean or replace filters of mechanical equipment.
- .15 Clean roofs, downspouts, and drainage systems.
- .16 Remove debris and surplus materials from crawl areas and other accessible concealed spaces.
- .17 Remove snow and ice from access to building.

**1.3 Waste Management And Disposal**

- .1 Separate waste materials for recycling in accordance with Section 01 74 21- Construction/Demolition Waste Management And Disposal.

**Part 2 Products**

**2.1 Not Used**

- .1 Not Used.

**Part 3 Execution**

**3.1 Not Used**

- .1 Not Used.

**END OF SECTION**

## **Part 1        General**

### **1.1        Waste Management Goals**

- .1        Prior to start of Work conduct meeting with Departmental Representative to review and discuss PSPC's waste management goal and Contractor's proposed Waste Reduction Workplan for Construction, Renovation and /or Demolition (CRD) waste to be project generated.
- .2        PSPC's waste management goal: to divert a minimum 75 percent of total Project Waste from landfill sites. Prior to project completion provide [Departmental Representative documentation certifying that waste management, recycling, reuse of recyclable and reusable materials have been extensively practiced. The overall waste diversion goal for this project is 75 percent.
- .3        Specific material target percentages for reuse and/or recycling:
  - .1        Mechanical - HVAC: 25%
  - .2        Mechanical - plumbing piping: 25%
  - .3        Electrical - wiring/conduits/boxes: 25%
  - .4        Packaging: 100%
- .4        Target percentage goals are achievable for waste diversion. Contractor to review and confirm Departmental Representative's Waste Audit acceptable values.
- .5        Minimize amount of non-hazardous solid waste generated by project and accomplish maximum source reduction, reuse and recycling of solid waste produced by CRD activities.
- .6        Protect environment and prevent environmental pollution damage.

### **1.2        Reference Standards**

- .1        Canadian Construction Association (CCA)
  - .1        CCA 81-2001: A Best Practices Guide to Solid Waste Reduction.
- .2        Public Works and Government Services Canada (PSPC)
  - .1        2002 National Construction, Renovation and Demolition Non-Hazardous Solid Waste Management Protocol.
  - .2        CRD Waste Management Market Research Report (available from PSPC's Environmental Services).
  - .3        Sustainable Development Strategy 2007-2009: Target 2.1 Environmentally Sustainable Use of Natural Resources.
    - .1        Real Property projects over \$1 million and in communities where industrial recycling is supported, implementation of CRD waste management practices will be completed, with waste materials being reused or recycled.
    - .2        Contractually ensure resources used in construction or maintenance are consumed and recovered in a sustainable manner.

### 1.3 Definitions

- .1 Approved/Authorized recycling facility: waste recycler approved by applicable provincial authority or other users of material for recycling approved by the Departmental Representative.
- .2 Class III: non-hazardous waste - construction renovation and demolition waste.
- .3 Construction, Renovation and/or Demolition (CRD) Waste: Class III solid, non-hazardous waste materials generated during construction, demolition, and/or renovation activities
- .4 Cost/Revenue Analysis Workplan (CRAW): based on information from Waste Reduction Workplan, and intended as financial tracking tool for determining economic status of waste management practices (Schedule E).
- .5 Inert Fill: inert waste - exclusively asphalt and concrete.
- .6 Waste Source Separation Program (WSSP): implementation and co-ordination of ongoing activities to ensure designated waste materials will be sorted into pre-defined categories and sent for recycling and reuse, maximizing diversion and potential to reduce disposal costs.
- .7 Recyclable: ability of product or material to be recovered at end of its life cycle and re-manufactured into new product for reuse.
- .8 Recycle: process by which waste and recyclable materials are transformed or collected for purpose of being transferred into new products.
- .9 Recycling: process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for purpose of using in altered form. Recycling does not include burning, incinerating, or thermally destroying waste.
- .10 Reuse: repeated use of product in same form but not necessarily for same purpose. Reuse includes:
  - .1 Salvaging reusable materials from re-modelling projects, before demolition stage, for resale, reuse on current project or for storage for use on future projects.
  - .2 Returning reusable items including pallets or unused products to vendors.
- .11 Salvage: removal of structural and non-structural materials from deconstruction/disassembly projects for purpose of reuse or recycling.
- .12 Separate Condition: refers to waste sorted into individual types.
- .13 Source Separation: act of keeping different types of waste materials separate beginning from the point they became waste.
- .14 Waste Audit (WA): detailed inventory of estimated quantities of waste materials that will be generated during construction, demolition, deconstruction and/or renovation. Involves quantifying by volume/weight amounts of materials and wastes that will be reused, recycled or landfilled. Refer to Schedule A.
- .15 Waste Diversion Report: detailed report of final results, quantifying cumulative weights and percentages of waste materials reused, recycled and landfilled over course of project. Measures success against Waste Reduction Workplan (WRW) goals and identifies lessons learned.

- .16 Waste Management Co-ordinator (WMC): contractor representative responsible for supervising waste management activities as well as co-ordinating required submittal and reporting requirements.
- .17 Waste Reduction Workplan (WRW): written report which addresses opportunities for reduction, reuse, or recycling of materials generated by project. Specifies diversion goals, implementation and reporting procedures, anticipated results and responsibilities. Waste Reduction Workplan (Schedule B) information acquired from Waste Audit.

#### **1.4 Documents**

- .1 Post and maintain in visible and accessible area at job site, one copy of following documents:
  - .1 Waste Audit (Schedule A).
  - .2 Waste Reduction Workplan (Schedule B).
  - .3 Waste Source Separation Program.
  - .4 Schedules [B] [A] completed for project.

#### **1.5 Action And Informational Submittals**

- .1 Submit in accordance with Section [01 33 00- Submittal Procedures].
- .2 Prepare and submit following prior to [project start-up]:
  - .1 electronic copy of completed Waste Audit (WA): Schedule A.
  - .2 \electronic copy of completed Waste Reduction Workplan (WRW): Schedule B.
  - .3 \electronic copy of Cost/Revenue Analysis Workplan (CRAW): Schedule E.
  - .4 \electronic copy of Waste Source Separation Program (WSSP).
- .3 Prepare and submit on monthly basis, throughout project or at intervals agreed to by Departmental Representative the following:
  - .1 Receipts, scale tickets, waybills, and/or waste disposal receipts that show quantities and types of materials reused, recycled, or disposed of.
  - .2 Updated Waste Materials Tracking form (Schedule D).
  - .3 Written monthly summary report detailing cumulative amounts of waste materials reused, recycled and landfilled, and brief status of ongoing waste management activities.
- .4 Submit prior to final payment the following:
  - .1 Waste Diversion Report, indicating final quantities in tones by material types salvaged for reuse, recycling or disposal in landfill and recycling centres, re-use depots, landfills and other waste processors that received waste materials (See Schedule C).
  - .2 Provide receipts, scale tickets, waybills, waste disposal receipts that confirm quantities and types of materials reused, recycled or disposed of and destination.

## **1.6 Waste Audit (Wa)**

- .1 Departmental Representative will prepare WA prior to project start-up. WA will be provided with bid documentation (see Schedule A).
- .2 WA provides detailed inventory, estimated quantities and types of waste materials that will be generated as well as their potential to be reused and/or recycled and project's waste diversion goals and objectives.
- .3 After award of contract, contractor to review WA and confirm that anticipated quantities of waste generated are accurate and goals achievable.
- .4 If after review, contractor determines that indicated quantities or opportunities in WA are not accurate or achievable, contractor to provide written details of discrepancies and revised quantities for areas of concern. Contractor to meet with Departmental Representative to review and justify revisions.
- .5 Post on-site WA where contractor and sub-contractors are able to review content.

## **1.7 Waste Reduction Workplan (Wrw)**

- .1 Prepare and submit WRW (Schedule B) at least 10 days prior to project start-up.
- .2 WRW identifies strategies to optimize diversion through reduction, reuse, and recycling of materials and comply with applicable regulations, based on information acquired from WA.
- .3 WRW should include but not limited to:
  - .1 Applicable regulations.
  - .2 Specific goals for waste reduction, identify existing barriers and develop strategies to overcome them.
  - .3 Destination of materials identified.
  - .4 Deconstruction/disassembly techniques and schedules.
  - .5 Methods to collect, separate, and reduce generated wastes.
  - .6 Location of waste bins on-site.
  - .7 Security of on-site stock piles and waste bins.
  - .8 Protection of personnel, sub-contractors.
  - .9 Clear labelling of storage areas.
  - .10 Training plan for contractor and sub-contractors.
  - .11 Methods to track and report results reliably (Schedule D).
  - .12 Details on materials handling and removal procedures.
  - .13 Recycler and reclaimer requirements.
  - .14 Quantities of materials to be salvaged for reuse or recycled and materials sent to landfill.
  - .15 Requirements for monitoring on-site wastes management activities.
- .4 Structure WRW to prioritize actions and follow 3R's hierarchy, with Reduction as first priority, followed by Reuse, then Recycle.
- .5 Post WRW or summary where workers at site are able to review content.

- .6 Monitor and report on waste reduction by documenting total volume (in tonnes) and cost of actual waste removed from project (Schedule D).

### **1.8 Cost/Revenue Analysis Workplan (Craw)**

- .1 Prepare CRAW (see Schedule E) and include the following:
  - .1 Cost of current waste management practices.
  - .2 Implementation cost of waste diversion program.
  - .3 Savings and benefits resulting from waste diversion program.

### **1.9 Waste Source Separation Program (Wssp)**

- .1 As part of Waste Reduction Workplan, prepare WSSP prior to project start-up.
- .2 WSSP will detail methodology and planned on-site activities for separation of reusable and recyclable materials from waste intended for landfill.
- .3 Provide list and drawings of locations that will be made available for sorting, collection, handling and storage of anticipated quantities of reusable and recyclable materials.
- .4 Provide sufficient on-site facilities and containers for collection, handling, and storage of anticipated quantities of reusable and recyclable materials.
- .5 Locate containers to facilitate deposit of materials without hindering daily operations.
- .6 Provide training for workers in handling and separation of materials for reuse and/or recycling.
- .7 Locate separated materials in areas which minimizes material damage.
- .8 Clearly and securely label containers to identify types/conditions of materials accepted and assist workers in separating materials accordingly.
- .9 Monitor on-site waste management activities by conducting periodic site inspections to verify: state of signage, contamination levels, bin locations and condition, personnel participation, use of waste tracking forms and collection of waybills, receipts and invoices.
- .10 On-site sale of salvaged materials is not permitted unless authorized in writing by Departmental Representative and provided that site safety regulations and security requirements are adhered to.

### **1.10 Use Of Site And Facilities**

- .1 Execute Work with minimal interference and disturbance to normal use of premises.
- .2 Maintain security measures established by facility provide temporary security measures approved by [Departmental Representative].
  - .1 Fax: [\_\_\_\_\_]

### **1.11 Quality Assurance**

- .1 After award of Contract, a mandatory site examination will be held for this Project for Contractor and/or sub-contractors responsible for construction, renovation demolition/deconstruction waste management.

- .1 Date, time and location will be arranged by Departmental Representative.
- .2 Waste Management Meeting: Waste Management Co-ordinator is to provide an update on status of waste diversion and management activities at each meeting. Written monthly Waste Diversion Report summary to be provided by Waste Management Coordinator (refer to the Waste Diversion Report form in Schedule C and Waste Materials Tracking form in Schedule D).

### **1.12 Storage, Handling And Protection**

- .1 Store, materials to be reused, recycled and salvaged in locations as directed by Departmental Representative.
- .2 Unless specified otherwise, materials for removal do not become Contractor's property.
- .3 Protect, stockpile, store and catalogue salvaged items.
- .4 Separate non-salvageable materials from salvaged items. Transport and deliver non-salvageable items to licensed disposal facility.
- .5 Protect structural components not removed and salvaged materials from movement or damage.
- .6 Support affected structures. If safety of building is endangered, cease operations and immediately notify Departmental Representative.
- .7 Protect, mechanical and electrical from damage and blockage.
- .8 Provide on-site facilities and containers for collection and storage of reusable and recyclable materials.
- .9 Separate and store materials produced during project in designated areas.
- .10 Prevent contamination of materials to be salvaged and recycled and handle materials in accordance with requirements for acceptance by designated processing facilities.
  - .1 On-site source separation is recommended.
  - .2 Remove co-mingled materials to off site processing facility for separation.
  - .3 Obtain waybills, receipts and/or scale tickets for separated materials removed from site.
  - .4 Materials reused on-site are considered to be diverted from landfill and as such are to be included in all reporting.

### **1.13 Disposal Of Wastes**

- .1 Do not bury rubbish or waste materials.
- .2 Do not dispose of volatile materials into waterways, storm, or sanitary sewers.
- .3 Keep records of construction waste including:
  - .1 Number and size of bins.
  - .2 Waste type of each bin.
  - .3 Total tonnage generated.
  - .4 Tonnage reused or recycled.
  - .5 Reused or recycled waste destination.

- .4 Remove materials on-site as Work progresses.
- .5 Prepare project summary to verify destination and quantities on a material-by-material basis as identified in the waste audit.

#### **1.14 Scheduling**

- .1 Co-ordinate Work with other activities at site to ensure timely and orderly progress of Work.

### **Part 2 Products**

#### **2.1 Not Used**

- .1 Not Used.

### **Part 3 Execution**

#### **3.1 Application**

- .1 Do Work in compliance with WRW and WSSP.
- .2 Handle waste materials not reused, salvaged, or recycled in accordance with appropriate regulations and codes.

#### **3.2 Cleaning**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning.
- .3 Waste Management: separate waste materials for recycling in accordance with Section 01 74 21- Construction/Demolition Waste Management and Disposal.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.
  - .2 Source separate materials to be reused/recycled into specified sort areas.

#### **3.3 Diversion Of Materials**

- .1 From following list, separate materials from general waste stream and stockpile in separate piles or containers, as reviewed by Departmental Representative, and consistent with applicable fire regulations.
  - .1 Mark containers or stockpile areas.
  - .2 Provide instruction on disposal practices.
- .2 On-site sale of recyclable material is not permitted.

### 3.4 Waste Diversion Report

- .1 At completion of Project, prepare written Waste Diversion Report indicating quantities of materials reused, recycled or disposed of as well as the following:
  - .1 Identify final diversion results and measure success against goals from Waste Reduction Workplan.
  - .2 Compare final quantities/percentages diverted with initial projections in Waste Audit and Waste Reduction Workplan and explain variances.
    - .1 Supporting documentation.
    - .2 Waybills and tracking forms.
    - .3 Description of issues, resolutions and lessons learned.

### 3.5 Waste Audit (Wa)

- .1 Schedule A - Waste Audit (WA)

(1) Material Category	(2) Material Quantity Unit	(3) Estimated Waste %	(4) Total Quantity of Waste (unit)	(5) Generation Point	(6) % Recycled	(7) % Reused
Wood and Plastics Material Description						
Off-cuts						
Warped Pallet Forms						
Plastic Packaging						
Cardboard Packaging						
Other						
Doors and Windows Material Description						
Painted Frames						
Glass						
Wood						
Metal						
Other						

### 3.6 Waste Reduction Workplan (Wrw)

- .1 Schedule B

(1) Material	(2) Person(s)	(3) Total Quantity	(4) Reused	Actual	(5) Recycled	Actual	(6) Material(s)
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Category	Respon- sible	of Waste (unit)	Amount (units) Projected		Amount (unit) Projected		Destina- tion
Wood and Plastics Material Description							
Chutes							
Warped Pallet Forms							
Plastic Packag ing							
Card- board Packag ing							
Other							
Doors and Windows Material Description							
Painted Frames							
Glass							
Wood							
Metal							
Other							

### 3.7 Cost/Revenue Analysis Workplan (Craw)

#### .1 Schedule E - Cost/Revenue Analysis Workplan (CRAW)

(1) Material Description	(2) Total Quantity (unit)	(3) Volume (cum)	(4) Weight (cum)	(5) Disposal Cost/Credit \$(+/-)	(6) Category Sub-Total \$(+/-)
Wood					
Wood Stud					
Plywood					
Baseboard - Wood					
Door Trim - Wood					
Cabinet					\$
Doors and Windows					
Panel Regular					
Slab Regular					
Wood Laminate					
Byfold -					

Closet					
Glazing					\$
		(7) Cost (-) / Revenue (+)			\$

**3.8 Canadian Governmental Departments Chief Responsibility For The Environment**

.1 Schedule G - Government Chief Responsibility for the Environment:

Province	Address	General Inquires	Fax
Saskatchewan	Saskatchewan Environment and Resource Management 3211 Albert Street Regina SK S4S 5W6	306-787-2700	306-787-3941

**3.9 Schedules**

.1 Following Schedules are attached to this Specification:

- .1 Waste Audit - Schedule A.
- .2 Waste Reduction Workplan Form - Schedule B.
- .3 Waste Diversion Report Form - Schedule C.
- .4 Waste Materials Tracking Form - Schedule D.
- .5 Cost/Revenue Analysis Workplan - Schedule E.
- .6 Market Research Report - Schedule F (When Available).

**END OF SECTION**

## **Part 1        General**

### **1.1        Administrative Requirements**

- .1 Acceptance of Work Procedures:
  - .1 Contractor's Inspection: 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 inspection.
  - .2 Departmental Representative 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, balanced, adjusted and fully operational.
    - .4 Certificates required by Fire Commissioner, Boiler Inspection Branch 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 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.
- .2 When Work deemed incomplete by Departmental Representative, complete outstanding items and request re-inspection.
- .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.

**Part 2 Products**

**2.1 Not Used**

- .1 Not Used.

**Part 3 Execution**

**3.1 Not Used**

- .1 Not Used.

**END OF SECTION**

**Part 1            General**

**1.1                Reference Standards**

**1.2                Administrative Requirements**

.1                Pre-warranty Meeting:

- .1                Convene meeting one week prior to contract completion with Departmental Representative, in accordance with Section 01 31 19- Project Meetings to:
  - .1                Verify Project requirements.
  - .2                Review warranty requirements, 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.

**1.3                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, four final copies of operating and maintenance 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.

**1.4                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 1:1 scaled CAD files in dwg format on CD.

### **1.5 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.

### **1.6 As -Built Documents And Samples**

- .1 Maintain, in addition to requirements in General Conditions, 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.

## **1.7 Recording Information On Project Record Documents**

- .1 Record information on set of blue line opaque drawings, and in copy of Project Manual, provided by Departmental Representative.
- .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 Referenced Standards 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.

## **1.8 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.

## **1.9 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 troubleshooting; 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] [Design-Builder'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 01 91 13- General Commissioning (Cx) Requirements.
- .15 [Aboveground] [Underground] storage tank inspection documentation, registration, forms, decommissioning and removal in accordance with CEPA SOR/2008-197.
- .16 Additional requirements: as specified in individual specification sections.

## **1.10 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.

### **1.11 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 on site; 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.

### **1.12 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.

### **1.13 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 Owner'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 HVAC balancing, pumps, motors, commissioned systems fire protection, sprinkler systems, etc.
  - .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.

#### **1.14 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.

**Part 2            Products**

**2.1                Not Used**

.1                Not Used.

**Part 3            Execution**

**3.1                Not Used**

.1                Not Used.

**END OF SECTION**

## **Part 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     Owner: 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 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, at the scheduled 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.

### **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.

**Part 2            Products**

**2.1                Not Used**

.1                Not Used.

**Part 3            Execution**

**3.1                Not Used**

.1                Not Used.

**END OF SECTION**

## **Part 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 Acronyms:
  - .1 Cx - Commissioning
  - .2 CxA - Commissioning Authority
  - .3 O&M - Operation and Maintenance
  - .4 CVF – Component Verification Form
  - .5 FPT – Functional Performance Test
  - .6 TAB - Testing, Adjusting and Balancing

### **1.2      GENERAL**

- .1 Commissioning is a formal, systematic process of ensuring that building systems perform interactively according to the design intent and the owner's operational needs.
- .2 Commissioning during the construction phase is intended to achieve the following specific objectives according to the Contract Documents:
  - .1 Applicable equipment and systems are installed according to the manufacturer's recommendations and to industry accepted standards and that they receive adequate operational checkout by installing contractors.
  - .2 Proper performance of equipment and systems is documented.
  - .3 O&M documentation left on site is complete.
  - .4 Owner's operating personnel are adequately trained.
- .3 The Contractor's Cx Agent is responsible for demonstrating equipment and systems, troubleshooting and making adjustments as required to the satisfaction of the CxA.
  - .1 Systems to be operated at full capacity under various modes to determine if they function correctly and consistently at peak efficiency. Systems to be interactively tested with each other as intended in accordance with Contract Documents and design criteria.
  - .2 During these checks, adjustments to be made to enhance performance to meet environmental or user requirements.

### **1.3      NON-CONFORMANCE TO PERFORMANCE VERIFICATION REQUIREMENTS**

- .1 Should equipment, system components, and associated controls be incorrectly installed or malfunction during Cx, the Contractor shall correct deficiencies, re-verify equipment and components within the non-functional system, including

related systems as deemed required by the CxA and/or related design authority, to ensure effective performance.

- .2 Contractor costs for corrective work, additional tests, and inspections to ensure proper performance of such items to be borne by Contractor.
- .3 Contractor shall pay for CxA labour associated with excessive retesting of systems.

#### **1.4 COORDINATION**

- .1 The following are members of the commissioning team:
  - .1 Owner Representative
  - .2 Commissioning Authority (CxA)
  - .3 Commissioning Agent
  - .4 Project Manager
  - .5 Architect and Sub-consultants
  - .6 General Contractor (Contractor)
  - .7 Mechanical Contractor
  - .8 Electrical Contractor
  - .9 TAB representative
  - .10 Controls Contractor
  - .11 Any other installing subcontractors or suppliers of equipment.

#### **1.5 CONFLICTS (BETWEEN SPECIFICATION SECTIONS)**

- .1 Report conflicts between requirements of this section and other specification sections to the General Contractor before start-up and obtain clarification.
- .2 Failure to report conflict and obtain clarification (through RFI process) will result in application of the design authority's intent on the issue.

#### **1.6 COMMISSIONING SCHEDULE**

- .1 The Contractor's Cx Agent will provide Cx schedule to CxA for review and comment.
- .2 The General Contractor will provide adequate time for Cx activities prescribed in technical sections and commissioning sections including:
  - .1 Commissioning site visits
  - .2 Component verification completion
  - .3 Startup and pre-functional activities
  - .4 Functional performance testing dates
  - .5 Owner training
  - .6 Seasonal or deferred testing.
- .3 All parties are responsible to address scheduling problems and make necessary notifications in a timely manner in order to expedite the commissioning process.

## **1.7 SYSTEMS TO BE COMMISSIONED**

- .1 The following systems will be commissioned for this project (if applicable):

### **HVAC**

Boilers  
Hydronic Pumps  
Heat Pipe  
Humidifiers  
Testing, Adjusting and Balancing Work

### **Direct Digital Controls (DDC)**

Central Building Automation System

## **1.8 MEETINGS**

- .1 Commissioning Kickoff Meeting. The CxA will schedule, plan and conduct a commissioning scoping meeting with the entire commissioning team in attendance.
- .2 Miscellaneous Meetings. Other meetings will be planned and conducted by the CxA at the discretion of the CxA as construction progresses. These meetings will cover coordination, deficiency resolution and planning issues with particular Contractors.

## **1.9 SUBMITTALS (SHOP DRAWINGS)**

- .1 The CxA requires submittal documentation for facilitating the commissioning work. These requests will be integrated into the normal submittal process and protocol of the construction team.
- .2 These submittals to the CxA do not constitute compliance for O&M manual documentation. The O&M manuals are the responsibility of the Contractor, though the CxA will review them and provide feedback, where in the opinion of the CxA, correction is required. O&M manuals must be submitted in electronic (pdf) format.

## **1.10 COMPONENT VERIFICATION FORM CHECKLISTS and INITIAL CHECKOUT**

- .1 The following procedures apply to all equipment to be commissioned (see Section 1.7 for list of equipment and systems).
- .2 Component Verification Forms (CVFs). CVF checklists document that the equipment and systems are installed as per the design intent and good practice. CVFs for a given system must be successfully completed prior to Functional Performance Testing (FPT).
- .1 CVFs will be developed in an electronic format (pdf) by the CxA and electronic copies will be provided to the Contractor's Cx Agent. The Cx Agent is responsible to execute and document the CVFs on site, and return to the CxA for inclusion in the final report. The CxA will verify the installation and accuracy of the CVFs using an audit process.
- .2 CVFs are used to track and document that the proper equipment has been specified, submitted and installed. The forms capture typical maintenance information such as tag #, model, service, location, nameplate data, static submittal data, etc.

- .3 A Sample CVF has been attached (Section 1.11) for bid purposes.
- .3 Issues identified during commissioning inspections will be documented by the CxA on the issue tracking log.
  - .1 The Cx Agent shall address issues and coordinate with contractors to ensure correction.

### 1.11 SAMPLE COMPONENT VERIFICATION FORM

Project Name		Component Verification Form	
Owner City, Province	Unit Tag: <b>AHU-1</b> Equipment Type: Air Handling Unit System: HVAC Location: Mech Rm Area Serviced: Open Office		
This box for IDI use only.		Form Audited?	YES <input type="checkbox"/> NO <input type="checkbox"/>
CxA reviewer: _____			
<b>Contractor (include company and print name)</b>	<b>Signature</b>	<b>Date</b>	IDI Audit Verification
Mechanical:	_____	_____	
Electrical:	_____	_____	
Controls:	_____	_____	
General:	_____	_____	
<hr/>			
<b>Nameplate Data</b>	<b>Submitted</b>	<b>Installed</b> <i>note any changes</i>	<b>Installer Verify</b>
Manufacturer	AHU Maker		<input type="checkbox"/>
Model	AHU 12AB-34CD		<input type="checkbox"/>
Supply fan flow [cfm]	5000		<input type="checkbox"/>
Supply Fan Motor HP	5		<input type="checkbox"/>
Return fan flow (cfm)	5000		<input type="checkbox"/>
Exhaust Fan Motor HP	5		<input type="checkbox"/>
Motor Volts	575/3/60		<input type="checkbox"/>
Glycol Cooling Coil (# coils, # Rows)	1, 8		<input type="checkbox"/>
Glycol Heating Coils (# coils, # rows)	1, 2		<input type="checkbox"/>
Details/Notes: Sample AHU unit			
<hr/>			
<b>Inspection Items</b>	<b>Comments</b>	<b>Installer Verify</b>	
<b>General Installation &amp; Cleanliness</b>			
Equipment is clean and free of debris		<input type="checkbox"/>	<input type="checkbox"/>
Equipment is properly mounted and vibration isolation equipment is installed on motors		<input type="checkbox"/>	<input type="checkbox"/>
Service hatches & filter access is not hindered by surrounding equipment		<input type="checkbox"/>	<input type="checkbox"/>
Record the MERV rating of the filters in the unit		<input type="checkbox"/>	<input type="checkbox"/>
Shipping mounts are removed		<input type="checkbox"/>	<input type="checkbox"/>
<b>Duct Installation</b>			
Duct layout matches drawings and duct connections are sealed		<input type="checkbox"/>	<input type="checkbox"/>
Smoke and fire dampers are properly installed according to contract documents		<input type="checkbox"/>	<input type="checkbox"/>
<b>Electrical Installation</b>			
Verify that overload breakers are installed and sized correctly		<input type="checkbox"/>	<input type="checkbox"/>
Local disconnects are installed and labelled		<input type="checkbox"/>	<input type="checkbox"/>
VFDs for fans installed per contract documents		<input type="checkbox"/>	<input type="checkbox"/>
<b>Controls Installation</b>			
Controls wiring complete and electrical connections are tight		<input type="checkbox"/>	<input type="checkbox"/>
Control actuators and sensors labelled per contract documents		<input type="checkbox"/>	<input type="checkbox"/>
<b>Insulation &amp; Labelling</b>			
Thermal Insulation complete as per contract documents		<input type="checkbox"/>	<input type="checkbox"/>
Unit is correctly labelled		<input type="checkbox"/>	<input type="checkbox"/>
Ducts and piping are labelled per contract documents and direction of flow is indicated		<input type="checkbox"/>	<input type="checkbox"/>

## **1.12 SYSTEM START-UP**

- .1 Start-up Plan. The General Contractor will provide a detailed startup plan for all commissioned equipment for review by the CxA and Cx Agent.
- .2 The startup plan will include blank startups forms (provided by manufacturer, or otherwise) for commissioned systems.
  - .1 The CxA may attend startups at their discretion to ensure that startup documentation and procedures are being followed as required.
  - .2 The Contractors and vendors shall execute start-up.
  - .3 Provide the CxA with a signed and dated copy of the completed start-up report.
- .3 Start-up documentation to include:
  - .1 Factory and on-site test certificates for specified equipment.
  - .2 Pre-start-up inspection reports.
  - .3 Signed installation/start-up check lists.
  - .4 Start-up reports,
  - .5 Step-by-step description of complete start-up procedures, to permit Consultant to repeat start-up at any time.
- .4 Submit required startup documentation including, but not limited to:
  - .1 Mechanical Systems
    - .1 Major equipment manufacturers startup reports (AHUs, Boilers, Chillers, Heat Pumps, etc.)
    - .2 Piping pressure tests
    - .3 Sprinkler verification reports
    - .4 TAB report
  - .2 Electrical Systems
    - .1 Electrical equipment test reports (megger tests, harmonic distortion testing)
    - .2 Low voltage lighting system test report
    - .3 Fire Alarm verification report.
  - .3 Controls
    - .1 Control point end-to-end verification report
    - .2 CO/NOx sensor calibration reports

## **1.13 FUNCTIONAL PERFORMANCE TESTING**

- .1 Refer to Section 1.7 for the list of systems to be commissioned.
- .2 Functional performance testing demonstrates that each system is operating according to the documented design intent and Contract documents. Each system should be operated through all modes of operation (seasonal, occupied, unoccupied, warm-up, cool-down, part and full load). Verifying the sequences of operation is required for all modes. Proper responses to modes and conditions such as power failure, freeze conditions, fire alarm conditions, equipment failure, etc. may also be tested.

- .3 Functional Performance Tests will be developed in an electronic format (pdf) by the CxA and electronic copies will be provided to Contractors.
- .4 The CVFs for a given system's equipment must be completed prior to the functional performance test.
- .5 The Contractors and/or vendors shall execute the functional tests as a pre-functional test to verify correct system operation and provide the CxA with a signed and dated copy of the completed tests prior to formal functional testing with the CxA present.
- .6 Issues identified during functional testing will be documented by the CxA on the issue tracking log.
  - .1 The Cx Agent shall address issues and coordinate with contractors to ensure correction.
- .7 A Sample functional performance test has been attached (Section 1.14) for bid purposes.

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### 1.14 SAMPLE FUNCTIONAL TEST

#### Functional Testing for AHU-1, ERV-1 and Reheat

Line #	Test	Expectation	First Test Status	Re-Test Status	Completed By	Date
AHU-1.F01	System Off	BMS commands system off during unoccupied mode - unit dampers close to outdoor air, supply fan is off. Verify by operational check.				
AHU-1.F02	Startup	When in occupied mode, BMS commands dampers to full return position, supply fans starts. Verify by operational check and trends.				
AHU-1.F03	Occupancy Schedule	Verify schedule with Owner. <i>Occupied schedule should be same for ERV-1, except for morning warm up periods, tests below.</i>				
AHU-1.F04	Morning Warm Up/Cool Down	AHU will operate in a warm up/cool down mode to bring the space under temperature control prior to occupancy. AHU will operate on full return in this mode, with ERV-1 off.				
AHU-1.F05	Supply Air Temperature Control: Heating	Hydronic Heating coil and modulating valve heat supply air when called to control zone temperature.  Verify by operational check and trends.				
AHU-1.F06	Supply Air Temperature Control: Free Cooling	When OAT allows, free cooling mode on the AHU is enabled to maintain supply temperature at setpoint. Outdoor air damper modulates open to control supply air temperature. This sequence is to be staged and integrated with ERV-1 free-cooling. Relief Damper to open during this mode.  Verify by operational check and trends.				
AHU-1.F07	Supply Air Temperature Control: Hydronic Cooling	Hydronic Cooling coil and modulating valve cool supply air when called to control zone temperature.  Verify by operational check and trends.				
AHU-1.F08	Zone Temperature Control	Verify that AHU adequately controls <i>average</i> zone temperature to setpoint, nominally 72°F (22°C), adjustable.				
AHU-1.F09	Zone Temperature Control: Unoccupied Mode	Verify that AHU adequately controls <i>average</i> zone temperature on fields to setpoint, nominally 78°F (25.5°C), adjustable, in cooling mode. Unoccupied heating mode setpoint to be 60°F (15.5°C), adjustable.				
AHU-1.F10	Graphics & Trends	Verify graphics indicate space temperature and setpoint, AHU enable status, AHU fan status and speed, heating/cooling valve positions, mixed air temperature, OA and return air enthalpy, supply temp SP, and supply air temperature.  Trends to be enabled on all points.				

**Functional Testing for AHU-1, ERV-1 and Reheat**

Line #	Test	Expectation	First Test Status	Re-Test Status	Completed By	Date
AHU-1.F11	Alarms	BMS to alarm on: - supply fan failure (x2) - supply air temperature differential from setpoint - high filter differential pressure (nominal 0.7"wc, adjustable) - freeze/heat alarm with shutdown at 40°F (4.4°C), heating valve opens fully, requiring manual restart				
ERV-1.F01	System Off	BMS commands system off during unoccupied mode - unit dampers close to outdoor air, supply and exhaust fans are off. This includes morning warmup periods. Verify by operational check.				
ERV-1.F02	Startup	When in occupied mode, BMS commands dampers open, supply and exhaust fans start (constant speed fans). Verify by operational check and trends.				
ERV-1.F03	Supply Air Temperature Control: Free Cooling	When OAT allows, and in sequence with AHU-1 free cooling, free cooling mode on the ERV is enabled by BMS. Dampers remain fixed during this mode, switching only once every 3 hours.				
ERV-1.F04	Supply Air Temperature Control: Heat Recovery	When OAT allows, and in sequence with AHU-1, heat recovery mode on the ERV is enabled by BMS. Dampers operate routinely during this mode, reversing flow every 2 minutes. Verify by operational check and trends.				
ERV-1.F05	Graphics & Trends	Verify graphics indicate space temperature and humidity, ERV enable status, ERV mode command, supply and exhaust fan status, heating valve positions, supply temp SP, supply temperature, and exhaust air temperature.				
ERV-1.F06	Alarms	BMS to alarm on: - supply fan failure - exhaust fan failure - supply air temperature differential from setpoint - high filter differential pressure (nominal 0.7"wc, adjustable)				

### **1.15 SEVEN (7) DAY INTEGRATED SYSTEM TESTING**

- .1 A 7-Day Integrated Systems Test will be completed to ensure proper building performance and operation. An additional test will be completed during seasonal testing.
- .2 General Acceptance requires that the systems operate as one entity as intended and that documentation is provided indicating such.
- .3 Issues identified during seven day testing will be documented by the CxA on the issue tracking log.
  - .1 The Cx Agent shall address issues and coordinate with contractors to ensure correction.

### **1.16 DEFERRED/SEASONAL TESTING**

- .1 Functional performance tests requiring specific environmental conditions (seasonal tests) will be deferred until after occupancy
- .2 The Cx Agent, contractors and/or vendors shall execute the deferred/seasonal tests as a pre-functional test to verify correct system operation and provide the CxA with a signed and dated copy of the completed tests prior to formal functional testing with the CxA present.
- .3 Issues identified during deferred/seasonal testing will be documented by the CxA on the issue tracking log.
  - .1 The Cx Agent shall address issues and coordinate with contractors to ensure correction.

### **1.17 ISSUE TRACKING LOG**

- .1 Contractors shall respond to issues noted on the issue tracking log within 7 days indicating the corrective action taken.
- .2 CxA may request the contractor demonstrate successful resolution of items noted on the tracking log.

### **1.18 OWNER TRAINING**

- .1 The Contractor is responsible for training of O & M staff to ensure they have all information necessary to operate and maintain commissioned features and systems.
- .2 Submit a training plan and schedule to CxA for review.
- .3 Training plan will address the following topics (at a minimum)
  - .1 Design intent
  - .2 Use of Operations and Maintenance (O&M) Manuals
  - .3 Control Drawings and Schematics
  - .4 Startup and Shutdown
  - .5 Unoccupied operations
  - .6 Seasonal changeover
  - .7 Manual operations
  - .8 Alarms

- .9 System interactions
- .10 Energy conservation optimizations
- .11 Health and safety
- .12 Special maintenance or replacement
- .13 Occupant interaction
- .14 Systems response to operating conditions
- .15 Contractor shall document training exercises with attendance sheets and implementation of training surveys.
- .16 A training evaluation form has been attached (Section 1.19) for bid purposes.

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**1.19 SAMPLE TRAINING EVALUATION FORM**



Commissioning Project Management Services

420 – 70 Arthur St.  
Winnipeg, MB, R3B 1G7  
Tel: 204.669.6818  
Fax: 204.944.1123

[www.i-designs.ca](http://www.i-designs.ca)

**Sample Project Name**

City, Province

**Training Survey**

**Date:**

**Name:**

**Training Covered:**

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1. Was the Instructor familiar with the equipment? Yes  No
2. Was the topic covered completely? Yes  No
3. Were your questions answered? Yes  No   
(if No, list questions?)

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4. Overall, are you satisfied? Yes  No
- Comments**

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**1.20 SYSTEMS MANUAL**

- .1 Contractor to provide the following documentation to the CxA for inclusion in the systems manual:
  - .1 As-built architectural drawings (electronic copy)
  - .2 As-built mechanical drawings (electronic copy)
  - .3 As-built electrical drawings (electronic copy)
  - .4 As-built controls drawings and cut sheets (electronic copy)
  - .5 Operations and Maintenance manuals (electronic copy)
  - .6 Occupancy permit.

**1.21 AUTHORITIES HAVING JURISDICTION (I.E. GOVERNMENT AND UTILITY AUTHORITIES)**

- .1 Where specified start-up, testing or commissioning procedures duplicate verification requirements of authority having jurisdiction, arrange for CxA to witness procedures so as to avoid duplication of tests and to facilitate expedient acceptance of facility.
- .2 Obtain certificates of approval, acceptance and compliance with rules and regulation of authority having jurisdiction.
- .3 Provide copies to Consultant and CxA within 5 days of test.

**Part 2 Products**

**2.1 Not used.**

**Part 3 Execution**

**3.1 Not used.**