

**Part 1 General**

**1.1 WORK COVERED BY CONTRACT DOCUMENTS**

- .1 Work of this Contract comprises general construction and renovation of the LRC Dairy & Metabolism Barn Roof located at Lethbridge, Alberta; and further identified as Project No. R.071094.001.

**1.2 CONTRACT METHOD**

- .1 Construct Work under single stipulated price contract.

**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: as identified on the drawings.
- .4 Maintain fire access/control.

**1.4 DEFINITIONS**

- .1 Contractor: means the person contracting with the Owner to provide or furnish all labour, material and supplies for the execution of the Work under the Contract, and includes the Contractor's superintendent as designated in writing to the Owner.
- .2 Departmental Representative: means the person designated in the Contract, or by written notice to the Contractor, to act as the Departmental Representative for the purposes of the Contract, and includes a person, designated and authorized in writing by the Departmental Representative to the Contractor.
- .3 Owner: within the context of these specifications, the term Owner refers to Public Works and Government Services Canada (PWGSC), as well as Agriculture and Agri-Food Canada (AAFC).
- .4 Site: in the context of these specifications, the site refers to the Dairy and Metabolism Barn located at Building #86, Lethbridge Research Centre, 5403 – 1 Avenue South, Lethbridge, Alberta.

**1.5 HAZARDOUS BUILDING MATERIALS DESCRIPTION OF THE WORK**

- .1 The required work to be undertaken by the Contractor will include, but not be limited to, the following activities at the Dairy and Metabolism Research Centre in Lethbridge, Alberta:
- .2 Asbestos Abatement, including:
  - .1 Removal of the asbestos-containing plaster from the ceiling of the Cattle Area #2 following Asbestos Intermediate requirements and Lead – Intermediate precautions.

- .2 Removal of the light ballasts suspected to contain polychlorinated biphenyls (PCBs) and light tubes containing mercury vapour both located in Cattle Area #2.
- .3 Mobilization and demobilization consists of preparatory work and operations including, but not limited to, those necessary for the movement of personnel, equipment, supplies and incidentals to and from the project.
- .4 Work includes:
  - .1 Permit Applications; including:
    - .1 Obtaining all municipal permits, as required, to complete the Work.
    - .2 Filing the Asbestos Project Notification form.
  - .2 Management of Site Safety for the work area, including:
    - .1 Responsibility for site safety in the work area;
    - .2 Development of a Site Specific Safety Plan;
    - .3 Coordinating and Leading Pre-Job Safety Meeting and Daily On-site Safety Meetings.

#### **1.6 HAZARDOUS BUILDING MATERIALS REQUIREMENTS**

- .1 The requirements outlined in the specifications are the minimum requirements for the project. Changes to the minimum specification requirements require prior written approval from the Owner and the Consultant. The contractor may elect to utilize an approved equivalent or a higher requirement based on health and safety, and site configuration.
- .2 The abatement of hazardous building materials and specifications should be interpreted in conjunction with Golder Associates Ltd. report entitled Hazard Assessment for Building Renovation, Dairy and Metabolism Barn, Lethbridge Research Centre, Lethbridge, Alberta dated May, 2015.
- .3 The work outlined in the specification sections above is intended as a summary of the abatement scope of work for this project and is not intended to be an exhaustive account of all work required for this project. It is the responsibility of the Contractor to familiarize themselves with all of the requirements of the work for this project. The Contractor is responsible for all quantity determinations for estimating purposes.
- .4 Electrical hazards must be eliminated within asbestos abatement work areas due to the use of water during abatement activities. Electrical isolation must be conducted prior to beginning abatement activities.
- .5 Timely removal of asbestos waste will be coordinated by the Contractor to prevent disposal bins from remaining on site for prolonged periods of time.

#### **1.7 HAZARDOUS BUILDING MATERIALS EXISTING SITE CONDITIONS**

- .1 Contractor to satisfy themselves as to the nature and location of the work, local conditions and condition of the building at the sites of the work, the equipment and facilities needed preliminary to and during the execution of the work, the means of access to the work site, all necessary information as to risks, contingencies and circumstances and all other matters which can in any way effect the work under the contract.

**1.8 CONTRACTOR USE OF PREMISES**

- .1 Limit use of premises for Work, for storage and for access, to allow:
  - .1 Partial owner occupancy.
  - .2 Refer to phasing plan in the drawings to co-ordinate with Departmental Representative ongoing use of the premises.
- .2 Co-ordinate use of premises under direction of Departmental Representative.
- .3 Obtain and pay for use of additional storage or work areas needed for operations under this Contract.
- .4 Remove or alter existing work to prevent injury or damage to portions of existing work which remain.
- .5 Repair or replace portions of existing work which have been altered during construction operations to match existing or adjoining work, as directed by Departmental Representative.
- .6 At completion of operations condition of existing work: equal to or better than that which existed before new work started.

**1.9 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.
- .3 Refer to phasing plan in the drawings to co-ordinate with Departmental Representative ongoing Owner occupation.

**1.10 PARTIAL OWNER OCCUPANCY**

- .1 Schedule and substantially complete designated portions of Work for Owner's occupancy prior to Substantial Performance of entire Work.

**1.11 ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING BUILDING**

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

**1.12 EXISTING SERVICES**

- .1 Notify, Departmental Representative and utility companies of intended interruption of services and obtain required permission.
- .2 Where Work involves breaking into or connecting to existing services, give Departmental Representative 48 hours notice for necessary interruption of mechanical or electrical service throughout course of work. Minimize duration of interruptions. Carry out work at times as directed by governing authorities with minimum disturbance to pedestrian vehicular traffic and tenant operations.
- .3 Provide alternative routes for 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 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 Departmental Representative to maintain critical building and tenant systems.
- .7 Where unknown services are encountered, immediately advise Departmental Representative and confirm findings in writing.
- .8 Protect, relocate or maintain existing active services. When inactive services are encountered, cap off in manner approved by authorities having jurisdiction.
- .9 Record locations of maintained, re-routed and abandoned service lines.
- .10 Construct barriers in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.

### **1.13 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.

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**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    Provide sanitary facilities for use by Contractor's personnel and locate on site as directed by Departmental Representative. 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 building operations, occupants, 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    Carry out noise generating Work Monday to Friday from 18:00 to 07:00 hours and on Saturdays, Sundays, and statutory holidays.
- .2    Submit schedule in accordance with 01 32 16.07 - Construction Progress Schedule - Bar (GANTT) Chart.
- .3    Ensure Contractor's personnel employed on site become familiar with and obey regulations including safety, fire, traffic and security regulations.
- .4    Keep within limits of work and avenues of ingress and egress.

**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 APPOINTMENT AND PAYMENT**

- .1 Departmental Representative will appoint and pay for services of testing laboratory except follows:
  - .1 Inspection and testing required by laws, ordinances, rules, regulations or orders of public authorities.
  - .2 Inspection and testing performed exclusively for Contractor's convenience.
  - .3 Testing, adjustment and balancing of conveying systems, mechanical and electrical equipment and systems.
  - .4 Mill tests and certificates of compliance.
  - .5 Tests specified to be carried out by Contractor under supervision of Departmental Representative.
- .2 Where tests or inspections by designated testing laboratory reveal Work not in accordance with contract requirements, pay costs for additional tests or inspections as required by Departmental Representative to verify acceptability of corrected work.

**1.2 CONTRACTOR'S RESPONSIBILITIES**

- .1 Provide labour, equipment and facilities to:
  - .1 Provide access to Work for inspection and testing.
  - .2 Facilitate inspections and tests.
  - .3 Make good Work disturbed by inspection and test.
  - .4 Provide storage on site for laboratory's exclusive use to store equipment and cure test samples.
- .2 Notify Departmental Representative 48 hours minimum sufficiently in advance of operations to allow for assignment of laboratory personnel and scheduling of test.
- .3 Where materials are specified to be tested, deliver representative samples in required quantity to testing laboratory.
- .4 Pay costs for uncovering and making good Work that is covered before required inspection or testing is completed and approved by Departmental Representative.

**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 at the call of Departmental Representative.
- .2      Prepare agenda for meetings.
- .3      Distribute written notice of each meeting four days in advance of meeting date to Departmental Representative.
- .4      Provide physical space and make arrangements for meetings.
- .5      Preside at meetings.
- .6      Record the meeting minutes. Include significant proceedings and decisions. Identify actions by parties.
- .7      Reproduce and distribute copies of minutes within three days after meetings and transmit to meeting participants and, affected parties not in attendance and Departmental Representative..
- .8      Representative of Contractor, Subcontractor and suppliers attending meetings will be qualified and authorized to act on behalf of party each represents.

**1.2                PRECONSTRUCTION MEETING**

- .1      Within 15 days after award of Contract, request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.
- .2      Departmental Representative, Contractor, major Subcontractors, field inspectors and supervisors will be in attendance.
- .3      Establish time and location of meeting and notify parties concerned minimum 5 days before meeting.
- .4      Incorporate mutually agreed variations to Contract Documents into Agreement, prior to signing.
- .5      Agenda to include:
  - .1      Appointment of official representative of participants in the Work.
  - .2      Schedule of Work: in accordance with Section 01 32 16.07 - Construction Progress Schedules - Bar (GANTT) Chart.
  - .3      Schedule of submission of shop drawings, samples, colour chips. Submit submittals in accordance with Section 01 33 00 - Submittal Procedures.
  - .4      Requirements for temporary facilities, site sign, offices, storage sheds, utilities, fences in accordance with Section 01 52 00 - Construction Facilities.
  - .5      Delivery schedule of specified equipment.
  - .6      Site security in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.
  - .7      Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements.

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

### **1.3 PROGRESS MEETINGS**

- .1 During course of Work and 8 weeks prior to project completion, schedule progress meetings every 2 weeks.
- .2 Contractor, major Subcontractors involved in Work and Departmental Representative are to be in attendance.
- .3 Notify parties minimum 8 days prior to meetings.
- .4 Record minutes of meetings and circulate to attending parties and affected parties not in attendance within 3 days after meeting.
- .5 Agenda to include the following:
  - .1 Review, approval of minutes of previous meeting.
  - .2 Review of Work progress since previous meeting.
  - .3 Field observations, problems, conflicts.
  - .4 Problems which impede construction schedule.
  - .5 Review of off-site fabrication delivery schedules.
  - .6 Corrective measures and procedures to regain projected schedule.
  - .7 Revision to construction schedule.
  - .8 Progress schedule, during succeeding work period.
  - .9 Review submittal schedules: expedite as required.
  - .10 Maintenance of quality standards.
  - .11 Review proposed changes for affect on construction schedule and on completion date.
  - .12 Other business.

## **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 other 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 PROJECT MILESTONES**

- .1 Project milestones form interim targets for Project Schedule.
  - .1 Interim Certificate (Substantial Completion) within 30 weeks of Award of Contract date.

### **1.5 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.

### **1.6 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 Roofing.
  - .7 Interior Architecture (Ceiling).
  - .8 Lighting.
  - .9 Electrical.
  - .10 Piping.
  - .11 Controls.
  - .12 Heating, Ventilating, and Air Conditioning.
  - .13 Testing and Commissioning.
  - .14 Supplied equipment long delivery items.
  - .15 Engineer supplied equipment required dates.

**1.7 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.

**1.8 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 Alberta.
- .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 7 days for Departmental Representative's review of each submission.
- .5      Adjustments made on shop drawings by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.



- .6 Make changes in shop drawings as Departmental Representative may require, consistent with Contract Documents. When resubmitting, notify Departmental Representative in writing of revisions other than those requested.
- .7 Accompany submissions with transmittal letter, containing:
  - .1 Date.
  - .2 Project title and number.
  - .3 Contractor's name and address.
  - .4 Identification and quantity of each shop drawing, product data and sample.
  - .5 Other pertinent data.
- .8 Submissions include:
  - .1 Date and revision dates.
  - .2 Project title and number.
  - .3 Name and address of:
    - .1 Subcontractor.
    - .2 Supplier.
    - .3 Manufacturer.
  - .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
  - .5 Details of appropriate portions of Work as applicable:
    - .1 Fabrication.
    - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
    - .3 Setting or erection details.
    - .4 Capacities.
    - .5 Performance characteristics.
    - .6 Standards.
    - .7 Operating weight.
    - .8 Wiring diagrams.
    - .9 Single line and schematic diagrams.
    - .10 Relationship to adjacent work.
- .9 After Departmental Representative's review, distribute copies.
- .10 Submit electronic copy of shop drawings for each requirement requested in specification Sections and as Departmental Representative may reasonably request.
- .11 Submit electronic copies of product data sheets or brochures for requirements requested in specification Sections and as requested by Departmental Representative where shop drawings will not be prepared due to standardized manufacture of product.
- .12 Submit electronic copies of test reports for requirements requested in specification Sections and as requested by Departmental Representative.

- .1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.
  - .2 Testing must have been within 3 years of date of contract award for project.
- .13 Submit electronic copies of certificates for requirements requested in specification Sections and as requested by Departmental Representative.
  - .1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.
  - .2 Certificates must be dated after award of project contract complete with project name.
- .14 Submit electronic copies of manufacturers instructions for requirements requested in specification Sections and as requested by Departmental Representative.
  - .1 Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.
- .15 Submit electronic copies of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Departmental Representative.
- .16 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.
- .17 Submit electronic copies of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Departmental Representative.
- .18 Delete information not applicable to project.
- .19 Supplement standard information to provide details applicable to project.
- .20 If upon review by Departmental Representative, no errors or omissions are discovered or if only minor corrections are made, copies will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.
- .21 The review of shop drawings by Departmental Representative is for sole purpose of ascertaining conformance with general concept.
  - .1 This review shall not mean that Departmental Representative approves detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting requirements of construction and Contract Documents.
  - .2 Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of sub-trades.

### **1.3 SAMPLES**

- .1 Submit for review samples as requested in respective specification Sections. Label samples with origin and intended use.
- .2 Deliver samples prepaid to Departmental Representative's business address.
- .3 Notify Departmental Representative in writing, at time of submission of deviations in samples from requirements of Contract Documents.
- .4 Where colour, pattern or texture is criterion, submit full range of samples.
- .5 Adjustments made on samples by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.
- .6 Make changes in samples which Departmental Representative may require, consistent with Contract Documents.
- .7 Reviewed and accepted samples will become standard of workmanship and material against which installed Work will be verified.

### **1.4 MOCK-UPS**

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

### **1.5 PHOTOGRAPHIC DOCUMENTATION**

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

### **1.6 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    Definitions:
  - .1    Environmental Pollution and Damage: presence of chemical, physical, biological elements or agents which adversely affect human health and welfare; unfavourably alter ecological balances of importance to human life; affect other species of importance to humans; or degrade environment aesthetically, culturally and/or historically.
  - .2    Environmental Protection: prevention/control of pollution and habitat or environment disruption during construction.
- .2    Reference Standards:
  - .1    U.S. Environmental Protection Agency (EPA)/Office of Water
    - .1    EPA 832/R-92-005-92, Storm Water Management for Construction Activities, Chapter 3.
    - .2    EPA General Construction Permit (GCP) 2012.

**1.2            ACTION AND INFORMATIONAL SUBMITTALS**

- .1    Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2    Product Data:
  - .1    Submit copies of WHMIS MSDS.
- .3    Before commencing construction activities or delivery of materials to site, submit Environmental Protection Plan for review by Departmental Representative.
- .4    Environmental Protection Plan must include comprehensive overview of known or potential environmental issues to be addressed during construction.
- .5    Address topics at level of detail commensurate with environmental issue and required construction tasks.
- .6    Include in Environmental Protection Plan:
  - .1    Names of persons responsible for ensuring adherence to Environmental Protection Plan.
  - .2    Names and qualifications of persons responsible for manifesting hazardous waste to be removed from site.
  - .3    Names and qualifications of persons responsible for training site personnel.
  - .4    Descriptions of environmental protection personnel training program.
  - .5    Work area plan showing proposed activity in each portion of area and identifying areas of limited use or non-use.
    - .1    Plan to include measures for marking limits of use areas and methods for protection of features to be preserved within authorized work areas.
  - .6    Spill Control Plan to include procedures, instructions, and reports to be used in event of unforeseen spill of regulated substance.

- .7 Non-Hazardous solid waste disposal plan identifying methods and locations for solid waste disposal including clearing debris.
- .8 Air pollution control plan detailing provisions to assure that dust, debris, materials, and trash, are contained on project site.
- .9 Contaminant Prevention Plan identifying potentially hazardous substances to be used on job site; intended actions to prevent introduction of such materials into air, water, or ground; and detailing provisions for compliance with Federal, Provincial, and Municipal laws and regulations for storage and handling of these materials.

### **1.3 FIRES**

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

## **Part 2 Products**

### **2.1 NOT USED**

- .1 Not Used.

## **Part 3 Execution**

### **3.1 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Ensure public waterways, storm and sanitary sewers remain free of waste and volatile materials disposal.
- .3 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

**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.

**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.

**1.2                INDEPENDENT INSPECTION AGENCIES**

- .1      Independent Inspection/Testing Agencies will be engaged by Departmental Representative for purpose of inspecting and/or testing portions of Work. Cost of such services will be borne by Departmental Representative.
- .2      Provide equipment required for executing inspection and testing by appointed agencies.
- .3      Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.
- .4      If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by Departmental Representative at no cost to Departmental Representative. Pay costs for retesting and reinspection.

**1.3                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.

**1.4                PROCEDURES**

- .1      Notify appropriate agency and Departmental Representative in advance of requirement for tests, in order that attendance arrangements can be made.
- .2      Submit samples and/or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in orderly sequence to not cause delays in Work.
- .3      Provide labour and facilities to obtain and handle samples and materials on site. Provide sufficient space to store and cure test samples.



**1.5 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, Departmental Representative 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.

**1.6 REPORTS**

- .1 Submit 4 copies of inspection and test reports to Departmental Representative.
- .2 Provide copies to subcontractor of work being inspected or tested.

**1.7 TESTS AND MIX DESIGNS**

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

**1.8 MOCK-UPS**

- .1 Prepare mock-ups for Work specifically requested in specifications. Include for Work of Sections required to provide mock-ups.
- .2 Construct in locations acceptable to Departmental Representative.
- .3 Prepare mock-ups for Departmental Representative review with reasonable promptness and in orderly sequence, to not cause delays in Work.
- .4 Failure to prepare mock-ups in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.
- .5 If requested, Departmental Representative will assist in preparing schedule fixing dates for preparation.
- .6 Remove mock-up at conclusion of Work or when acceptable to Departmental Representative.
- .7 Mock-ups may remain as part of Work.
- .8 Specification section identifies whether mock-up may remain as part of Work or if it is to be removed and when.

**1.9 MILL TESTS**

- .1 Submit mill test certificates as requested.

**1.10 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            DEWATERING**

- .1        Provide temporary drainage and pumping facilities to keep excavations and site free from standing water.

**1.4            WATER SUPPLY**

- .1        Departmental Representative will provide continuous supply of potable water for construction use.
- .2        Arrange for connection with appropriate utility company and pay costs for installation, maintenance and removal.

**1.5            TEMPORARY HEATING AND VENTILATION**

- .1        Provide temporary heating required during construction period, including attendance, maintenance and fuel.
- .2        Construction heaters used inside building must be vented to outside or be non-flameless type. Solid fuel salamanders are not permitted.
- .3        Provide temporary heat and ventilation in enclosed areas as required to:
  - .1        Facilitate progress of Work.
  - .2        Protect Work and products against dampness and cold.
  - .3        Prevent moisture condensation on surfaces.
  - .4        Provide ambient temperatures and humidity levels for storage, installation and curing of materials.
  - .5        Provide adequate ventilation to meet health regulations for safe working environment.
- .4        Maintain temperatures of minimum 10 degrees C in areas where construction is in progress.
- .5        Ventilating:
  - .1        Prevent accumulations of dust, fumes, mists, vapours or gases in areas occupied during construction.
  - .2        Provide local exhaust ventilation to prevent harmful accumulation of hazardous substances into atmosphere of occupied areas.

- .3 Dispose of exhaust materials in manner that will not result in harmful exposure to persons.
- .4 Ventilate storage spaces containing hazardous or volatile materials.
- .5 Ventilate temporary sanitary facilities.
- .6 Continue operation of ventilation and exhaust system for time after cessation of work process to assure removal of harmful contaminants.
- .6 Permanent heating system of building, to be used when available. Be responsible for damage to heating system if use is permitted.
- .7 On completion of Work for which permanent heating system is used, replace filters and clean ducts.
- .8 Ensure Date of Substantial Performance and Warranties for heating system do not commence until entire system is in as near original condition as possible and is certified by Departmental Representative.
- .9 Pay costs for maintaining temporary heat, when using permanent heating system.
- .10 Maintain strict supervision of operation of temporary heating and ventilating equipment to:
  - .1 Conform with applicable codes and standards.
  - .2 Enforce safe practices.
  - .3 Prevent abuse of services.
  - .4 Prevent damage to finishes.
  - .5 Vent direct-fired combustion units to outside.
- .11 Be responsible for damage to Work due to failure in providing adequate heat and protection during construction.

## **1.6 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 230 volts 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 62 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.

## **1.7 TEMPORARY COMMUNICATION FACILITIES**

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

**1.8 FIRE PROTECTION**

- .1 Provide and maintain temporary fire protection equipment during performance of Work required by insurance companies having jurisdiction governing codes, regulations and bylaws.
- .2 Burning rubbish and construction waste materials is not permitted on site.

**Part 2 Products**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 Execution**

**3.1 NOT USED**

**END OF SECTION**

**Part 1 General**

**1.1 REFERENCES**

- .1 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB 1.189-00, Exterior Alkyd Primer for Wood.
  - .2 CGSB 1.59-97, Alkyd Exterior Gloss Enamel.
- .2 Canadian Standards Association (CSA International)
  - .1 CSA-A23.1/A23.2-04, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
  - .2 CSA-0121-M1978(R2003), Douglas Fir Plywood.
  - .3 CAN/CSA-S269.2-M1987(R2003), Access Scaffolding for Construction Purposes.
  - .4 CAN/CSA-Z321-96(R2001), Signs and Symbols for the Occupational Environment.
- .3 Public Works Government Services Canada (PWGSC) Standard Acquisition Clauses and Conditions (SACC)-ID: R0202D, Title: General Conditions 'C', In Effect as of: May 14, 2004.

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

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

**1.3 INSTALLATION AND REMOVAL**

- .1 Prepare site plan indicating proposed location and dimensions of area to be fenced and used by Contractor, number of trailers to be used, avenues of ingress/egress to fenced area and details of fence installation.
- .2 Identify areas which have to be gravelled to prevent tracking of mud.
- .3 Indicate use of supplemental or other staging area.
- .4 Provide construction facilities in order to execute work expeditiously.
- .5 Remove from site all such work after use.

**1.4 SCAFFOLDING**

- .1 Scaffolding in accordance with CAN/CSA-S269.2.
- .2 Provide and maintain scaffolding, ladders and platforms.

**1.5 HOISTING**

- .1 Provide, operate and maintain hoists and cranes required for moving of workers, materials and equipment. Make financial arrangements with Subcontractors for their use of hoists.
- .2 Hoists and cranes to be operated by qualified operator.

**1.6 SITE STORAGE/LOADING**

- .1 Confine work and operations of employees by Contract Documents. Do not unreasonably encumber premises with products.
- .2 Do not load or permit to load any part of Work with weight or force that will endanger Work.

**1.7 CONSTRUCTION PARKING**

- .1 Parking will be permitted on site provided it does not disrupt performance of Work.
- .2 Provide and maintain adequate access to project site.

**1.8 SECURITY**

- .1 Provide and pay for responsible security personnel to guard site and contents of site after working hours and during holidays.

**1.9 OFFICES**

- .1 Provide office heated to 22 degrees C, lighted 750 lx and ventilated, of sufficient size to accommodate site meetings and furnished with drawing laydown table.
- .2 Provide marked and fully stocked first-aid case in a readily available location.
- .3 Subcontractors to provide their own offices as necessary. Direct location of these offices.

**1.10 EQUIPMENT, TOOL AND MATERIALS STORAGE**

- .1 Provide and maintain, in clean and orderly condition, lockable weatherproof sheds for storage of tools, equipment and materials.
- .2 Locate materials not required to be stored in weatherproof sheds on site in manner to cause least interference with work activities.

**1.11 SANITARY FACILITIES**

- .1 Provide sanitary facilities for work force in accordance with governing regulations and ordinances.
- .2 Post notices and take precautions as required by local health authorities. Keep area and premises in sanitary condition.
- .3 When permanent water and drain connections are completed, provide temporary water closets and urinals complete with temporary enclosures, inside building. Permanent facilities may be used on approval of Departmental Representative.

**1.12 CONSTRUCTION SIGNAGE**

- .1 Provide and erect project sign, within three weeks of signing Contract, in a location designated by Departmental Representative.
- .2 Indicate on sign, name of Owner, Contractor, of design style approved by Departmental Representative.
- .3 No other signs or advertisements, other than warning signs, are permitted on site.

- .4 Provide project identification site sign comprising foundation, framing, and one 1200 x 2400 mm signboard as detailed and as described below.
  - .1 Foundations: 15 MPa concrete to CSA-A23.1 minimum 200 mm x 900 mm deep.
  - .2 Framework and battens: SPF, pressure treated minimum 89 x 89 mm.
  - .3 Signboard: 19 mm Medium Density Overlaid Douglas Fir Plywood to CSA O121.
  - .4 Paint: alkyd enamel to CAN/CGSB-1.59 over exterior alkyd primer to CAN/CGSB 1.189.
  - .5 Fasteners: hot-dip galvanized steel nails and carriage bolts.
- .5 Signs and notices for safety and instruction in both official languages Graphic symbols to CAN/CSA-Z321.
- .6 Maintain approved signs and notices in good condition for duration of project, and dispose of off site on completion of project or earlier if directed by Departmental Representative.

#### **1.13 PROTECTION AND MAINTENANCE OF TRAFFIC**

- .1 Provide access as necessary to maintain traffic.
- .2 Provide measures for protection and diversion of traffic, including provision of watch-persons and flag-persons, erection of barricades, placing of lights around and in front of equipment and work, and erection and maintenance of adequate warning, danger, and direction signs
- .3 Protect travelling public from damage to person and property.
- .4 Contractor's traffic on roads selected for hauling material to and from site to interfere as little as possible with public traffic.
- .5 Verify adequacy of existing roads and allowable load limit on these roads. Contractor: responsible for repair of damage to roads caused by construction operations.
- .6 Construct access and haul roads necessary.
- .7 Haul roads: constructed with suitable grades and widths; sharp curves, blind corners, and dangerous cross traffic shall be avoided.
- .8 Provide necessary lighting, signs, barricades, and distinctive markings for safe movement of traffic.
- .9 Dust control: adequate to ensure safe operation at all times.
- .10 Lighting: to assure full and clear visibility for full width of haul road and work areas during night work operations.
- .11 Provide snow removal during period of Work.

#### **1.14 CLEAN-UP**

- .1 Remove construction debris, waste materials, packaging material from work site daily.
- .2 Clean dirt or mud tracked onto paved or surfaced roadways.
- .3 Store materials resulting from demolition activities that are salvageable.



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

**Part 2 Products**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 Execution**

**3.1 NOT USED**

**END OF SECTION**

**Part 1            General**

**1.1                INSTALLATION AND REMOVAL**

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

**1.2                GUARD RAILS AND BARRICADES**

- .1        Provide secure, rigid guard rails and barricades around roofs.
- .2        Provide as required by governing authorities.

**1.3                WEATHER ENCLOSURES**

- .1        Provide weather tight closures to unfinished openings, tops of shafts and other openings in roofs.
- .2        Close off floor areas where walls are not finished; seal off other openings; enclose building interior work for temporary heat.
- .3        Design enclosures to withstand wind pressure and snow loading.

**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 reuse and 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 REFERENCES**

- .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 Keep sand, when used for grout or mortar materials, clean and dry. Store sand on wooden platforms and cover with waterproof tarpaulins during inclement weather.
- .6 Store sheet materials and lumber on flat, solid supports and keep clear of ground. Slope to shed moisture.
- .7 Store and mix paints in heated and ventilated room. Remove oily rags and other combustible debris from site daily. Take every precaution necessary to prevent spontaneous combustion.
- .8 Remove and replace damaged products at own expense and to satisfaction of Departmental Representative.
- .9 Touch-up damaged factory finished surfaces to Departmental Representative's satisfaction. Use touch-up materials to match original. Do not paint over name plates.

#### **1.5 TRANSPORTATION**

- .1 Pay costs of transportation of products required in performance of Work.
- .2 Transportation cost of products supplied by Owner will be paid for by Departmental Representative. Unload, handle and store such products.

#### **1.6 MANUFACTURER'S INSTRUCTIONS**

- .1 Unless otherwise indicated in specifications, install or erect products in accordance with manufacturer's instructions. Do not rely on labels or enclosures provided with products. Obtain written instructions directly from manufacturers.
- .2 Notify Departmental Representative in writing, of conflicts between specifications and manufacturer's instructions, so that Departmental Representative will establish course of action.
- .3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes Departmental Representative to require removal and re-installation at no increase in Contract Price or Contract Time.

#### **1.7 QUALITY OF WORK**

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

- .2 Do not employ anyone unskilled in their required duties. Departmental Representative reserves right to require dismissal from site, workers deemed incompetent or careless.
- .3 Decisions as to standard or fitness of Quality of Work in cases of dispute rest solely with Departmental Representative, whose decision is final.

#### **1.8 CO-ORDINATION**

- .1 Ensure co-operation of workers in laying out Work. Maintain efficient and continuous supervision.
- .2 Be responsible for coordination and placement of openings, sleeves and accessories.

#### **1.9 CONCEALMENT**

- .1 In finished areas conceal pipes, ducts and wiring in floors, walls and ceilings, except where indicated otherwise.
- .2 Before installation inform Departmental Representative if there is interference. Install as directed by Departmental Representative.

#### **1.10 REMEDIAL WORK**

- .1 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.
- .2 Perform remedial work by specialists familiar with materials affected. Perform in a manner to neither damage nor put at risk any portion of Work.

#### **1.11 LOCATION OF FIXTURES**

- .1 Consider location of fixtures, outlets, and mechanical and electrical items indicated as approximate.
- .2 Inform Departmental Representative of conflicting installation. Install as directed.

#### **1.12 FASTENINGS**

- .1 Provide metal fastenings and accessories in same texture, colour and finish as adjacent materials, unless indicated otherwise.
- .2 Prevent electrolytic action between dissimilar metals and materials.
- .3 Use non-corrosive hot dip galvanized steel fasteners and anchors for securing exterior work, unless stainless steel or other material is specifically requested in affected specification Section.
- .4 Space anchors within individual load limit or shear capacity and ensure they provide positive permanent anchorage. Wood, or any other organic material plugs are not acceptable.
- .5 Keep exposed fastenings to a minimum, space evenly and install neatly.
- .6 Fastenings which cause spalling or cracking of material to which anchorage is made are not acceptable.

**1.13 FASTENINGS - EQUIPMENT**

- .1 Use fastenings of standard commercial sizes and patterns with material and finish suitable for service.
- .2 Use heavy hexagon heads, semi-finished unless otherwise specified. Use No. 304 stainless steel for exterior areas.
- .3 Bolts may not project more than one diameter beyond nuts.
- .4 Use plain type washers on equipment, sheet metal and soft gasket lock type washers where vibrations occur. Use resilient washers with stainless steel.

**1.14 PROTECTION OF WORK IN PROGRESS**

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

**1.15 EXISTING UTILITIES**

- .1 When breaking into or connecting to existing services or utilities, execute Work at times directed by local governing authorities, with minimum of disturbance to Work, and/or building occupants and pedestrian and vehicular traffic.
- .2 Protect, relocate or maintain existing active services. When services are encountered, cap off in manner approved by authority having jurisdiction. Stake and record location of capped service.

**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                EXISTING SERVICES**

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

**1.2                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.

**1.3                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.

**1.4                ACTION AND INFORMATIONAL SUBMITTALS**

- .1        On request of Departmental Representative, submit documentation to verify accuracy of field engineering 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            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 Remove samples of installed Work for testing.
- .6 Provide openings in non-structural elements of Work for penetrations of mechanical and electrical Work.
- .7 Execute Work by methods to avoid damage to other Work, and which will provide proper surfaces to receive patching and finishing.
- .8 Employ original installer to perform cutting and patching for weather-exposed and moisture-resistant elements, and sight-exposed surfaces.
- .9 Cut rigid materials using masonry saw or core drill. Pneumatic or impact tools not allowed on masonry work without prior approval.
- .10 Restore work with new products in accordance with requirements of Contract Documents.
- .11 Fit Work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- .12 At penetration of fire rated wall, ceiling, or floor construction, completely seal voids with firestopping material in accordance with Section 07 84 00 - Firestopping , full thickness of the construction element.
- .13 Refinish surfaces to match adjacent finishes: Refinish continuous surfaces to nearest intersection. Refinish assemblies by refinishing entire unit.
- .14 Conceal pipes, ducts and wiring in floor, wall and ceiling construction of finished areas except where indicated otherwise.

## **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, including 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, unless approved by Departmental Representative.
- .3      Clear snow and ice from access to building construction area, bank/pile snow in designated areas only.
- .4      Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .5      Provide on-site containers for collection of waste materials and debris.
- .6      Provide and use marked separate bins for recycling. Refer to Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .7      Dispose of waste materials and debris at dumping areas off site.
- .8      Clean interior areas prior to start of finishing work, and maintain areas free of dust and other contaminants during finishing operations.
- .9      Store volatile waste in covered metal containers, and remove from premises at end of each working day.
- .10     Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.
- .11     Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.
- .12     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            SUBSTANTIAL PERFORMANCE CLEANING**

- .1      Prior to Substantial Performance, ensure Work is cleaned to ensure proper review can be conducted by Departmental Representative and Contractor.
- .2      Remove waste products and debris other than that caused by Owner.
- .3      Remove waste materials from site at regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site.
- .4      Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .5      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.

- .6 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, walls and floors.
- .7 Clean lighting reflectors, lenses, and other lighting surfaces.
- .8 Vacuum clean and dust building interiors, behind grilles, louvres and screens.
- .9 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.
- .10 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.
- .11 Remove dirt and other disfiguration from exterior surfaces.
- .12 Clean and sweep roofs, gutters, areaways, and sunken wells.
- .13 Sweep and wash clean paved areas.
- .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 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.
- .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 and floors.
- .9 Clean lighting reflectors, lenses, and other lighting surfaces.
- .10 Vacuum clean and dust building interiors, behind grilles, louvres and screens.
- .11 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.

- .12 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.
- .13 Remove dirt and other disfiguration from exterior surfaces.
- .14 Clean and sweep roofs, gutters, areaways, and sunken wells.
- .15 Sweep and wash clean paved areas.
- .16 Clean equipment and fixtures to sanitary condition; clean or replace filters of mechanical equipment.
- .17 Clean roofs, downspouts, and drainage systems.
- .18 Remove debris and surplus materials from crawl areas and other accessible concealed spaces.
- .19 Remove snow and ice from access to building.

**1.4 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            REFERENCES**

.1        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.

## **1.2 DOCUMENTS**

- .1 Post and maintain in visible and accessible area at job site, one copy of following documents:
  - .1 Waste Source Separation Program.

## **1.3 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 1electronic copy of Waste Source Separation Program (WSSP).

## **1.4 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 contractor, sub-contractors 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 sub-contractors 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.

## **1.5 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.

## **1.6 WASTE PROCESSING SITES**

- .1 Contractor is responsible to research and locate waste diversion resources and service providers. Salvaged materials are to be transported off site to approved and/or authorized recycling facilities or to users of material for recycling.

## **1.7 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 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 surface drainage, 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.



## **1.8 DISPOSAL OF WASTES**

- .1 Do not bury rubbish or waste materials.
- .2 Do not dispose of waste, 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.

## **1.9 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 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 salvaged materials is not permitted.

### **3.4 CANADIAN GOVERNMENTAL DEPARTMENTS CHIEF RESPONSIBILITY FOR THE ENVIRONMENT**

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

Province	Address	General Inquires	Fax
Alberta	Alberta Environmental Protection Petroleum Plaza, South Tower 9915 - 108 th Street Edmonton AB T5K 2G8	403-427-2739	
	Alberta Special Waste Management Corporation Pacific Plaza, Suite 610 10909 Jasper Avenue NW Edmonton AB T5J 3L9	403-422-5029	403-428-9627

**END OF SECTION**

**Part 1            General**

**1.1            ADMINISTRATIVE REQUIREMENTS**

- .1    Acceptance of Work Procedures:
  - .1    Contractor's Inspection: Contractor: conduct inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents.
    - .1    Notify Departmental Representative in writing of satisfactory completion of Contractor's inspection and submit verification that corrections have been made.
    - .2    Request Departmental Representative review.
  - .2    Departmental Representative Review:
    - .1    Departmental Representative and Contractor to review Work and identify defects and deficiencies.
    - .2    Contractor to correct Work as directed.
  - .3    Completion Tasks: submit written certificates in English that tasks have been performed as follows:
    - .1    Work: completed and inspected for compliance with Contract Documents.
    - .2    Defects: corrected and deficiencies completed.
    - .3    Equipment and systems: tested, adjusted, balanced and fully operational.
    - .4    Certificates required by Fire Commissioner and Utility companies: submitted.
    - .5    Operation of systems: demonstrated to Owner's personnel.
    - .6    Commissioning of mechanical systems: completed in accordance with 01 91 13 - General Commissioning (Cx) Requirements and copies of final Commissioning Report submitted to Departmental Representative.
    - .7    Work: complete and ready for final review.
  - .4    Final Review:
    - .1    When completion tasks are done, request final review of Work by Departmental Representative, and Contractor.
    - .2    When Work is incomplete according to Departmental Representative, complete outstanding items and request re-review.
  - .5    Declaration of Substantial Performance: when Departmental Representative considers deficiencies and defects corrected and requirements of Contract substantially performed, make application for Certificate of Substantial Performance.
  - .6    Commencement of Lien and Warranty Periods: date of Owner's acceptance of submitted declaration of Substantial Performance to be date for commencement for warranty period and commencement of lien period unless required otherwise by lien statute of Place of Work.
  - .7    Final Payment:

- .1 When Departmental Representative considers final deficiencies and defects corrected and requirements of Contract met, make application for final payment.
- .8 Payment of Holdback: after issuance of Certificate of Substantial Performance of Work, submit application for payment of holdback amount in accordance with contractual agreement.

**1.2 FINAL CLEANING**

- .1 Clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.
- .2 Waste Management: 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 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 and manufacturer's installation instructions.
  - .2 Departmental Representative to establish communication procedures for:
    - .1 Notifying construction warranty defects.
    - .2 Determine priorities for type of defects.
    - .3 Determine reasonable response time.
  - .3 Contact information for bonded and licensed company for warranty work action: provide name, telephone number and address of company authorized for construction warranty work action.
  - .4 Ensure contact is located within local service area of warranted construction, is continuously available, and is responsive to inquiries for warranty work action.

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Two weeks prior to Substantial Performance of the Work, submit to the Departmental Representative, 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.

**1.3 FORMAT**

- .1 Organize data as instructional manual.
- .2 Binders: vinyl, hard covered, 3 'D' ring, loose leaf 219 x 279 mm with spine and face pockets.
- .3 When multiple binders are used correlate data into related consistent groupings.
  - .1 Identify contents of each binder on spine.
- .4 Cover: identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.
- .5 Arrange content by systems, process flow, 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.

#### **1.4 CONTENTS - PROJECT RECORD DOCUMENTS**

- .1 Table of Contents for Each Volume: provide title of project;
  - .1 Date of submission; names.
  - .2 Addresses, and telephone numbers of Consultant and Contractor with name of responsible parties.
  - .3 Schedule of products and systems, indexed to content of volume.
- .2 For each product or system:
  - .1 List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.
- .3 Product Data: mark each sheet to identify specific products and component parts, and data applicable to installation; delete inapplicable information.
- .4 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.
- .5 Typewritten Text: as required to supplement product data.
  - .1 Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 01 45 00 - Quality Control.

#### **1.5 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.

## **1.6 RECORDING INFORMATION ON PROJECT RECORD DOCUMENTS**

- .1 Record information on set of black line opaque drawings, and in copy of Project Manual.
- .2 Use felt tip marking pens, maintaining separate colours for each major system, for recording information.
- .3 Record information concurrently with construction progress.
  - .1 Do not conceal Work until required information is recorded.
- .4 Contract Drawings and shop drawings: mark each item to record actual construction, including:
  - .1 Measured depths of elements of foundation in relation to finish first floor datum.
  - .2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
  - .3 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.
  - .4 Field changes of dimension and detail.
  - .5 Changes made by change orders.
  - .6 Details not on original Contract Drawings.
  - .7 References to related shop drawings and modifications.
- .5 Specifications: mark each item to record actual construction, including:
  - .1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.
  - .2 Changes made by Addenda and change orders.
- .6 Other Documents: maintain manufacturer's certifications, inspection certifications, field test records, required by individual specifications sections.
- .7 Provide digital photos, if requested, for site records.

## **1.7 EQUIPMENT AND SYSTEMS**

- .1 For each item of equipment and each system include description of unit or system, and component parts.
  - .1 Give function, normal operation characteristics and limiting conditions.
  - .2 Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.
- .2 Panel board circuit directories: provide electrical service characteristics, controls, and communications.
- .3 Include installed colour coded wiring diagrams.
- .4 Operating Procedures: include start-up, break-in, and routine normal operating instructions and sequences.

- .1 Include regulation, control, stopping, shut-down, and emergency instructions.
- .2 Include summer, winter, and any special operating instructions.
- .5 Maintenance Requirements: include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- .6 Provide servicing and lubrication schedule, and list of lubricants required.
- .7 Include manufacturer's printed operation and maintenance instructions.
- .8 Include sequence of operation by controls manufacturer.
- .9 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- .10 Provide installed control diagrams by controls manufacturer.
- .11 Provide Contractor's co-ordination drawings, with installed colour coded piping diagrams.
- .12 Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- .13 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- .14 Include test and balancing reports as specified in Section 01 45 00 - Quality Control 01 91 13 - General Commissioning (Cx) Requirements.
- .15 Additional requirements: as specified in individual specification sections.

## **1.8 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.

## **1.9 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 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 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.
- .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 site; place and store.
  - .4 Receive and catalogue items.
    - .1 Submit inventory listing to Departmental Representative.
    - .2 Include approved listings in Maintenance Manual.

#### **1.10 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.

#### **1.11 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 9 month warranty inspection, measured from time of acceptance, by Departmental Representative.
- .9 Include information contained in warranty management plan as follows:
  - .1 Roles and responsibilities of personnel associated with warranty process, including points of contact and telephone numbers within the organizations of Contractors, subcontractors, manufacturers or suppliers involved.
  - .2 Listing and status of delivery of Certificates of Warranty for extended warranty items, to include roofs, HVAC balancing, commissioned systems, lightning protection systems.
  - .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 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.

**1.12 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 SUMMARY**

- .1 Section Includes:
  - .1 General requirements relating to commissioning of project's components and systems, specifying general requirements to PV of components, equipment, sub-systems, systems, and integrated systems.
- .2 Acronyms:
  - .1 AFD - Alternate Forms of Delivery, service provider.
  - .2 BMM - Building Management Manual.
  - .3 Cx - Commissioning.
  - .4 EMCS - Energy Monitoring and Control Systems.
  - .5 O M - Operation and Maintenance.
  - .6 PI - Product Information.
  - .7 PV - Performance Verification.
  - .8 TAB - Testing, Adjusting and Balancing.

### **1.2 GENERAL**

- .1 Cx is a planned program of tests, procedures and checks carried out systematically on systems and integrated systems of the finished Project. Cx is performed after systems and integrated systems are completely installed, functional and Contractor's Performance Verification responsibilities have been completed and approved. Objectives:
  - .1 Verify installed equipment, systems and integrated systems operate in accordance with contract documents and design criteria and intent.
  - .2 Ensure appropriate documentation is compiled into the BMM.
  - .3 Effectively train O M staff.
- .2 Contractor assists in Cx process, operating equipment and systems, troubleshooting and making adjustments as required.
  - .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 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.
- .3 Design Criteria: as per client's requirements or determined by designer. To meet Project functional and operational requirements.

### **1.3 COMMISSIONING OVERVIEW**

- .1 Section 01 91 31 - Commissioning (Cx) Plan.
- .2 For Cx responsibilities refer to Section 01 91 31 - Commissioning (Cx) Plan.

- .3 Cx to be a line item of Contractor's cost breakdown by discipline.
- .4 Cx activities supplement field quality and testing procedures described in relevant technical sections.
- .5 Cx is conducted in concert with activities performed during stage of project delivery. Cx identifies issues in Planning and Design stages which are addressed during Construction and Cx stages to ensure the built facility is constructed and proven to operate satisfactorily under weather, environmental and occupancy conditions to meet functional and operational requirements. Cx activities includes transfer of critical knowledge to facility operational personnel.
- .6 Departmental Representative will issue Interim Acceptance Certificate when:
  - .1 Completed Cx documentation has been received, reviewed for suitability and approved by Departmental Representative.
  - .2 Equipment, components and systems have been commissioned.
  - .3 O M training has been completed.

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

- .1 Should equipment, system components, and associated controls be incorrectly installed or malfunction during Cx, correct deficiencies, re-verify equipment and components within the unfunctional system, including related systems as deemed required by Departmental Representative to ensure effective performance.
- .2 Costs for corrective work, additional tests, inspections, to determine acceptability and proper performance of such items to be borne by Contractor. Above costs to be in form of progress payment reductions or hold-back assessments.

#### **1.5 PRE-CX REVIEW**

- .1 Before Construction:
  - .1 Review contract documents, confirm by writing to Departmental Representative.
    - .1 Adequacy of provisions for Cx.
    - .2 Aspects of design and installation pertinent to success of Cx.
- .2 During Construction:
  - .1 Co-ordinate provision, location and installation of provisions for Cx.
- .3 Before start of Cx:
  - .1 Have completed Cx Plan up-to-date.
  - .2 Ensure installation of related components, equipment, sub-systems, systems is complete.
  - .3 Fully understand Cx requirements and procedures.
  - .4 Have Cx documentation shelf-ready.
  - .5 Understand completely design criteria and intent and special features.
  - .6 Submit complete start-up documentation to Departmental Representative.
  - .7 Have Cx schedules up-to-date.

- .8 Ensure systems have been cleaned thoroughly.
- .9 Complete TAB procedures on systems, submit TAB reports to Departmental Representative for review and approval.
- .10 Ensure "As-Built" system schematics are available.
- .4 Inform Departmental Representative in writing of discrepancies and deficiencies on finished works.

## **1.6 CONFLICTS**

- .1 Report conflicts between requirements of this section and other sections to Departmental Representative before start-up and obtain clarification.
- .2 Failure to report conflict and obtain clarification will result in application of most stringent requirement.

## **1.7 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
  - .1 Submit no later than 4 weeks after award of Contract:
    - .1 Name of Contractor's Cx agent.
    - .2 Draft Cx documentation.
    - .3 Preliminary Cx schedule.
  - .2 Request in writing to Departmental Representative for changes to submittals and obtain written approval at least 8 weeks prior to start of Cx.
  - .3 Submit proposed Cx procedures to Departmental Representative where not specified and obtain written approval at least 8 weeks prior to start of Cx.
  - .4 Provide additional documentation relating to Cx process required by Departmental Representative.

## **1.8 COMMISSIONING DOCUMENTATION**

- .1 Refer to Section 01 91 33 - Commissioning (Cx) Forms: Installation Check Lists and Product Information (PI) / Performance Verification (PV) Forms for requirements and instructions for use.
- .2 Departmental Representative to review and approve Cx documentation.
- .3 Provide completed and approved Cx documentation to Departmental Representative.

## **1.9 COMMISSIONING SCHEDULE**

- .1 Provide detailed Cx schedule as part of construction schedule in accordance with Section 01 32 16.06 - Construction Progress Schedule - Critical Path Method (CPM), 01 32 16.07 - Construction Progress Schedules - Bar (GANTT) Chart.
- .2 Provide adequate time for Cx activities prescribed in technical sections and commissioning sections including:
  - .1 Approval of Cx reports.
  - .2 Verification of reported results.
  - .3 Repairs, retesting, re-commissioning, re-verification.

.4 Training.

#### **1.10 COMMISSIONING MEETINGS**

- .1 Convene Cx meetings following project meetings: Section 01 32 16.06 - Construction Progress Schedule - Critical Path Method (CPM), 01 32 16.07 - Construction Progress Schedules - Bar (GANTT) Chart and as specified herein.
- .2 Purpose: to resolve issues, monitor progress, identify deficiencies, relating to Cx.
- .3 Continue Cx meetings on regular basis until commissioning deliverables have been addressed.
- .4 At 60% construction completion stage. Section 01 32 16.06 - Construction Progress Schedule - Critical Path Method (CPM), 01 32 16.07 - Construction Progress Schedules - Bar (GANTT) Chart. Departmental Representative to call a separate Cx scope meeting to review progress, discuss schedule of equipment start-up activities and prepare for Cx. Issues at meeting to include:
  - .1 Review duties and responsibilities of Contractor and subcontractors, addressing delays and potential problems.
  - .2 Determine the degree of involvement of trades and manufacturer's representatives in the commissioning process.
- .5 Thereafter Cx meetings to be held until project completion and as required during equipment start-up and functional testing period.
- .6 Meeting will be chaired by Departmental Representative, who will record and distribute minutes.
- .7 Ensure subcontractors and relevant manufacturer representatives are present at 60% and subsequent Cx meetings and as required.

#### **1.11 STARTING AND TESTING**

- .1 Contractor assumes liabilities and costs for inspections. Including disassembly and re-assembly after approval, starting, testing and adjusting, including supply of testing equipment.

#### **1.12 WITNESSING OF STARTING AND TESTING**

- .1 Provide 14 days notice prior to commencement.
- .2 Departmental Representative to witness of start-up and testing.
- .3 Contractor's Cx Agent to be present at tests performed and documented by sub-trades, suppliers and equipment manufacturers.

#### **1.13 MANUFACTURER'S INVOLVEMENT**

- .1 Factory testing: manufacturer to:
  - .1 Coordinate time and location of testing.
  - .2 Provide testing documentation for approval by Departmental Representative.
  - .3 Arrange for Departmental Representative to witness tests.

- .4 Obtain written approval of test results and documentation from Departmental Representative before delivery to site.
- .2 Obtain manufacturers installation, start-up and operations instructions prior to start-up of components, equipment and systems and review with Departmental Representative.
  - .1 Compare completed installation with manufacturer's published data, record discrepancies, and review with manufacturer.
  - .2 Modify procedures detrimental to equipment performance and review same with manufacturer before start-up.
- .3 Integrity of warranties:
  - .1 Use manufacturer's trained start-up personnel where specified elsewhere in other divisions or required to maintain integrity of warranty.
  - .2 Verify with manufacturer that testing as specified will not void warranties.
- .4 Qualifications of manufacturer's personnel:
  - .1 Experienced in design, installation and operation of equipment and systems.
  - .2 Ability to interpret test results accurately.
  - .3 To report results in clear, concise, logical manner.

#### **1.14 PROCEDURES**

- .1 Verify that equipment and systems are complete, clean, and operating in normal and safe manner prior to conducting start-up, testing and Cx.
- .2 Conduct start-up and testing in following distinct phases:
  - .1 Included in delivery and installation:
    - .1 Verification of conformity to specification, approved shop drawings and completion of PI report forms.
    - .2 Visual inspection of quality of installation.
  - .2 Start-up: follow accepted start-up procedures.
  - .3 Operational testing: document equipment performance.
  - .4 System PV: include repetition of tests after correcting deficiencies.
  - .5 Post-substantial performance verification: to include fine-tuning.
- .3 Correct deficiencies and obtain approval from Departmental Representative after distinct phases have been completed and before commencing next phase.
- .4 Document require tests on approved PV forms.
- .5 Failure to follow accepted start-up procedures will result in re-evaluation of equipment by an independent testing agency selected by Departmental Representative. If results reveal that equipment start-up was not in accordance with requirements, and resulted in damage to equipment, implement following:
  - .1 Minor equipment/systems: implement corrective measures approved by Departmental Representative.
  - .2 Major equipment/systems: if evaluation report concludes that damage is minor, implement corrective measures approved by Departmental Representative.



- .3 If evaluation report concludes that major damage has occurred, Departmental Representative shall reject equipment.
  - .1 Rejected equipment to be removed from site and replace with new.
  - .2 Subject new equipment/systems to specified start-up procedures.

#### **1.15 START-UP DOCUMENTATION**

- .1 Assemble start-up documentation and submit to Departmental Representative for approval before commencement of commissioning.
- .2 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 Departmental Representative to repeat start-up at any time.

#### **1.16 OPERATION AND MAINTENANCE OF EQUIPMENT AND SYSTEMS**

- .1 After start-up, operate and maintain equipment and systems as directed by equipment/system manufacturer.
- .2 With assistance of manufacturer develop written maintenance program and submit Departmental Representative for approval before implementation.
- .3 Operate and maintain systems for length of time required for commissioning to be completed.
- .4 After completion of commissioning, operate and maintain systems until issuance of certificate of interim acceptance.

#### **1.17 TEST RESULTS**

- .1 If start-up, testing and/or PV produce unacceptable results, repair, replace or repeat specified starting and/or PV procedures until acceptable results are achieved.
- .2 Provide manpower and materials, assume costs for re-commissioning.

#### **1.18 START OF COMMISSIONING**

- .1 Notify Departmental Representative at least 21 days prior to start of Cx.
- .2 Start Cx after elements of building affecting start-up and performance verification of systems have been completed.

#### **1.19 INSTRUMENTS / EQUIPMENT**

- .1 Submit to Departmental Representative for review and approval:
  - .1 Complete list of instruments proposed to be used.
  - .2 Listed data including, serial number, current calibration certificate, calibration date, calibration expiry date and calibration accuracy.
- .2 Provide the following equipment as required:

- .1 2-way radios.
- .2 Ladders.
- .3 Equipment as required to complete work.

#### **1.20 COMMISSIONING PERFORMANCE VERIFICATION**

- .1 Carry out Cx:
  - .1 Under accepted simulated operating conditions, over entire operating range, in all modes.
  - .2 On independent systems and interacting systems.
- .2 Cx procedures to be repeatable and reported results are to be verifiable.
- .3 Follow equipment manufacturer's operating instructions.
- .4 EMCS trending to be available as supporting documentation for performance verification.

#### **1.21 WITNESSING COMMISSIONING**

- .1 Departmental Representative to witness activities and verify results.

#### **1.22 AUTHORITIES HAVING JURISDICTION**

- .1 Where specified start-up, testing or commissioning procedures duplicate verification requirements of authority having jurisdiction, arrange for authority 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 Departmental Representative within 5 days of test and with Cx report.

#### **1.23 COMMISSIONING CONSTRAINTS**

- .1 It is necessary to complete Cx of occupancy, weather, and seasonal sensitive equipment and systems before issuance of the Interim Certificate, using, if necessary, simulated thermal loads.

#### **1.24 EXTRAPOLATION OF RESULTS**

- .1 Where Cx of weather, occupancy, or seasonal-sensitive equipment or systems cannot be conducted under near-rated or near-design conditions, extrapolate part-load results to design conditions when approved by Departmental Representative in accordance with equipment manufacturer's instructions, using manufacturer's data, with manufacturer's assistance and using approved formulae.

#### **1.25 EXTENT OF VERIFICATION**

- .1 Laboratory areas:
  - .1 Provide manpower and instrumentation to verify up to 100 % of reported results.
- .2 Elsewhere:

- .1 Provide manpower and instrumentation to verify up to 30 % of reported results, unless specified otherwise in other sections.
- .3 Number and location to be at discretion of Departmental Representative.
- .4 Conduct tests repeated during verification under same conditions as original tests, using same test equipment, instrumentation.
- .5 Review and repeat commissioning of systems if inconsistencies found in more than 20% of reported results.
- .6 Perform additional commissioning until results are acceptable to Departmental Representative.

#### **1.26 REPEAT VERIFICATIONS**

- .1 Assume costs incurred by Departmental Representative for third and subsequent verifications where:
  - .1 Verification of reported results fail to receive Departmental Representative's approval.
  - .2 Repetition of second verification again fails to receive approval.
  - .3 Departmental Representative deems Contractor's request for second verification was premature.

#### **1.27 SUNDRY CHECKS AND ADJUSTMENTS**

- .1 Make adjustments and changes which become apparent as Cx proceeds.
- .2 Perform static and operational checks as applicable and as required.

#### **1.28 DEFICIENCIES, FAULTS, DEFECTS**

- .1 Correct deficiencies found during start-up and Cx to satisfaction of Departmental Representative.
- .2 Report problems, faults or defects affecting Cx to Departmental Representative in writing. Stop Cx until problems are rectified. Proceed with written approval from Departmental Representative.

#### **1.29 COMPLETION OF COMMISSIONING**

- .1 Upon completion of Cx leave systems in normal operating mode.
- .2 Except for warranty and seasonal verification activities specified in Cx specifications, complete Cx prior to issuance of Interim Certificate of Completion.
- .3 Cx to be considered complete when contract Cx deliverables have been submitted and accepted by Departmental Representative.

#### **1.30 ACTIVITIES UPON COMPLETION OF COMMISSIONING**

- .1 When changes are made to baseline components or system settings established during Cx process, provide updated Cx form for affected item.

**1.31 TRAINING**

- .1 In accordance with Section 01 91 41 - Commissioning (Cx) - Training.

**1.32 MAINTENANCE MATERIALS, SPARE PARTS, SPECIAL TOOLS**

- .1 Supply, deliver, and document maintenance materials, spare parts, and special tools as specified in contract.

**1.33 OCCUPANCY**

- .1 Cooperate fully with Departmental Representative during stages of acceptance and occupancy of facility.

**1.34 INSTALLED INSTRUMENTATION**

- .1 Use instruments installed under Contract for TAB and PV if:
  - .1 Accuracy complies with these specifications.
  - .2 Calibration certificates have been deposited with Departmental Representative.
- .2 Calibrated EMCS sensors may be used to obtain performance data provided that sensor calibration has been completed and accepted.

**1.35 PERFORMANCE VERIFICATION TOLERANCES**

- .1 Application tolerances:
  - .1 Specified range of acceptable deviations of measured values from specified values or specified design criteria. Except for special areas, to be within +/- 10% of specified values.
- .2 Instrument accuracy tolerances:
  - .1 To be of higher order of magnitude than equipment or system being tested.
- .3 Measurement tolerances during verification:
  - .1 Unless otherwise specified actual values to be within +/- 2% of recorded values.

**1.36 OWNER'S PERFORMANCE TESTING**

- .1 Performance testing of equipment or system by Departmental Representative will not relieve Contractor from compliance with specified start-up and testing procedures.

**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    Description of overall structure of Cx Plan and roles and responsibilities of Cx team.

### **1.2            REFERENCES**

- .1    American Water Works Association (AWWA)
- .2    National Fire Protection Association (NFPA)
  - .1    NFPA-13, Installation of Sprinkler Systems Handbook.
  - .2    NFPA-14, Automatic Sprinkler Systems Handbook.
  - .3    NFPA-20, Standard for the Installation of Stationary Fire Pumps for Fire Protection.
- .3    Public Works and Government Services Canada (PWGSC)
  - .1    PWGSC - Commissioning Guidelines, 3rd edition.
- .4    Underwriters' Laboratories of Canada (ULC)
- .5    CSA Z320-11 – Building Commissioning

### **1.3            GENERAL**

- .1    Provide a fully functional facility:
  - .1    Systems, equipment and components meet user's functional requirements before date of acceptance, and operate consistently at peak efficiencies and within specified energy budgets under normal loads.
  - .2    Facility user and O M personnel have been fully trained in aspects of installed systems.
  - .3    Optimized life cycle costs.
  - .4    Complete documentation relating to installed equipment and systems.
- .2    Term "Cx" in this section means "Commissioning".
- .3    Use this Cx Plan as master planning document for Cx:
  - .1    Outlines organization, scheduling, allocation of resources, documentation, pertaining to implementation of Cx.
  - .2    Communicates responsibilities of team members involved in Cx Scheduling, documentation requirements, and verification procedures.
  - .3    Sets out deliverables relating to O M, process and administration of Cx.
  - .4    Describes process of verification of how built works meet Owner requirements.
  - .5    Produces a complete functional system prior to issuance of Certificate of Occupancy.

- .6 Management tool that sets out scope, standards, roles and responsibilities, expectations, deliverables, and provides:
  - .1 Overview of Cx.
  - .2 General description of elements that make up Cx Plan.
  - .3 Process and methodology for successful Cx.
- .4 Acronyms:
  - .1 Cx - Commissioning.
  - .2 BMM - Building Management Manual.
  - .3 EMCS - Energy Monitoring and Control Systems.
  - .4 MSDS - Material Safety Data Sheets.
  - .5 PI - Product Information.
  - .6 PV - Performance Verification.
  - .7 TAB - Testing, Adjusting and Balancing.
  - .8 WHMIS - Workplace Hazardous Materials Information System.
- .5 Commissioning terms used in this Section:
  - .1 Bumping: short term start-up to prove ability to start and prove correct rotation.
  - .2 Deferred Cx - Cx activities delayed for reasons beyond Contractor's control due to lack of occupancy, weather conditions, need for heating/cooling loads.

#### **1.4 DEVELOPMENT OF 100% CX PLAN**

- .1 Cx Plan to be 95% completed by the Departmental Representative and Transmit to Contractor.
- .2 Cx Plan to be 100% completed within 8 weeks of award of contract to take into account:
  - .1 Approved shop drawings and product data.
  - .2 Approved changes to contract.
  - .3 Contractor's project schedule.
  - .4 Cx schedule.
  - .5 Contractor's, sub-contractor's, suppliers' requirements.
  - .6 Project construction team's and Cx team's requirements.
- .3 Submit 100% completed Cx Plan to Departmental Representative and obtain written approval.

#### **1.5 REFINEMENT OF CX PLAN**

- .1 During construction phase, revise, refine and update Cx Plan to include:
  - .1 Changes resulting from Client program modifications.
  - .2 Approved design and construction changes.
- .2 Revise, refine and update every 6 weeks during construction phase. At each revision, indicate revision number and date.
- .3 Submit each revised Cx Plan to Departmental Representative for review and obtain written approval.

- .4 Include testing parameters at full range of operating conditions and check responses of equipment and systems.

## **1.6 COMPOSITION, ROLES AND RESPONSIBILITIES OF CX TEAM**

- .1 Departmental Representative to maintain overall responsibility for project and is sole point of contact between members of commissioning team.
- .2 Project Manager will select Cx Team consisting of following members:
  - .1 PWGSC Design Quality Review Team: during construction, will conduct periodic site reviews to observe general progress.
  - .2 PWGSC Quality Assurance Commissioning Manager: ensures Cx processes, Cx forms and checklists are developed by the Departmental Representative to deliver a fully operational project, including:
    - .1 Review of Cx documentation from operational perspective.
    - .2 Review for performance, reliability, durability of operation, accessibility, maintainability, operational efficiency under conditions of operation.
    - .3 Protection of health, safety and comfort of occupants and O M personnel.
  - .3 Departmental Representative is responsible for:
    - .1 Organizing Cx.
    - .2 Monitoring operations Cx activities.
    - .3 Witnessing, certifying accuracy of reported results.
    - .4 Witnessing and certifying TAB and other tests.
    - .5 Developing BMM.
    - .6 Ensuring implementation of final Cx Plan.
    - .7 Performing verification of performance of installed systems and equipment.
    - .8 Implementation of Training Plan.
    - .9 Monitoring of Cx activities, training, development of Cx documentation.
    - .10 Work closely with members of Cx Team.
  - .4 Construction Team: contractor, sub-contractors, suppliers and support disciplines, is responsible for construction/installation in accordance with contract documents, including:
    - .1 Testing.
    - .2 TAB.
    - .3 Performance of Cx activities.
    - .4 Delivery of training and Cx documentation.
    - .5 Assigning one person as point of contact with Consultant and PWGSC Cx Manager for administrative and coordination purposes.
  - .5 Contractor's Cx agent implements specified Cx activities including:
    - .1 Demonstrations.
    - .2 Training.
    - .3 Testing.
    - .4 Preparation, submission of test reports.



- .6 Property Manager: represents lead role in Operation Phase and onwards and is responsible for:
  - .1 Receiving facility.
  - .2 Day-To-Day operation and maintenance of facility.

## **1.7 CX PARTICIPANTS**

- .1 Employ the following Cx participants to verify performance of equipment and systems:
  - .1 Installation contractor/subcontractor:
    - .1 Equipment and systems except as noted.
  - .2 Equipment manufacturer: equipment specified to be installed and started by manufacturer.
    - .1 To include performance verification.
  - .3 Specialist subcontractor: equipment and systems supplied and installed by specialist subcontractor.
  - .4 Specialist Cx agency:
    - .1 Possessing specialist qualifications and installations providing environments essential to client's program but are outside scope or expertise of Cx specialists on this project.
  - .5 Client: responsible for intrusion and access security systems.
  - .6 Ensure that Cx participant:
    - .1 Could complete work within scheduled time frame.
    - .2 Available for emergency and troubleshooting service during first year of occupancy by user for adjustments and modifications outside responsibility of O M personnel, including:
      - .1 Modify ventilation rates to meet changes in off-gassing.
      - .2 Redistribution of electrical services.
      - .3 Modifications of fire alarm systems.
  - .7 Provide names of participants to Departmental Representative and details of instruments and procedures to be followed for Cx 3 months prior to starting date of Cx for review and approval.

## **1.8 EXTENT OF CX**

- .1 Commission mechanical systems and associated equipment:
  - .1 Plumbing systems:
    - .1 Storm water systems.
  - .2 HVAC and exhaust systems:
    - .1 HVAC systems.
    - .2 General exhaust systems.
- .2 Commission electrical systems and equipment:
  - .1 Low voltage below 750 V:

- .1 Low voltage equipment.
- .2 Low voltage distribution systems.
- .2 Lighting systems:
  - .1 Lighting equipment.
  - .2 Emergency lighting systems, including battery packs.
  - .3 Fire exit emergency signage.
- .3 Fire alarm systems, equipment:
  - .1 Annunciators.
  - .2 Control panels.

## **1.9 DELIVERABLES RELATING TO O M PERSPECTIVES**

- .1 General requirements:
  - .1 Compile English documentation.
  - .2 Documentation to be computer-compatible format ready for inputting for data management.
- .2 Provide deliverables:
  - .1 Warranties.
  - .2 Project record documentation.
  - .3 Inventory of spare parts, special tools and maintenance materials.
  - .4 Maintenance Management System (MMS) identification system used.
  - .5 WHMIS information.
  - .6 MSDS data sheets.
  - .7 Electrical Panel inventory containing detailed inventory of electrical circuitry for each panel board. Duplicate of inventory inside each panel.
  - .8 As-built drawings

## **1.10 DELIVERABLES RELATING TO THE CX PROCESS**

- .1 General:
  - .1 Start-up, testing and Cx requirements, conditions for acceptance and specifications form part of relevant technical sections of these specifications.
- .2 Definitions:
  - .1 Cx as used in this section includes:
    - .1 Cx of components, equipment, systems, subsystems, and integrated systems.
    - .2 Factory inspections and performance verification tests.
- .3 Deliverables: provide:
  - .1 Cx Specifications.
  - .2 Startup, pre-Cx activities and documentation for systems, and equipment.
  - .3 Completed installation checklists (ICL).
  - .4 Completed product information (PI) report forms.

- .5 Completed performance verification (PV) report forms.
- .6 Results of Performance Verification Tests and Inspections.
- .7 Description of Cx activities and documentation.
- .8 Description of Cx of integrated systems and documentation.
- .9 Tests performed by Owner/User.
- .10 Training Plans.
- .11 Cx Reports.
- .12 Prescribed activities during warranty period.
- .4 Departmental Representative to witness and certify tests and reports of results provided to Departmental Representative.
- .5 Departmental Representative to participate.

#### **1.11 PRE-CX ACTIVITIES AND RELATED DOCUMENTATION**

- .1 Items listed in this Cx Plan include the following:
  - .1 Pre-Start-Up inspections: by Departmental Representative prior to permission to start up and rectification of deficiencies to Departmental Representative's satisfaction.
  - .2 Departmental Representative to use approved check lists.
  - .3 Departmental Representative will monitor some of these pre-start-up inspections.
  - .4 Include completed documentation with Cx report.
  - .5 Conduct pre-start-up tests: conduct pressure, static, flushing, cleaning, and "bumping" during construction as specified in technical sections. To be witnessed and certified by Departmental Representative and does not form part of Cx specifications.
  - .6 Departmental Representative will monitor some of these inspections and tests.
  - .7 Include completed documentation in Cx report.
- .2 Pre-Cx activities - MECHANICAL:
  - .1 Plumbing systems:
    - .1 "Bump" each item of equipment in its "stand-alone" mode.
    - .2 Complete pre-start-up checks and complete relevant documentation.
    - .3 After equipment has been started, test related systems in conjunction with control systems on a system-by-system basis.
  - .2 HVAC equipment and systems:
    - .1 "Bump" each item of equipment in its "stand-alone" mode.
    - .2 At this time, complete pre-start-up checks and complete relevant documentation.
    - .3 After equipment has been started, test related systems in conjunction with control systems on a system-by-system basis.
    - .4 Perform TAB on systems. TAB reports to be approved by Departmental Representative.
- .3 Pre-Cx activities - ELECTRICAL:

- .1 Low voltage distribution systems under 750 V:
  - .1 Requires independent testing agency to perform pre- energization and post-energization tests.
- .2 Lighting systems:
  - .1 Emergency lighting systems:
    - .1 Tests to include verification of lighting levels and coverage, initially by disrupting normal power.
- .3 Fire alarm systems: test after other safety and security systems are completed. Testing to include a complete verification in accordance with ULC requirements. Departmental Representative has witnessed and certified report, demonstrate devices and zones to Departmental Representative.

#### **1.12 START-UP**

- .1 Start up components, equipment and systems.
- .2 Departmental Representative to monitor some of these start-up activities.
  - .1 Rectify start-up deficiencies to satisfaction of Departmental Representative.
- .3 Performance Verification (PV):
  - .1 Approved Cx Agent to perform.
    - .1 Repeat when necessary until results are acceptable to Departmental Representative.
  - .2 Use procedures modified generic procedures to suit project requirements.
  - .3 Departmental Representative to witness and certify reported results using approved PI and PV forms.
  - .4 Departmental Representative to approve completed PV reports and provide to Departmental Representative.
  - .5 Departmental Representative reserves right to verify up to 30% of reported results at random.
  - .6 Failure of randomly selected item shall result in rejection of PV report or report of system startup and testing.

#### **1.13 CX ACTIVITIES AND RELATED DOCUMENTATION**

- .1 Perform Cx by specified Cx agency using procedures developed and approved by Departmental Representative.
- .2 Departmental Representative to monitor Cx activities.
- .3 Upon satisfactory completion, Cx agency performing tests to prepare Cx Report using approved PV forms.
- .4 Departmental Representative to witness, certify reported results of, Cx activities and forward to Departmental Representative.
- .5 Departmental Representative reserves right to verify a percentage of reported results at no cost to contract.

**1.14 CX OF INTEGRATED SYSTEMS AND RELATED DOCUMENTATION**

- .1 Cx to be performed by specified Cx specialist, using procedures developed and approved by Departmental Representative.
- .2 Tests to be witnessed by Departmental Representative and documented on approved report forms.
- .3 Upon satisfactory completion, Cx specialist to prepare Cx Report, to be certified by Departmental Representative and submitted to Departmental Representative for review.
- .4 Departmental Representative reserves right to verify percentage of reported results.
- .5 Integrated systems to include:
  - .1 HVAC and associated systems forming part of integrated HVAC system.
  - .2 Indoor air quality.
  - .3 Fire alarm systems.
  - .4 Emergency lighting systems.
  - .5 Roof drainage water system
- .6 Identification:
  - .1 In later stages of Cx, before hand-over and acceptance Departmental Representative, Contractor, and Cx Manager to co-operate to complete inventory data sheets and provide assistance to PWGSC in full implementation of MMS identification system of components, equipment, sub-systems, systems.

**1.15 INSTALLATION CHECK LISTS (ICL)**

- .1 Refer to Section 01 91 33 - Commissioning (Cx) Forms: Installation Check Lists and Product Information (PI) / Performance Verification (PV) Forms.

**1.16 PRODUCT INFORMATION (PI) REPORT FORMS**

- .1 Refer to Section 01 91 33 - Commissioning (Cx) Forms: Installation Check Lists and Product Information (PI) / Performance Verification (PV) Forms.

**1.17 PERFORMANCE VERIFICATION (PV) REPORT**

- .1 Refer to Section 01 91 33 - Commissioning (Cx) Forms: Installation Check Lists and Product Information (PI) / Performance Verification (PV) Forms.

**1.18 DELIVERABLES RELATING TO ADMINISTRATION OF CX**

- .1 General:
  - .1 Because of risk assessment, complete Cx of occupancy, weather and seasonal-sensitive equipment and systems in these areas before building is occupied.

**1.19 CX SCHEDULES**

- .1 Prepare detailed [critical path] Cx Schedule and submit to Departmental Representative for review and approval same time as project Construction Schedule. Include:
  - .1 Milestones, testing, documentation, training and Cx activities of components, equipment, subsystems, systems and integrated systems, including:

- .1 Design criteria, design intents.
- .2 Pre-TAB review: 28 days after contract award, and before construction starts.
- .3 Cx agents' credentials: 60 days before start of Cx.
- .4 Cx procedures: 3 months after award of contract.
- .5 Cx Report format: 3 months after contract award.
- .6 Discussion of heating/cooling loads for Cx: 3 months before start-up.
- .7 Submission of list of instrumentation with relevant certificates: 21 days before start of Cx.
- .8 Notification of intention to start TAB: 21 days before start of TAB.
- .9 TAB: after successful start-up, correction of deficiencies and verification of normal and safe operation.
- .10 Notification of intention to start Cx: 14 days before start of Cx.
- .11 Notification of intention to start Cx of integrated systems: after Cx of related systems is completed 14 days before start of integrated system Cx.
- .12 Identification of deferred Cx.
- .13 Implementation of training plans.
- .14 Cx of smoke management/control systems: after Cx of related systems is completed and 7 days before proposed date of Cx these systems.
- .15 Cx reports: immediately upon successful completion of Cx.
- .16 Emergency evacuation exercises: after 80% occupancy.
- .2 Detailed training schedule to demonstrate no conflicts with testing, completion of project and hand-over to Property Manager.
- .3 6 months in Cx schedule for verification of performance in all seasons and wear conditions.
- .2 After approval, incorporate Cx Schedule into Construction Schedule.
- .3 Consultant, Contractor, Contractor's Cx agent, and Departmental Representative will monitor progress of Cx against this schedule.

## **1.20 CX REPORTS**

- .1 Submit reports of tests, witnessed and certified by Departmental Representative to Departmental Representative who will verify reported results.
- .2 Include completed and certified PV reports in properly formatted Cx Reports.
- .3 Before reports are accepted, reported results to be subject to verification by Departmental Representative.

## **1.21 ACTIVITIES DURING WARRANTY PERIOD**

- .1 Cx activities must be completed before issuance of Interim Certificate, it is anticipated that certain Cx activities may be necessary during Warranty Period, including:
  - .1 Fine tuning of HVAC systems.

- .2 Adjustment of ventilation rates to promote good indoor air quality and reduce deleterious effects of VOCs generated by off-gassing from construction materials and furnishings.
- .3 Full-scale emergency evacuation exercises.

**1.22 TESTS TO BE PERFORMED BY OWNER/USER**

- .1 None is anticipated on this project.

**1.23 TRAINING PLANS**

- .1 Refer to Section 01 91 41 - Commissioning (Cx) - Training.

**1.24 FINAL SETTINGS**

- .1 Upon completion of Cx to satisfaction of Departmental Representative lock control devices in their final positions, indelibly mark settings marked and include in Cx Reports.

**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            Commissioning forms to be completed for equipment, system and integrated system.

**1.2                INSTALLATION/START-UP CHECK LISTS**

- .1        Include the following data:
  - .1            Product manufacturer's installation instructions and recommended checks.
  - .2            Special procedures as specified in relevant technical sections.
  - .3            Items considered good installation and engineering industry practices deemed appropriate for proper and efficient operation.
- .2        Equipment manufacturer's installation/start-up check lists are acceptable for use. As deemed necessary by Departmental Representative supplemental additional data lists will be required for specific project conditions.
- .3        Use check lists for equipment installation. Document check list verifying checks have been made, indicate deficiencies and corrective action taken.
- .4        Installer to sign check lists upon completion, certifying stated checks and inspections have been performed. Return completed check lists to Departmental Representative. Check lists will be required during Commissioning and will be included in Building Maintenance Manual (BMM) at completion of project.
- .5        Use of check lists will not be considered part of commissioning process but will be stringently used for equipment pre-start and start-up procedures.

**1.3                PRODUCT INFORMATION (PI) REPORT FORMS**

- .1        Product Information (PI) forms compiles gathered data on items of equipment produced by equipment manufacturer, includes nameplate information, parts list, operating instructions, maintenance guidelines and pertinent technical data and recommended checks that is necessary to prepare for start-up and functional testing and used during operation and maintenance of equipment. This documentation is included in the BMM at completion of work.
- .2        Prior to Performance Verification (PV) of systems complete items on PI forms related to systems and obtain Departmental Representative's approval.

**1.4                PERFORMANCE VERIFICATION (PV) FORMS**

- .1        PV forms to be used for checks, running dynamic tests and adjustments carried out on equipment and systems to ensure correct operation, efficiently and function independently and interactively with other systems as intended with project requirements.
- .2        PV report forms include those developed by Contractor records measured data and readings taken during functional testing and Performance Verification procedures.



- .3 Prior to PV of integrated system, complete PV forms of related systems and obtain Departmental Representative's approval.

## **1.5 SAMPLES OF COMMISSIONING FORMS**

- .1 Departmental Representative will develop and provide to Contractor required project-specific Commissioning forms in electronic format complete with specification data.
- .2 Revise items on Commissioning forms to suit project requirements.
- .3 Samples of Commissioning forms and a complete index of produced to date will be attached to this section.

## **1.6 CHANGES AND DEVELOPMENT OF NEW REPORT FORMS**

- .1 When additional forms are required, but are not available from Departmental Representative develop appropriate verification forms and submit to Departmental Representative for approval prior to use.
  - .1 Additional commissioning forms to be in same format as provided by Departmental Representative.

## **1.7 COMMISSIONING FORMS**

- .1 Use Commissioning forms to verify installation and record performance when starting equipment and systems.
- .2 Strategy for Use:
  - .1 Departmental Representative provides Contractor project-specific Commissioning forms with Specification data included.
  - .2 Contractor will provide required shop drawings information and verify correct installation and operation of items indicated on these forms.
  - .3 Confirm operation as per design criteria and intent.
  - .4 Identify variances between design and operation and reasons for variances.
  - .5 Verify operation in specified normal and emergency modes and under specified load conditions.
  - .6 Record analytical and substantiating data.
  - .7 Verify reported results.
  - .8 Form to bear signatures of recording technician and reviewed and signed off by Departmental Representative.
  - .9 Submit immediately after tests are performed.
  - .10 Reported results in true measured SI unit values.
  - .11 Provide Departmental Representative with originals of completed forms.
  - .12 Maintain copy on site during start-up, testing and commissioning period.
  - .13 Forms to be both hard copy and electronic format with typed written results in Building Management Manual in accordance with Section 01 91 51 - Building Management Manual (BMM).

## **1.8 LANGUAGE**

- .1 To suit the language profile of the awarded contract.

**Part 2            Products**

**2.1                NOT USED**

.1            Not Used.

**Part 3            Execution**

**3.1                NOT USED**

.1            Not Used.

**END OF SECTION**

## FIRE ALARM SYSTEM VERIFICATION REPORT

(Ref.: CAN/ULC-S537-04)

**CHECK**

☐ - **ANNUAL** (Ref: CAN/ULC-S536-97, Clause 3.3)

**ONE**

☐ - **INITIAL** (Ref.: CAN/ULC-S537-04, Clauses 3.2, 4.1 to 4.6)

JOB / CONTRACT NO.: \_\_\_\_\_

DATE: \_\_\_\_\_

BUILDING NAME: \_\_\_\_\_

SYSTEM MANUFACTURER: \_\_\_\_\_

ADDRESS: \_\_\_\_\_

MODEL NO.: \_\_\_\_\_

☐ - SINGLE STAGE OPERATION

☐ - TWO STAGE OPERATION

1. THIS IS TO CERTIFY THAT THE FIRE ALARM SYSTEM HAS BEEN TESTED AND INSPECTED IN ACCORDANCE WITH THE **STANDARD FOR THE VERIFICATION OF FIRE ALARM SYSTEMS, CAN/ULC-S537-97**, AND THESE RECORDS DOCUMENT THE RESULTS OF TESTING PERFORMED.

2. THE FIRE ALARM SYSTEM IS NOW FULLY FUNCTIONAL. ☐

↑

OR (Check one of these two)

↓

3. THE FIRE ALARM SYSTEM HAS DEFICIENCIES SUMMARIZED IN THE COMMENTS BELOW AND REPORTED ON THE ATTACHED PAGES. ☐

4. SUMMARY COMMENTS: \_\_\_\_\_

5. A COPY OF THIS REPORT WILL BE GIVEN TO \_\_\_\_\_  
WHO IS THE OWNER ☐ OR OWNER'S REPRESENTATIVE ☐ FOR THIS BUILDING.

Office: \_\_\_\_\_

Address: \_\_\_\_\_ City: \_\_\_\_\_ Prov: \_\_\_\_\_ Postal Code: \_\_\_\_\_ Tel: \_\_\_\_\_

Print Name of Engineering Representative Conducting Test

Signature

Print Name of Technician Conducting Test

Signature

Print Name of Engineer Certifying Test

Signature

Seal

In this report, an **X** in the appropriate column is used to indicate as follows:  
(ALL ITEMS MUST BE MARKED OR ANSWERED)

**X** in the **YES** column means: the unit tested correctly.

**X** in the **NO** column means: the unit did not test correctly, and an explanation is recorded on an attached remarks sheet.

**X** in the **N/A** column means: the item is **NOT APPLICABLE**, the function or feature is not provided on this fire alarm system.

CAUTION: The tests reported on the forms do not include the actual operational test of Ancillary devices.

## **FIRE ALARM SYSTEM INSPECTION/TEST**

### **DOCUMENTATION REQUIRED - Reference: CAN/ULC-S537-04, Clauses C2**

	YES	NO	N/A		YES	NO	N/A
• Instructions for resetting the system and silencing alarm signals	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	• Description of alarm signal operation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Instructions for silencing the trouble signal and action to be taken when the trouble signal sounds	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	• Description of ancillary equipment controlled by the fire alarm system	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Description of the function of each operating control and indicator on the fire alarm unit	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	• The fire alarm system has a feature for connection for fire department signaling.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Description of the area or fire zone protected by each alarm detection circuit (this may be in the form of a list or plan drawing)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	• If connected, indicate the fire signal receiving centre: Monitor connections Installed but not yet connected to monitoring.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

### **FIELD DEVICE AND RELATED CIRCUITS – TEST AND INSPECTION - Reference: CAN/ULC-S536-04, Clauses C3**

	YES	NO	N/A		YES	NO	N/A
• Correct Field termination and wiring size.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	• Class A circuits serving conventional field devices tested for the capability of providing an alarm signal on each side of an open circuit fault connection at an electrically remote point in the circuit.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Correct circuit polarities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	• Ground fault indications occur when tested at the electrically furthest field device, and does not result in normal to off-normal status change conditions.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• An open circuit fault on a conventional device causes a trouble signal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	• Field device at the electrically furthest point from the power source (in every circuit) receives rated power in accordance with manufacturer's specifications.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Removal of any active or supporting field device circuit causes a trouble signal.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	• Replaceable over-current devices are of correct rating	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• One contact device and one non-contact device tested for operation and annunciation at the control unit or transponder, when using a field verifying device	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	• Wire type and gauge in accordance with equipment manufacturers installation wiring at all system termination points.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

### **DATA COMMUNICATION LINK TEST - Reference: CAN/ULC-S537-04, Clauses C4**

Control Unit or Transponder Location:

Control Unit or Transponder Identification:

Data Communications Link Identification:

	YES	NO	N/A		YES	NO	N/A
• Each system abnormal condition specified in Table 1, abnormal system conditions, tested for each data communication link at the control unit or transponder	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	• Where a data communication link serves devices on more than one floor area, impose a wire to wire short circuit fault within each floor area and confirm receipt of trouble and alarm condition from another floor area.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Tests for alarm and trouble received under a single ground fault condition conducted on each conductor of that data communication link independently	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	• Where fault isolation modules are installed in data communication links serving field devices, wiring shorted on the isolated side, annunciation of the fault confirmed, and then a device on the source side operated, and activation confirmed at the control unit or transponder	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Each conductor in a data communication link, Class A (DCLA) tested for the capability of providing an alarm signal on each side of a single open circuit fault condition	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	• Where fault isolation in data communication links is provided between control units or transponders, the field wiring shorted between each pair of control units or transponders, in turn, annunciation of the fault confirmed and operation outside the shorted section confirmed.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

## **FIRE ALARM SYSTEM INSPECTION/TEST**

**CONTROL UNIT TEST** – Reference: CAN/ULC-S537-04, Clauses C5.1

	YES	NO	N/A		YES	NO	N/A
• Power 'on' visual indicator operates	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	• Input circuit supervision fault causes a trouble indication	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Common visual trouble signal operates	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	• Output circuit alarm indicators operated	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Common audible trouble signal operates	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	• Output circuit supervision fault causes a trouble indication	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Trouble signal silence switch operates	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	• Visual indicator test (lamp test) operates	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Main power supply failure trouble signal operates	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	• Coded signal sequences operate not less than the required number of times and the correct alarm signal operate thereafter	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Ground fault tested on positive and negative initiates trouble signal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	• Coded signal sequences are not interrupted by subsequent alarms	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Alert signal operates	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	• Ancillary device control circuit is rated for the intended purpose	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Alarm signal operates	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	• Ancillary device by-pass results in trouble signal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Automatic transfer from alert signal to alarm signal operates	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	• Input circuit to output circuit operation, including ancillary device circuits (Refer to Appendix C5.12, Ancillary Device Circuit Test) for correct programmer operation, as per design and specification	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Manual transfer from alert signal to alarm signal operates	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	• Fire alarm system reset operates	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Automatic transfer from alert signal to alarm signal cancel (acknowledge) feature operates on a two-stage system.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	• Main power supply to emergency power supply transfer operates	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Alarm signal silence inhibit operates	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	• Control Unit or transponder bonded to ground	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Alarm signal manual silence operates	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	• Status change confirmation feature (smoke detectors only) verified	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Alarm signal silence visual indication operates	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	• Confirm that the alarm transmission to the remote fire signal receiving centre is received	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Alarm signal, when silenced, automatically reinitiates upon subsequent alarm.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	• Confirm that the supervisory transmission to the fire signal receiving centre is received	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Alarm signal silence automatic cut-out timer	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	• Confirm that the trouble transmission to the fire signal receiving centre is received.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Audible and visual alarm signals programmed and operate per design and specification.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	• If connected, record the name and telephone number of the fire signal receiving centre.	Name: Telephone: ID:		
• Input circuit, alarm and supervisory operation, including visual indicator operates.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	• Operation of the fire signal receiving centre disconnect means results in a specific trouble indication at the control unit or transponder and transmits a trouble signal to the fire signal receiving centre.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**VOICE COMMUNICATION TEST** - Reference: CAN/ULC-S537-04, Clauses C5.2

	YES	NO	N/A		YES	NO	N/A
• Power 'ON' indicator.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	• Operation of voice paging does not interfere with initial inhibit time of alert signal and alarm signal.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Common visual trouble signal.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	• All-call voice paging operates (on emergency power supply).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Common audible trouble signal.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	• Upon failure of one amplifier, system automatically transfers to back-up amplifier(s).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Trouble signal silence switch.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	• Circuits for emergency telephone call-in operation, including audible and visual indication.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• All-call voice paging including visual indicator.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	• Circuits for emergency telephones for operation, including two-way voice communication.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Output circuits for selective voice paging including visual indication.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	• Circuits for emergency telephone trouble operation including visual indication.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Output circuits for selective voice paging trouble operation, including visual indication.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	• Emergency telephone verbal communication.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Microphone including press to talk switch.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	• Emergency telephone operable or in-use tone at handset.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

## **FIRE ALARM SYSTEM INSPECTION/TEST**

**REQUIRED FOR SYSTEM RESPONSE TIMES** - Reference: CAN/ULC-S536-04, Clauses C5.3

	YES	NO	N/A		YES	NO	N/A
• Audible signal devices and visible signal devices operated within 10s and	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	• Subsequent input operated within 10 s	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Subsequent input operated within 10 s	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	• Required central alarm and control facility operated within 10 s and	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Remote connection operated within 10 s	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	• Subsequent input operated within 10 s	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Releasing device start of sequence operated within 10 s	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	• Ancillary circuits operated within 10 s	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Required annunciation operated within 10 s	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	• Subsequent input operated within 10 s	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**CONTROL UNIT INSPECTION** - Reference: CAN/ULC-S537-04, Clauses 5.4

Control Unit or Transponder Location:	Main Entrance						
Control Unit or Transponder Identification:	Main Fire Alarm Panel						
	YES	NO	N/A		YES	NO	N/A
• Input circuit designations, correctly identified in	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	• Record the Date, Revision and Version of Firmware and Software Firmware: Date: ____, Rev. No.: ____, Version No.: ____, Software: Date: ____, Rev. No.: ____, Version No.: ____,			
• Relation to connected field devices	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	• Cleanliness.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Output circuit designations, correctly identified in relation to connected field devices.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	• Fuses in accordance with manufacturer's specification.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Designations for common control functions and indicators.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	• Control unit lock.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Cabinet, plug-in components and modules securely in place.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	• Termination points from wiring to field devices secure.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Plug-in cables securely in place.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	• Control units or transponders which operate with stand-alone capability have signal silence, reset, and trouble silence switches with visual indicators, degraded mode capability and stand-alone capability indicators	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Control unit or transponder power disconnects in accordance with C22.1, Safety Standard for Electrical Installations, Canadian Electrical Code, Part 1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	• Each Control unit or transponder furnished with operating and maintenance instructions and installation instructions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Main Power supply feed wiring in accordance with manufacturers specifications	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	• Control Unit or transponder visual indicators comply with Table 3 Visual Indicators- Colour Code	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Verify control units or transponders with stand-alone capability serves the same area for both input circuits and output circuits	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				

**ANNUNCIATOR TEST AND INSPECTION** - Reference: CAN/ULC-S536-97, Clauses 6.4.1

	YES	NO	N/A		YES	NO	N/A
• Power-on indicator.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	• Input wiring from Control Unit is supervised.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Individual alarm and supervisory zone indication.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	• Alarm Signal silence visual indicator.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Individual alarm and supervisory zone designation labels are properly identified.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	• Switches for ancillary functions operate as per design and specification.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Common trouble signal.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	• Other ancillary functions visual indicators.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Visual indicator test (lamp test)/	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	• Manual activation of Alarm Signal and indication.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

## **FIRE ALARM SYSTEM INSPECTION/TEST**

### **POWER SUPPLY INSPECTION - Reference: CAN/ULC-S536-97, Clauses 6.3.1**

	YES	NO	N/A		YES	NO	N/A
• Conforms with the requirements of CAN/ULC-S524, Standard for the Installation of Fire Alarm Systems; and C22.1, Safety Standard for Electrical Installations, Canadian Electrical Code, Part I, Section 32.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	• Power for ancillary devices is taken from a source separate from the fire alarm system control unit or transponder power supply	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Fused in accordance with the manufacturer's marked rating of the system.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	• Power for ancillary devices is taken from the control unit or transponder that is designed to provide such power	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Equipped with the identified disconnect means	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	• Ancillary devices, which are powered from control unit or transponder, are recorded	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Adequate to meet the requirements of the system.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

### **BATTERY TEST AND INSPECTION – Reference: CAN/ULC-S537-04, Clause C5.7**

Control Unit or Transponder Location:

MAIN ENTRANCE

Control Unit or Transponder Identification:

	YES	NO	N/A		YES	NO	N/A
• Correct battery type as recommended by manufacturer.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	• Terminals clamped tightly.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Correct battery rating as determined by battery calculations based on full system load.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	• Correct electrolyte level.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Battery voltage (Main Power Supply 'ON') is:				• Specific gravity of the electrolyte is within manufacturer's specifications.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	FACP:		V dc	• Electrolyte leaks.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Battery voltage and current with Main Power Supply 'OFF' and Fire Alarm System in supervisory condition:	FACP:		V dc		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Battery voltage and current with Main Power supply 'OFF' and system Fire Alarm System in full load condition.	FACP:		V dc	• Adequately ventilated.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• The charging current is:			_____A	• Within manufacturer's rated life date code.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Inspected for physical damage.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Terminals cleaned and lubricated.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	• Record calculated battery capacity (refer to Appendix D3.1-C)		_____A	
• Indicate type of battery tests performed:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	• Record Battery terminal voltage after completion of tests		_____Vdc	
• (i) Required supervisory load for 24 h followed by the required full load operation; or	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	• Battery voltage no less than 85% of its rating after the tests	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• (ii) A silent test by using the load resistor method may be used for the full duration test (Refer to Appendix D1, Silent Test); or	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	• Generator provides power to the AC circuit serving the fire alarm system	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• (iii) Silent accelerated test. (Refer to Appendix D2, Silent accelerated test)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	• Trouble condition at the emergency generator results in a audible common trouble signal and a visual indication at the required annunciator	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

### **ANCILLARY DEVICE CIRCUIT TEST - Reference: CAN/ULC-S537-04, Clauses C5.12**

	YES	NO	N/A
• Fan and associated damper operation as per verification report.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

### **PRINTERS IN A PROPRIETARY CONTROL CENTRE – TEST AND INSPECTION - Reference: CAN/ULC-S536-97, Clauses 6.5.2**

	YES	NO	N/A		YES	NO	N/A
• Events and acknowledgements are automatically printed.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	• Paper advances automatically such that printed record is visible.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Time and date of each event is recorded by the printer.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	• Printer operates under loss of main power supply.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Each event is recorded as they occur, irrespective of event acknowledgement.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	• Printer is monitored for 'low paper' and 'paper out'.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• System records status changes without the loss of any data.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

## **LEGEND / REMARKS** **FOR INSPECTION/TEST OR VERIFICATION**

**DEVICE LEGEND AND TYPE/MODEL**

**Inspection/Test** reference: CAN/ULC-S536-97

**Verification** reference: CAN/ULC-S537-97

<b>DEVICE</b>	<b>DESCRIPTION</b>	<b>MODEL NO.</b>	<b>TYPE</b>
FP	Manual Pull Station		
HD	Heat Detector, Restorable (Note 9)		
SD	Smoke Detector (Notes 1, 2, 9)		
DS	Duct Smoke detector (Notes 1, 3, 4 and 9)		
--	Other Type of Detector		
FS	Sprinkler Flow Switch (Note 5)		
TS	Sprinkler Supervisory device (Note 6)		
--	Other Supervisory Devices (Low Pressure, Low Water, Low Temperature, Power Loss, etc.) (Notes 6, 7)		
IM	Fault Isolation Module		
CT	Input Module		
B	Bell		
H	Horn		
V	Visual Signal Appliance		
AD	Ancillary Device (Note 8)		
H/S	Horn/Strobe		
EOL	End of Line Resistor		

NOTE 1: Smoke detector sensitivity confirmation or measurement required in Clause 6.6.4.1.2 and the test method or test equipment model used in Clause 6.6.4.1.6 should be recorded in the remarks column.

NOTE 2: Smoke detector cleaning or replacement date should also be recorded in the remarks column.

NOTE 3: Status Change, including time delay, should be recorded in the remarks column.

NOTE 4: Duct smoke detector pressure differential should be confirmed and recorded in the remarks column.

NOTE 5: Time delay setting of water flow switch should be recorded in the remarks column.

NOTE 6: Sprinkler supervisory switches cause trouble condition to be annunciated but not an alarm condition.

NOTE 7: Upper and lower pressure setting of supervisory devices should be recorded in the remarks column.

NOTE 8: Low temperature setting should be recorded in the remarks column.

NOTE 9: Identify the specific ancillary devices in the remarks column.

**CAUTION:** The tests reported on these forms do not include the actual operational test of Ancillary devices.

**ANCILLARY DEVICE CIRCUIT TEST**

**Inspection/Test** ref.: CAN/ULC-S536-97, Clauses 6.2.1      **Verification** ref.: CAN/ULC-S537-97, Clauses 3.3.2.2

The following Specific Circuits are connected to the Fire Alarm System

_____	Y <input type="checkbox"/>	N <input type="checkbox"/>	N/A <input type="checkbox"/>
_____	Y <input type="checkbox"/>	N <input type="checkbox"/>	N/A <input type="checkbox"/>
_____	Y <input type="checkbox"/>	N <input type="checkbox"/>	N/A <input type="checkbox"/>
_____	Y <input type="checkbox"/>	N <input type="checkbox"/>	N/A <input type="checkbox"/>
_____	Y <input type="checkbox"/>	N <input type="checkbox"/>	N/A <input type="checkbox"/>
_____	Y <input type="checkbox"/>	N <input type="checkbox"/>	N/A <input type="checkbox"/>
_____	Y <input type="checkbox"/>	N <input type="checkbox"/>	N/A <input type="checkbox"/>

**COMMENTS (DESCRIPTION OF SPECIFIC DEFICIENCIES AND EXCEPTIONS)**

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Attach additional sheets if further remarks are required



*Fax: 403-329-9354*



## INSPECTION/TEST AND VERIFICATION

Verification Reference: CAN/ULC-S537-97, 4.4.1.4, 4.8.1.1

[illegible]

*Fax: 403-329-9354*



**Engineering Ltd.**

[illegible]

Fax: 403-329-9354



**Engineering Ltd.**

[illegible]

Suite 300, 714 5 Avenue South  
 Lethbridge, AB T1J 0V1  
 Phone: 403-329-3442  
 1-866-329-3442  
 Fax: 403-329-9354



ZONE- ADDRESS	LOCATION	DEVICE	ALARM	TROUBLE	GROUND FAULT	SUPERVISORY	ANNUNCIATION	REMARKS	DATE

- A -- Correctly Installed*
- B -- Requires Service, Repairs, Missing or Cleaning*
- C -- Alarm Operation Confirmed*
- D -- Annunciation Indication Confirmed*
- E -- Circuit Number or Address*
- F -- Supervision and Ground Fault Detection of Wiring to Device Confirmed*
- G -- Smoke Sensitivity Testing*

### ***Inspection Remarks***

***Note: The DEFICIENCIES listed on this page must be corrected before a certificate can be issued.***

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## **LRC Dairy Barn Roof Replacement – Commissioning Requirements**

### **INDEX**

1. UH-1 AND 2
2. REINSTALLED UH (x2)
3. EUH-1
4. EF-1 AND 2
5. REINSTALLED EF (x10)
6. REINSTALLED SUPPLY AIR FABRIC PLENUMS (x3)
7. MAKE UP AIR UNIT MUA-1

SHEET TITLE DAIRY BARN ROOF REPLACEMENT		DAIRY BARN
CONSULTANTS NAME AND ADDRESS:  MPE ENGINEERING LTD. #300,714 – 5 AVENUE S. LETHBRIDGE, Alberta T1J OV1 Phone: (403) 329-3442 Fax: (403) 329-9354	BUILDING NAME AND LOCATION:  LRC Dairy Barn Roof Replacement  Lethbridge, ALBERTA	
	COMMISSIONING	

## **INDEX TABLE OF SYSTEM COMPONENTS**

	MECHANICAL	ELECTRICAL
UNIT HEATER UH-1	X	X
UNIT HEATER UH-2	X	X
REINSTALLED UNIT HEATER (LAB)	X	X
REINSTALLED UNIT HEATER (METABOLISM)	X	X
ELECTRIC UNIT HEATER EUH-1	X	X
EXHAUST FAN EF-1	X	X
EXHAUST FAN EF-2	X	X
REINSTALLED EXHAUST FAN (CALF BARN NORTH)	X	X
REINSTALLED EXHAUST FAN (CALF BARN SOUTH)	X	X
REINSTALLED EXHAUST FAN (CALF BARN EAST)	X	X
REINSTALLED EXHAUST FAN (STORAGE)	X	X
REINSTALLED EXHAUST FAN (LAB)	X	X
REINSTALLED EXHAUST FAN (WASHROOMS)	X	X
REINSTALLED EXHAUST FAN (METABOLISM)	X	X
REINSTALLED EXHAUST FAN (DAIRY BARN NORTH)	X	X
REINSTALLED EXHAUST FAN (DAIRY BARN MIDDLE)	X	X
REINSTALLED EXHAUST FAN (DAIRY BARN SOUTH)	X	X
REINSTALLED FABRIC SUPPLY AIR PLEMUMS	X	
MAKE UP AIR UNIT MUA-1	X	X

SHEET TITLE <b>DAIRY BARN ROOF REPLACEMENT</b>		<b>DAIRY BARN</b>	
CONSULTANTS NAME AND ADDRESS:  <b>MPE ENGINEERING LTD.</b> <b>#300,714 – 5 AVENUE S.</b> <b>LETHBRIDGE, Alberta</b> <b>T1J OV1</b> Phone: (403) 329-3442 Fax: (403) 329-9354		BUILDING NAME AND LOCATION:  <b>LRC Dairy Barn Roof Replacement</b>  <b>Lethbridge, ALBERTA</b>	
		<b>COMMISSIONING</b>	

**UNIT HEATERS UH-1 AND UH-2**
**CONFIRM PERFORMANCE AND OPERATION**
**UNIT HEATER UH-1**
**FUNCTIONAL TESTING:**

**This equipment will be functionally tested by operating it through all phases of heating.**

**Name Plate Data;**

**Manufacturer** \_\_\_\_\_ **Volts** \_\_\_\_\_ **Input KW** \_\_\_\_\_

**Model:** \_\_\_\_\_ **Serial #:** \_\_\_\_\_ **Other:** \_\_\_\_\_

	YES/NO/N/A	INSPECTOR	DATE
INSTALLED AS PER DRAWINGS AND SPECS			
INSTALLED AS PER MANUFACTURER'S RECOMMENDATIONS			
UNIT LEVEL ON MOUNTING			
NO DAMAGE TO FLUES, CHIMNEYS AND HEATER JACKET			
HEATER SAFETIES INSTALLATION AND OPERATION			
FAN OPERATION VERIFIED			
AIRFLOW VERIFIED			
ALL LABELS VISIBLE			
BURNER SET TO MANUFACTURER'S SPECIFICATIONS			
HEATER, BURNER FLUE CLEAN AND FREE OF CONSTRUCTION DEBRIS			
GAS PIPING CORRECT			

**COMMENTS:**

SHEET TITLE <b>DAIRY BARN ROOF REPLACEMENT</b>		<b>DAIRY BARN</b>	
CONSULTANTS NAME AND ADDRESS:  MPE ENGINEERING LTD. #300,714 – 5 AVENUE S. LETHBRIDGE, Alberta T1J OV1 Phone: (403) 329-3442 Fax: (403) 329-9354		BUILDING NAME AND LOCATION:  LRC Dairy Barn Roof Replacement  Lethbridge, ALBERTA	
		COMMISSIONING	

# UNIT HEATERS UH-1 AND UH-2

# CONFIRM PERFORMANCE AND OPERATION

## UNIT HEATER UH-2

### FUNCTIONAL TESTING:

This equipment will be functionally tested by operating it through all phases of heating.

### Name Plate Data;

Manufacturer \_\_\_\_\_ Volts \_\_\_\_\_ Input KW \_\_\_\_\_

Model: \_\_\_\_\_ Serial #: \_\_\_\_\_ Other: \_\_\_\_\_

	YES/NO/N/A	INSPECTOR	DATE
INSTALLED AS PER DRAWINGS AND SPECS			
INSTALLED AS PER MANUFACTURER'S RECOMMENDATIONS			
UNIT LEVEL ON MOUNTING			
NO DAMAGE TO FLUES, CHIMNEYS AND HEATER JACKET			
HEATER SAFETIES INSTALLATION AND OPERATION			
FAN OPERATION VERIFIED			
AIRFLOW VERIFIED			
ALL LABELS VISIBILE			
BURNER SET TO MANUFACTURER'S SPECIFICATIONS			
HEATER, BURNER FLUE CLEAN AND FREE OF CONSTRUCTION DEBRIS			
GAS PIPING CORRECT			

### COMMENTS:



SHEET TITLE <b>DAIRY BARN ROOF REPLACEMENT</b>		<b>DAIRY BARN</b>	
CONSULTANTS NAME AND ADDRESS:  <b>MPE ENGINEERING LTD.</b> <b>#300,714 – 5 AVENUE S.</b> <b>LETHBRIDGE, Alberta</b> <b>T1J OV1</b> Phone: (403) 329-3442 Fax: (403) 329-9354		BUILDING NAME AND LOCATION:  <b>LRC Dairy Barn Roof Replacement</b>  <b>Lethbridge, ALBERTA</b>	
		<b>COMMISSIONING</b>	

# **REINSTALLED UNIT HEATERS**

# **CONFIRM PERFORMANCE AND OPERATION**

## **UNIT HEATER (LAB)**

### **FUNCTIONAL TESTING:**

**This equipment will be functionally tested by operating it through all phases of heating.**

### **Name Plate Data;**

**Manufacturer** \_\_\_\_\_ **Volts** \_\_\_\_\_ **Input KW** \_\_\_\_\_

**Model:** \_\_\_\_\_ **Serial #:** \_\_\_\_\_ **Other:** \_\_\_\_\_

	YES/NO/N/A	INSPECTOR	DATE
INSTALLED AS PER DRAWINGS AND SPECS			
INSTALLED AS PER MANUFACTURER'S RECOMMENDATIONS			
UNIT LEVEL ON MOUNTING			
NO DAMAGE TO FLUES, CHIMNEYS AND HEATER JACKET			
HEATER SAFETIES INSTALLATION AND OPERATION			
FAN OPERATION VERIFIED			
AIRFLOW VERIFIED			
ALL LABELS VISIBLE			
BURNER SET TO MANUFACTURER'S SPECIFICATIONS			
HEATER, BURNER FLUE CLEAN AND FREE OF CONSTRUCTION DEBRIS			
GAS PIPING CORRECT			

### **COMMENTS:**

SHEET TITLE <b>DAIRY BARN ROOF REPLACEMENT</b>		<b>DAIRY BARN</b>
CONSULTANTS NAME AND ADDRESS:  MPE ENGINEERING LTD. #300,714 – 5 AVENUE S. LETHBRIDGE, Alberta T1J OV1 Phone: (403) 329-3442 Fax: (403) 329-9354	BUILDING NAME AND LOCATION:  LRC Dairy Barn Roof Replacement  Lethbridge, ALBERTA	
	COMMISSIONING	

# REINSTALLED UNIT HEATERS

# CONFIRM PERFORMANCE AND OPERATION

## UNIT HEATER (METABOLISM)

### FUNCTIONAL TESTING:

This equipment will be functionally tested by operating it through all phases of heating.

### Name Plate Data;

Manufacturer \_\_\_\_\_ Volts \_\_\_\_\_ Input KW \_\_\_\_\_

Model: \_\_\_\_\_ Serial #: \_\_\_\_\_ Other: \_\_\_\_\_

	YES/NO/N/A	INSPECTOR	DATE
INSTALLED AS PER DRAWINGS AND SPECS			
INSTALLED AS PER MANUFACTURER'S RECOMMENDATIONS			
UNIT LEVEL ON MOUNTING			
NO DAMAGE TO FLUES, CHIMNEYS AND HEATER JACKET			
HEATER SAFETIES INSTALLATION AND OPERATION			
FAN OPERATION VERIFIED			
AIRFLOW VERIFIED			
ALL LABELS VISIBLE			
BURNER SET TO MANUFACTURER'S SPECIFICATIONS			
HEATER, BURNER FLUE CLEAN AND FREE OF CONSTRUCTION DEBRIS			
GAS PIPING CORRECT			

### COMMENTS:

SHEET TITLE <b>DAIRY BARN ROOF REPLACEMENT</b>		<b>DAIRY BARN</b>
CONSULTANTS NAME AND ADDRESS:  MPE ENGINEERING LTD. #300,714 – 5 AVENUE S. LETHBRIDGE, Alberta T1J OV1 Phone: (403) 329-3442 Fax: (403) 329-9354	BUILDING NAME AND LOCATION:  LRC Dairy Barn Roof Replacement  Lethbridge, ALBERTA	
	COMMISSIONING	

# **ELECTRIC UNIT HEATERS**

# **CONFIRM PERFORMANCE AND OPERATION**

## **ELECTRIC UNIT HEATER EUH-1**

### **FUNCTIONAL TESTING:**

This equipment will be functionally tested by operating it through all phases of heating.

### **Name Plate Data;**

Manufacturer \_\_\_\_\_ Volts \_\_\_\_\_ Input KW \_\_\_\_\_

Model: \_\_\_\_\_ Serial #: \_\_\_\_\_ Other: \_\_\_\_\_

	YES/NO/N/A	INSPECTOR	DATE
INSTALLED AS PER DRAWINGS AND SPECS			
INSTALLED AS PER MANUFACTURER'S RECOMMENDATIONS			
UNIT LEVEL ON MOUNTING			
HEATER SAFETIES INSTALLATION AND OPERATION			
FAN OPERATION VERIFIED			
AIRFLOW VERIFIED			
ALL LABELS VISIBLE			
HEATING ELEMENT SET TO MANUFACTURER'S SPECIFICATIONS			
HEATER CLEAN AND FREE OF CONSTRUCTION DEBRIS			

### **COMMENTS:**

SHEET TITLE <b>DAIRY BARN ROOF REPLACEMENT</b>		<b>DAIRY BARN</b>	
CONSULTANTS NAME AND ADDRESS:  MPE ENGINEERING LTD. #300,714 – 5 AVENUE S. LETHBRIDGE, Alberta T1J OV1 Phone: (403) 329-3442 Fax: (403) 329-9354		BUILDING NAME AND LOCATION:  LRC Dairy Barn Roof Replacement  Lethbridge, ALBERTA	
		COMMISSIONING	

## EXHAUST FANS

## CONFIRM PERFORMANCE AND OPERATION

### EXHAUST FAN EF-1

#### FUNCTIONAL TESTING:

This equipment will be functionally tested by operating it through all phases of exhaust.

#### Name Plate Data;

Manufacturer \_\_\_\_\_ Volts \_\_\_\_\_ Input KW \_\_\_\_\_

Model: \_\_\_\_\_ Serial #: \_\_\_\_\_ Other: \_\_\_\_\_

	YES/NO/N/A	INSPECTOR	DATE
INSTALLED AS PER DRAWINGS AND SPECS			
INSTALLED AS PER MANUFACTURER'S RECOMMENDATIONS			
UNIT LEVEL ON MOUNTING			
NO DAMAGE TO FAN BLADES, MOTOR			
FAN OPERATION VERIFIED			
AIRFLOW VERIFIED			
ALL LABELS VISIBILE			
OPERATION OF CONTROLS AS INTENDED			

#### COMMENTS:

SHEET TITLE <b>DAIRY BARN ROOF REPLACEMENT</b>		<b>DAIRY BARN</b>	
CONSULTANTS NAME AND ADDRESS:  MPE ENGINEERING LTD. #300,714 – 5 AVENUE S. LETHBRIDGE, Alberta T1J OV1 Phone: (403) 329-3442 Fax: (403) 329-9354		BUILDING NAME AND LOCATION:  LRC Dairy Barn Roof Replacement  Lethbridge, ALBERTA	
		COMMISSIONING	

## EXHAUST FANS

## CONFIRM PERFORMANCE AND OPERATION

### EXHAUST FAN EF-2

#### FUNCTIONAL TESTING:

This equipment will be functionally tested by operating it through all phases of exhaust.

#### Name Plate Data;

Manufacturer \_\_\_\_\_ Volts \_\_\_\_\_ Input KW \_\_\_\_\_

Model: \_\_\_\_\_ Serial #: \_\_\_\_\_ Other: \_\_\_\_\_

	YES/NO/N/A	INSPECTOR	DATE
INSTALLED AS PER DRAWINGS AND SPECS			
INSTALLED AS PER MANUFACTURER'S RECOMMENDATIONS			
UNIT LEVEL ON MOUNTING			
NO DAMAGE TO FAN BLADES, MOTOR			
FAN OPERATION VERIFIED			
AIRFLOW VERIFIED			
ALL LABELS VISIBLE			
OPERATION OF CONTROLS AS INTENDED			

#### COMMENTS:

SHEET TITLE <b>DAIRY BARN ROOF REPLACEMENT</b>		<b>DAIRY BARN</b>	
CONSULTANTS NAME AND ADDRESS:  MPE ENGINEERING LTD. #300,714 – 5 AVENUE S. LETHBRIDGE, Alberta T1J OV1 Phone: (403) 329-3442 Fax: (403) 329-9354		BUILDING NAME AND LOCATION:  LRC Dairy Barn Roof Replacement  Lethbridge, ALBERTA	
		COMMISSIONING	

# REINSTALLED EXHAUST FANS

# CONFIRM PERFORMANCE AND OPERATION

## EXHAUST FAN (CALF BARN NORTH)

### FUNCTIONAL TESTING:

This equipment will be functionally tested by operating it through all phases of exhaust.

### Name Plate Data;

Manufacturer \_\_\_\_\_ Volts \_\_\_\_\_ Input KW \_\_\_\_\_

Model: \_\_\_\_\_ Serial #: \_\_\_\_\_ Other: \_\_\_\_\_

	YES/NO/N/A	INSPECTOR	DATE
INSTALLED AS PER DRAWINGS AND SPECS			
INSTALLED AS PER MANUFACTURER'S RECOMMENDATIONS			
UNIT LEVEL ON MOUNTING			
NO DAMAGE TO FAN BLADES, MOTOR			
FAN OPERATION VERIFIED			
AIRFLOW VERIFIED			
ALL LABELS VISIBILE			
OPERATION OF CONTROLS AS INTENDED			

### COMMENTS:

SHEET TITLE <b>DAIRY BARN ROOF REPLACEMENT</b>		<b>DAIRY BARN</b>	
CONSULTANTS NAME AND ADDRESS:  MPE ENGINEERING LTD. #300,714 – 5 AVENUE S. LETHBRIDGE, Alberta T1J OV1 Phone: (403) 329-3442 Fax: (403) 329-9354		BUILDING NAME AND LOCATION:  LRC Dairy Barn Roof Replacement  Lethbridge, ALBERTA	
		COMMISSIONING	

# REINSTALLED EXHAUST FANS

# CONFIRM PERFORMANCE AND OPERATION

## EXHAUST FAN (CALF BARN SOUTH)

### FUNCTIONAL TESTING:

This equipment will be functionally tested by operating it through all phases of exhaust.

### Name Plate Data;

Manufacturer \_\_\_\_\_ Volts \_\_\_\_\_ Input KW \_\_\_\_\_

Model: \_\_\_\_\_ Serial #: \_\_\_\_\_ Other: \_\_\_\_\_

	YES/NO/N/A	INSPECTOR	DATE
INSTALLED AS PER DRAWINGS AND SPECS			
INSTALLED AS PER MANUFACTURER'S RECOMMENDATIONS			
UNIT LEVEL ON MOUNTING			
NO DAMAGE TO FAN BLADES, MOTOR			
FAN OPERATION VERIFIED			
AIRFLOW VERIFIED			
ALL LABELS VISIBLE			
OPERATION OF CONTROLS AS INTENDED			

### COMMENTS:

SHEET TITLE <b>DAIRY BARN ROOF REPLACEMENT</b>		<b>DAIRY BARN</b>
CONSULTANTS NAME AND ADDRESS:  MPE ENGINEERING LTD. #300,714 – 5 AVENUE S. LETHBRIDGE, Alberta T1J OV1 Phone: (403) 329-3442 Fax: (403) 329-9354	BUILDING NAME AND LOCATION:  LRC Dairy Barn Roof Replacement  Lethbridge, ALBERTA	
	COMMISSIONING	

# REINSTALLED EXHAUST FANS

# CONFIRM PERFORMANCE AND OPERATION

## EXHAUST FAN (CALF BARN EAST)

### FUNCTIONAL TESTING:

This equipment will be functionally tested by operating it through all phases of exhaust.

### Name Plate Data;

Manufacturer \_\_\_\_\_ Volts \_\_\_\_\_ Input KW \_\_\_\_\_

Model: \_\_\_\_\_ Serial #: \_\_\_\_\_ Other: \_\_\_\_\_

	YES/NO/N/A	INSPECTOR	DATE
INSTALLED AS PER DRAWINGS AND SPECS			
INSTALLED AS PER MANUFACTURER'S RECOMMENDATIONS			
UNIT LEVEL ON MOUNTING			
NO DAMAGE TO FAN BLADES, MOTOR			
FAN OPERATION VERIFIED			
AIRFLOW VERIFIED			
ALL LABELS VISIBLE			
OPERATION OF CONTROLS AS INTENDED			

### COMMENTS:



SHEET TITLE <b>DAIRY BARN ROOF REPLACEMENT</b>		<b>DAIRY BARN</b>	
CONSULTANTS NAME AND ADDRESS:  MPE ENGINEERING LTD. #300,714 – 5 AVENUE S. LETHBRIDGE, Alberta T1J OV1 Phone: (403) 329-3442 Fax: (403) 329-9354		BUILDING NAME AND LOCATION:  LRC Dairy Barn Roof Replacement  Lethbridge, ALBERTA	
		COMMISSIONING	

**REINSTALLED EXHAUST FANS**

**CONFIRM PERFORMANCE AND OPERATION**

**EXHAUST FAN (STORAGE)**

**FUNCTIONAL TESTING:**

This equipment will be functionally tested by operating it through all phases of exhaust.

**Name Plate Data;**

**Manufacturer** \_\_\_\_\_ **Volts** \_\_\_\_\_ **Input KW** \_\_\_\_\_

**Model:** \_\_\_\_\_ **Serial #:** \_\_\_\_\_ **Other:** \_\_\_\_\_

	YES/NO/N/A	INSPECTOR	DATE
INSTALLED AS PER DRAWINGS AND SPECS			
INSTALLED AS PER MANUFACTURER'S RECOMMENDATIONS			
UNIT LEVEL ON MOUNTING			
NO DAMAGE TO FAN BLADES, MOTOR			
FAN OPERATION VERIFIED			
AIRFLOW VERIFIED			
ALL LABELS VISIBLE			
OPERATION OF CONTROLS AS INTENDED			

**COMMENTS:**

SHEET TITLE <b>DAIRY BARN ROOF REPLACEMENT</b>		<b>DAIRY BARN</b>	
CONSULTANTS NAME AND ADDRESS:  MPE ENGINEERING LTD. #300,714 – 5 AVENUE S. LETHBRIDGE, Alberta T1J OV1 Phone: (403) 329-3442 Fax: (403) 329-9354		BUILDING NAME AND LOCATION:  LRC Dairy Barn Roof Replacement  Lethbridge, ALBERTA	
		COMMISSIONING	

# REINSTALLED EXHAUST FANS

# CONFIRM PERFORMANCE AND OPERATION

## EXHAUST FAN (LAB)

### FUNCTIONAL TESTING:

This equipment will be functionally tested by operating it through all phases of exhaust.

### Name Plate Data;

Manufacturer \_\_\_\_\_ Volts \_\_\_\_\_ Input KW \_\_\_\_\_

Model: \_\_\_\_\_ Serial #: \_\_\_\_\_ Other: \_\_\_\_\_

	YES/NO/N/A	INSPECTOR	DATE
INSTALLED AS PER DRAWINGS AND SPECS			
INSTALLED AS PER MANUFACTURER'S RECOMMENDATIONS			
UNIT LEVEL ON MOUNTING			
NO DAMAGE TO FAN BLADES, MOTOR			
FAN OPERATION VERIFIED			
AIRFLOW VERIFIED			
ALL LABELS VISIBLE			
OPERATION OF CONTROLS AS INTENDED			

### COMMENTS:

SHEET TITLE <b>DAIRY BARN ROOF REPLACEMENT</b>		<b>DAIRY BARN</b>	
CONSULTANTS NAME AND ADDRESS:  MPE ENGINEERING LTD. #300,714 – 5 AVENUE S. LETHBRIDGE, Alberta T1J OV1 Phone: (403) 329-3442 Fax: (403) 329-9354		BUILDING NAME AND LOCATION:  LRC Dairy Barn Roof Replacement  Lethbridge, ALBERTA	
		COMMISSIONING	

**REINSTALLED EXHAUST FANS**

**CONFIRM PERFORMANCE AND OPERATION**

**EXHAUST FAN (WASHROOMS)**

**FUNCTIONAL TESTING:**

This equipment will be functionally tested by operating it through all phases of exhaust.

**Name Plate Data;**

**Manufacturer** \_\_\_\_\_ **Volts** \_\_\_\_\_ **Input KW** \_\_\_\_\_

**Model:** \_\_\_\_\_ **Serial #:** \_\_\_\_\_ **Other:** \_\_\_\_\_

	YES/NO/N/A	INSPECTOR	DATE
INSTALLED AS PER DRAWINGS AND SPECS			
INSTALLED AS PER MANUFACTURER'S RECOMMENDATIONS			
UNIT LEVEL ON MOUNTING			
NO DAMAGE TO FAN BLADES, MOTOR			
FAN OPERATION VERIFIED			
AIRFLOW VERIFIED			
ALL LABELS VISIBLE			
OPERATION OF CONTROLS AS INTENDED			

**COMMENTS:**

SHEET TITLE <b>DAIRY BARN ROOF REPLACEMENT</b>		<b>DAIRY BARN</b>	
CONSULTANTS NAME AND ADDRESS:  MPE ENGINEERING LTD. #300,714 – 5 AVENUE S. LETHBRIDGE, Alberta T1J OV1 Phone: (403) 329-3442 Fax: (403) 329-9354		BUILDING NAME AND LOCATION:  LRC Dairy Barn Roof Replacement  Lethbridge, ALBERTA	
		COMMISSIONING	

# REINSTALLED EXHAUST FANS

# CONFIRM PERFORMANCE AND OPERATION

## EXHAUST FAN (METABOLISM)

### FUNCTIONAL TESTING:

This equipment will be functionally tested by operating it through all phases of exhaust.

### Name Plate Data;

Manufacturer \_\_\_\_\_ Volts \_\_\_\_\_ Input KW \_\_\_\_\_

Model: \_\_\_\_\_ Serial #: \_\_\_\_\_ Other: \_\_\_\_\_

	YES/NO/N/A	INSPECTOR	DATE
INSTALLED AS PER DRAWINGS AND SPECS			
INSTALLED AS PER MANUFACTURER'S RECOMMENDATIONS			
UNIT LEVEL ON MOUNTING			
NO DAMAGE TO FAN BLADES, MOTOR			
FAN OPERATION VERIFIED			
AIRFLOW VERIFIED			
ALL LABELS VISIBLE			
OPERATION OF CONTROLS AS INTENDED			

### COMMENTS:

SHEET TITLE <b>DAIRY BARN ROOF REPLACEMENT</b>		<b>DAIRY BARN</b>	
CONSULTANTS NAME AND ADDRESS:  MPE ENGINEERING LTD. #300,714 – 5 AVENUE S. LETHBRIDGE, Alberta T1J OV1 Phone: (403) 329-3442 Fax: (403) 329-9354		BUILDING NAME AND LOCATION:  LRC Dairy Barn Roof Replacement  Lethbridge, ALBERTA	
		COMMISSIONING	

# REINSTALLED EXHAUST FANS

# CONFIRM PERFORMANCE AND OPERATION

## EXHAUST FAN (DAIRY BARN NORTH)

### FUNCTIONAL TESTING:

This equipment will be functionally tested by operating it through all phases of exhaust.

### Name Plate Data;

Manufacturer \_\_\_\_\_ Volts \_\_\_\_\_ Input KW \_\_\_\_\_

Model: \_\_\_\_\_ Serial #: \_\_\_\_\_ Other: \_\_\_\_\_

	YES/NO/N/A	INSPECTOR	DATE
INSTALLED AS PER DRAWINGS AND SPECS			
INSTALLED AS PER MANUFACTURER'S RECOMMENDATIONS			
UNIT LEVEL ON MOUNTING			
NO DAMAGE TO FAN BLADES, MOTOR			
FAN OPERATION VERIFIED			
AIRFLOW VERIFIED			
ALL LABELS VISIBLE			
OPERATION OF CONTROLS AS INTENDED			

### COMMENTS:

SHEET TITLE <b>DAIRY BARN ROOF REPLACEMENT</b>		<b>DAIRY BARN</b>	
CONSULTANTS NAME AND ADDRESS:  MPE ENGINEERING LTD. #300,714 – 5 AVENUE S. LETHBRIDGE, Alberta T1J OV1 Phone: (403) 329-3442 Fax: (403) 329-9354		BUILDING NAME AND LOCATION:  LRC Dairy Barn Roof Replacement  Lethbridge, ALBERTA	
		COMMISSIONING	

# REINSTALLED EXHAUST FANS

# CONFIRM PERFORMANCE AND OPERATION

## EXHAUST FAN (DAIRY BARN MIDDLE)

### FUNCTIONAL TESTING:

This equipment will be functionally tested by operating it through all phases of exhaust.

### Name Plate Data;

Manufacturer \_\_\_\_\_ Volts \_\_\_\_\_ Input KW \_\_\_\_\_

Model: \_\_\_\_\_ Serial #: \_\_\_\_\_ Other: \_\_\_\_\_

	YES/NO/N/A	INSPECTOR	DATE
INSTALLED AS PER DRAWINGS AND SPECS			
INSTALLED AS PER MANUFACTURER'S RECOMMENDATIONS			
UNIT LEVEL ON MOUNTING			
NO DAMAGE TO FAN BLADES, MOTOR			
FAN OPERATION VERIFIED			
AIRFLOW VERIFIED			
ALL LABELS VISIBLE			
OPERATION OF CONTROLS AS INTENDED			

### COMMENTS:

SHEET TITLE <b>DAIRY BARN ROOF REPLACEMENT</b>		<b>DAIRY BARN</b>	
CONSULTANTS NAME AND ADDRESS:  MPE ENGINEERING LTD. #300,714 – 5 AVENUE S. LETHBRIDGE, Alberta T1J OV1 Phone: (403) 329-3442 Fax: (403) 329-9354		BUILDING NAME AND LOCATION:  LRC Dairy Barn Roof Replacement  Lethbridge, ALBERTA	
		COMMISSIONING	

# REINSTALLED EXHAUST FANS

# CONFIRM PERFORMANCE AND OPERATION

## EXHAUST FAN (DAIRY BARN SOUTH)

### FUNCTIONAL TESTING:

This equipment will be functionally tested by operating it through all phases of exhaust.

### Name Plate Data;

Manufacturer \_\_\_\_\_ Volts \_\_\_\_\_ Input KW \_\_\_\_\_

Model: \_\_\_\_\_ Serial #: \_\_\_\_\_ Other: \_\_\_\_\_

	YES/NO/N/A	INSPECTOR	DATE
INSTALLED AS PER DRAWINGS AND SPECS			
INSTALLED AS PER MANUFACTURER'S RECOMMENDATIONS			
UNIT LEVEL ON MOUNTING			
NO DAMAGE TO FAN BLADES, MOTOR			
FAN OPERATION VERIFIED			
AIRFLOW VERIFIED			
ALL LABELS VISIBLE			
OPERATION OF CONTROLS AS INTENDED			

### COMMENTS:





SHEET TITLE <b>DAIRY BARN ROOF REPLACEMENT</b>		<b>DAIRY BARN</b>
CONSULTANTS NAME AND ADDRESS:  MPE ENGINEERING LTD. #300,714 – 5 AVENUE S. LETHBRIDGE, Alberta T1J OV1 Phone: (403) 329-3442 Fax: (403) 329-9354	BUILDING NAME AND LOCATION:  LRC Dairy Barn Roof Replacement  Lethbridge, ALBERTA	
	COMMISSIONING	

# **MAKE UP AIR UNIT**

# **CONFIRM PERFORMANCE AND OPERATION**

## **MAKE UP AIR UNIT MUA-1**

### **FUNCTIONAL TESTING:**

This equipment will be functionally tested by operating it through all phases of heating and ventilation.

### **Name Plate Data;**

Manufacturer \_\_\_\_\_ Volts \_\_\_\_\_ Input KW \_\_\_\_\_

Model: \_\_\_\_\_ Serial #: \_\_\_\_\_ Other: \_\_\_\_\_

	YES/NO/N/A	INSPECTOR	DATE
INSTALLED AS PER DRAWINGS AND SPECS			
INSTALLED AS PER MANUFACTURER'S RECOMMENDATIONS			
UNIT LEVEL ON MOUNTING			
NO DAMAGE TO FLUES, CHIMNEYS AND HEATER JACKET			
HEATER SAFETIES INSTALLATION AND OPERATION			
FAN OPERATION VERIFIED			
AIRFLOW VERIFIED			
ALL LABELS VISIBILE			
BURNER SET TO MANUFACTURER'S SPECIFICATIONS			
HEATER, BURNER FLUE CLEAN AND FREE OF CONSTRUCTION DEBRIS			
GAS PIPING CORRECT			
INTAKE FILTER, NO DAMAGE			

### **COMMENTS:**

## **Part 1 General**

### **1.1 SUMMARY**

- .1 Section Includes:
  - .1 This Section specifies roles and responsibilities of Commissioning Training.

### **1.2 TRAINEES**

- .1 Trainees: personnel selected for operating and maintaining this facility. Includes Facility Manager, building operators, maintenance staff, security staff, and technical specialists as required.
- .2 Trainees will be available for training during later stages of construction for purposes of familiarization with systems.

### **1.3 INSTRUCTORS**

- .1 Departmental Representative will provide:
  - .1 Descriptions of systems.
  - .2 Instruction on design philosophy, design criteria, and design intent.
- .2 Contractor and certified factory-trained manufacturers' personnel: to provide instruction on the following:
  - .1 Start-Up, operation, shut-down of equipment, components and systems.
  - .2 Control features, reasons for, results of, implications on associated systems of, adjustment of set points of control and safety devices.
  - .3 Instructions on servicing, maintenance and adjustment of systems, equipment and components.
- .3 Contractor and equipment manufacturer to provide instruction on:
  - .1 Start-up, operation, maintenance and shut-down of equipment they have certified installation, started up and carried out PV tests.

### **1.4 TRAINING OBJECTIVES**

- .1 Training to be detailed and duration to ensure:
  - .1 Safe, reliable, cost-effective, energy-efficient operation of systems in normal and emergency modes under all conditions.
  - .2 Effective on-going inspection, measurements of system performance.
  - .3 Proper preventive maintenance, diagnosis and trouble-shooting.
  - .4 Ability to update documentation.
  - .5 Ability to operate equipment and systems under emergency conditions until appropriate qualified assistance arrives.

### **1.5 TRAINING MATERIALS**

- .1 Instructors to be responsible for content and quality.

- .2 Training materials to include:
  - .1 "As-Built" Contract Documents.
  - .2 Operating Manual.
  - .3 Maintenance Manual.
  - .4 Management Manual.
  - .5 TAB and PV Reports.
- .3 Project Manager, Commissioning Manager and Facility Manager will review training manuals.
- .4 Training materials to be in a format that permits future training procedures to same degree of detail.
- .5 Supplement training materials:
  - .1 Transparencies for overhead projectors.
  - .2 Multimedia presentations.
  - .3 Manufacturer's training videos.
  - .4 Equipment models.

## **1.6 SCHEDULING**

- .1 Include in Commissioning Schedule time for training.
- .2 Deliver training during regular working hours, training sessions to be 3 hours in length.
- .3 Training to be completed prior to acceptance of facility.

## **1.7 RESPONSIBILITIES**

- .1 Be responsible for:
  - .1 Implementation of training activities,
  - .2 Coordination among instructors,
  - .3 Quality of training, training materials,
- .2 Departmental Representative will evaluate training and materials.
- .3 Upon completion of training, provide written report, signed by Instructors, witnessed by Departmental Representative.

## **1.8 TRAINING CONTENT**

- .1 Training to include demonstrations by Instructors using the installed equipment and systems.
- .2 Content includes:
  - .1 Review of facility and occupancy profile.
  - .2 Functional requirements.
  - .3 System philosophy, limitations of systems and emergency procedures.
  - .4 Review of system layout, equipment, components and controls.
  - .5 Equipment and system start-up, operation, monitoring, servicing, maintenance and shut-down procedures.

- .6 System operating sequences, including step-by-step directions for starting up, shut-down, operation of valves, dampers, switches, adjustment of control settings and emergency procedures.
- .7 Maintenance and servicing.
- .8 Trouble-shooting diagnosis.
- .9 Inter-Action among systems during integrated operation.
- .10 Review of O M documentation.
- .3 Provide specialized training as specified in relevant Technical Sections of the construction specifications.

**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        This section is limited to portions of the Building Management Manual (BMM) provided to Departmental Representative by Contractor.
- .2    Acronyms:
  - .1        BMM - Building Management Manual.
  - .2        Cx - Commissioning.
  - .3        HVAC - Heating, Ventilation and Air Conditioning.
  - .4        PI - Product Information.
  - .5        PV - Performance Verification.
  - .6        TAB - Testing, Adjusting and Balancing.
  - .7        WHMIS - Workplace Hazardous Materials Information System.

### **1.2        GENERAL REQUIREMENTS**

- .1    Standard letter size paper 216 mm x 279 mm.
- .2    Methodology used to facilitate updating.
- .3    Drawings, diagrams and schematics to be professionally developed.
- .4    Electronic copy of data to be in a format accepted and approved by Departmental Representative.

### **1.3        APPROVALS**

- .1    Prior to commencement, co-ordinate requirements for preparation, submission and approval with Departmental Representative.

### **1.4        GENERAL INFORMATION**

- .1    Provide Departmental Representative the following for insertion into appropriate Part and Section of BMM:
  - .1        Complete list of names, addresses, telephone and fax numbers of contractor, sub-contractors that participated in delivery of project - as indicated in Section 1.2 of BMM.
  - .2        Summary of architectural, structural, fire protection, mechanical and electrical systems installed and commissioned - as indicated in Section 1.4 of BMM.
    - .1            Including sequence of operation as finalized after commissioning is complete as indicated in Section 2.0 of BMM.
  - .3        Description of building operation under conditions of heightened security and emergencies as indicated in Section 2.0 of BMM.
  - .4        System, equipment and components Maintenance Management System (MMS) identification - Section 2.1 of BMM.

- .5 Information on operation and maintenance of architectural systems and equipment installed and commissioned - Section 2.0 of BMM.
- .6 Information on operation and maintenance of fire protection and life safety systems and equipment installed and commissioned - Section 2.0 of BMM.
- .7 Information on operation and maintenance of mechanical systems and equipment installed and commissioned - Section 2.0 of BMM.
- .8 Operating and maintenance manual - Section 3.2 of BMM.
- .9 Final commissioning plan as actually implemented.
- .10 Completed commissioning checklists.
- .11 Commissioning test procedures employed.
- .12 Completed Product Information (PI) and Performance Verification (PV) report forms, approved and accepted by Departmental Representative.
- .13 Commissioning reports.

## **1.5 CONTENTS OF OPERATING AND MAINTENANCE MANUAL**

- .1 For detailed requirements refer to Section 01 78 00 - Closeout Submittals.
- .2 Departmental Representative to review and approve format and organization within 12 weeks of award of contract.
- .3 Include original manufactures brochures and written information on products and equipment installed on this project.
- .4 Record and organize for easy access and retrieval of information contained in BMM.
- .5 Include completed PI report forms, data and information from other sources as required.
- .6 Inventory directory relating to information on installed systems, equipment and components.
- .7 Approved project shop-drawings, product and maintenance data.
- .8 Manufacturer's data and recommendations relating: manufacturing process, installation, commissioning, start-up, O M, shutdown and training materials.
- .9 Inventory and location of spare parts, special tools and maintenance materials.
- .10 Warranty information.
- .11 Inspection certificates with expiration dates, which require on-going re-certification inspections.
- .12 Maintenance program supporting information including:
  - .1 Recommended maintenance procedures and schedule.
  - .2 Information to removal and replacement of equipment including, required equipment, points of lift and means of entry and egress.

## **1.6 LIFE SAFETY COMPLIANCE (LSC) MANUAL**

- .1 Samples of LSC Manual will be available from Departmental Representative.
- .2 Content of Manual:

- .1 All possible Emergency situations modes including: presence of fire and smoke, power failure, lose of water or pressure, chemical spills and refrigerant release.
- .2 HVAC emergencies and fuel supply failures.
- .3 Intrusion and security breach.
- .4 Emergency provisions for natural disasters, bomb threats and other disruptive situations.
- .5 Emergency control procedures for fire, power and major equipment failure.
- .6 Emergency contacts and numbers.
- .7 Manual to be readily available and comprehensible to non- technical readers.

## **1.7 SUPPORTING DOCUMENTATION FOR INSERTION INTO SUPPORTING APPENDICES**

- .1 Provide Departmental Representative supporting documentation relating to installed equipment and system, including:
  - .1 General:
    - .1 Finalized commissioning plan.
    - .2 WHMIS information manual.
    - .3 Approved "as-built" drawings and specifications.
    - .4 Procedures used during commissioning.
    - .5 Cross-Reference to specification sections.
  - .2 Architectural and structural:
    - .1 Inspection certificates, construction permits.
    - .2 Roof anchor log books.
    - .3 PV reports.
  - .3 Mechanical:
    - .1 Installation permits, inspection certificates.
    - .2 Piping pressure test certificates.
    - .3 Ducting leakage test reports.
    - .4 TAB and PV reports.
    - .5 Charts of valves and steam traps.
    - .6 Copies of posted instructions.
  - .4 Electrical:
    - .1 Installation permits, inspection certificates.
    - .2 TAB and PV reports.
    - .3 Electrical work log book.
    - .4 Charts and schedules.
    - .5 Locations of cables and components.
    - .6 Copies of posted instructions.
- .2 Assist Departmental Representative with preparation of BMM.

**1.8 LANGUAGE**

- .1 English and French Language to be in separate binders.

**1.9 USE OF CURRENT TECHNOLOGY**

- .1 Use current technology for production of documentation. Emphasis on ease of accessibility at all times, maintain in up-to-date state, compatibility with user's requirements.
- .2 Obtain Departmental Representative's approval before starting Work.

**Part 2 Products**

**2.1 NOT USED**

- .1 Not used.

**Part 3 Execution**

**3.1 NOT USED**

- .1 Not used.

**END OF SECTION**