

Part 1 General

1.1 WORK COVERED BY CONTRACT DOCUMENTS

- .1 Work of this Contract comprises selective demolition and renovation of an office space located at 740 Sioux Avenue, Fort Qu'Appelle, Saskatchewan, and further identified as INAC Fit-Up.

1.2 CONTRACT METHOD

- .1 Construct Work under single stipulated price contract.

1.3 LAWS, NOTICES, PERMITS AND FEES

- .1 The Consultant has submitted the Plans on behalf of the Departmental Representative to the local authority having jurisdiction for plans examination. The Contractor will be required to pick-up the Building Permit from the AHJ and pay the cost based on the tender amount. Include the cost in the Bid Price.

1.4 SUPPLEMENTARY INFORMATION FOR PROGRESS PAYMENTS

- .1 Submit a detailed breakdown of costs for each elemental section into three funding accountabilities within 5 business days of Contract Award and with every change to the project. The funding accountability will be detailed as directed, and on a form provided by the Departmental Representative, for parts of Work, aggregating total amount of Contract Price, to facilitate evaluation of application for payments. After review by Departmental Representative, cost breakdown will be used as basis for progress payment.

1.5 WORK BY OTHERS

- .1 Co-operate with other Contractors in carrying out their respective works and carry out instructions from Departmental Representative.
- .2 Co-ordinate work with that of other Contractors. If any part of work under this Contract depends for its proper execution or result upon work of another Contractor, report promptly to Departmental Representative, in writing, any defects which may interfere with proper execution of Work.
- .3 Work by Others that is specifically excluded from this Contract is indicated on the Drawings.

1.6 CONTRACTOR USE OF PREMISES

- .1 Unrestricted use of site until Substantial Performance.
- .2 Limit use of premises for Work, for storage, for access, to allow:
 - .1 Work by other contractors.
- .3 Co-ordinate use of premises under direction of Departmental Representative.
- .4 Obtain and pay for use of additional storage or work areas needed for operations under this Contract.

- .5 Remove or alter existing work to prevent injury or damage to portions of existing work that remain.
- .6 Repair or replace portions of existing work that have been altered during construction operations to match existing or adjoining work, as directed by Departmental Representative.
- .7 At completion of operations condition of existing work: equal to or better than that which existed before new work started.

1.7 DEPARTMENTAL REPRESENTATIVE FURNISHED ITEMS

- .1 Departmental Representative Responsibilities:
 - .1 Arrange for delivery of shop drawings, product data, samples, manufacturer's instructions, and certificates to Contractor.
 - .2 Deliver supplier's bill of materials to Contractor.
 - .3 Arrange and pay for delivery to site in accordance with Progress Schedule.
 - .4 Inspect deliveries jointly with Contractor.
 - .5 Submit claims for transportation damage.
 - .6 Arrange for replacement of damaged, defective or missing items.
 - .7 Arrange for manufacturer's field services; arrange for and deliver manufacturer's warranties and bonds to Contractor.
- .2 Contractor Responsibilities:
 - .1 Designate submittals and delivery date for each product in progress schedule.
 - .2 Review shop drawings, product data, samples, and other submittals. Submit to Departmental Representative notification of observed discrepancies or problems anticipated due to non-conformance with Contract Documents.
 - .3 Receive and unload products at site.
 - .4 Inspect deliveries jointly with Departmental Representative; record shortages, and damaged or defective items.
 - .5 Handle products at site, including uncrating and storage.
 - .6 Protect products from damage, and from exposure to elements.
 - .7 Assemble, install, connect, adjust, and finish products.
 - .8 Provide installation inspections required by public authorities.
 - .9 Repair or replace items damaged by Contractor or subcontractor on site (under his control).

1.8 ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING BUILDING

- .1 Execute work with least possible interference or disturbance to building operations, occupants, public and normal use of premises. Arrange with Departmental Representative to facilitate execution of work.
- .2 Use designated elevators in building for moving workers and material.

- .1 Protect walls of passenger elevators, to approval of Departmental Representative, prior to use.
- .2 Accept liability for damage, safety of equipment and overloading of existing equipment.

1.9 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 tenant operations.
- .3 Establish location and extent of service lines in area of work before starting Work. Notify Departmental Representative of findings.
- .4 Submit schedule to and obtain approval from Departmental Representative for shut-down or closure of active service or facility including power and communications services. Adhere to approved schedule and provide notice to affected parties.
- .5 Provide temporary services when directed by Departmental Representative to maintain critical building and tenant systems.
- .6 Provide adequate bridging over trenches that cross sidewalks or roads to permit normal traffic.
- .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 53 00 – Temporary Construction.

1.10 DOCUMENTS REQUIRED

- .1 Successful bidding Contractor is to obtain required sets of Contract Documents for construction purposes, which includes two (2) sets for "as-built" and record purposes.
 - .1 Contractor is responsible for costs of printing, handling, and shipping of Contract Documents.
- .2 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
Not used.

Part 3 Execution
Not used.

END OF SECTION

Part 1 General

1.1 ACCESS AND EGRESS

- .1 Design, construct, and maintain temporary "access to" and "egress from" work areas, including stairs, runways, ramps, 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 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, public 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' notice for necessary interruption of mechanical or electrical service. Keep duration of interruptions to a minimum. Carry out interruptions after normal working hours of occupants, preferably on weekends.
- .3 Provide for personnel, pedestrian, and vehicular traffic.
- .4 Construct barriers in accordance with Section 01 53 00 - Temporary Construction.

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 Section 01 32 16 - 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.

1.6 SECURITY

- .1 Contractors will require an escort to rooms 208 and 221 where SSC equipment is located.

1.7 BUILDING SMOKING ENVIRONMENT

- .1 Comply with smoking restrictions.
- .2 Smoking is not permitted inside building.
- .3 Confirm, with building management, outdoor locations where personnel may smoke.

Part 2 Products

Not used.

Part 3 Execution

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; transmit to Departmental Representative, meeting participants, and affected parties not in attendance.
- .8 Representatives 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 five days before meeting.
- .4 Incorporate mutually agreed variations to Contract Documents into Agreement, prior to signing.
- .5 Agenda to include:
 - .1 Appointment of official representative of participants in the Work.
 - .2 Schedule of Work: in accordance with Section 01 32 16 - Construction Progress 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, offices, storage sheds, utilities in accordance with Section 01 52 00 - Construction Facilities.
 - .5 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements.
 - .6 Departmental Representative-provided products.
 - .7 Record drawings in accordance with Section 01 33 00 - Submittal Procedures.

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

1.3 PROGRESS MEETINGS

- .1 During course of Work and two weeks prior to project completion, schedule progress meetings bi-weekly.
- .2 Contractor, major Subcontractors involved in Work, and Departmental Representative are to be in attendance.
- .3 Notify parties minimum three days prior to meetings.
- .4 Record minutes of meetings; circulate to attending parties and affected parties not in attendance within three 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 that 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 and expedite as required.
 - .10 Maintenance of quality standards.
 - .11 Review proposed changes for effect on construction schedule and on completion date.
 - .12 Other business.

Part 2 Products
Not used.

Part 3 Execution
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 non-working 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 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 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit to Departmental Representative within 10 working days of Award of Contract Bar (GANTT) Chart as Master Plan for planning, monitoring and reporting of project progress.
- .3 Submit Project Schedule to Departmental Representative within 5 working days of receipt of acceptance of Master Plan.

1.4 MASTER PLAN

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

1.5 PROJECT SCHEDULE

- .1 Develop detailed Project Schedule derived from Master Plan.
- .2 Ensure detailed Project Schedule includes as minimum milestone and activity types as follows:
 - .1 Award.
 - .2 Shop Drawings, Samples.
 - .3 Permits.
 - .4 Mobilization.
 - .5 Interior Architecture (Walls, Floors).
 - .6 Work to be performed by Landlord.
 - .7 Plumbing.
 - .8 Lighting.
 - .9 Electrical.
 - .10 Piping.
 - .11 Controls.
 - .12 Heating, Ventilating, and Air Conditioning.
 - .13 Millwork.
 - .14 Fire Systems.
 - .15 Testing and Commissioning.
 - .16 Supplied equipment long delivery items.
 - .17 Engineer-supplied equipment required dates.

1.6 PROJECT SCHEDULE REPORTING

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

1.7 PROJECT MEETINGS

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

Part 2 Products

Not used.

Part 3 Execution

Not used.

END OF SECTION

Part 1 General

1.1 ADMINISTRATIVE

- .1 Provide submittals listed for review to Departmental Representative. 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 for 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 are 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 at time of submission, in writing, 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 that are to be provided by Contractor to illustrate details of a portion of Work.
- .2 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Saskatchewan.
- .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 10 working 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 copies 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 to 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:
 - .1 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.
 - .16 Submit electronic copies of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Departmental Representative.
 - .17 Delete information not applicable to project.
 - .18 Supplement standard information to provide details applicable to project.
 - .19 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.
 - .20 The review of shop drawings by Public Works and Government Services Canada (PWGSC) is for sole purpose of ascertaining conformance with general concept.

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

1.4 PHOTOGRAPHIC DOCUMENTATION

- .1 Submit electronic copy of colour digital photography in jpg format, standard resolution, 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 location: As determined by Departmental Representative.
- .4 Frequency of photographic documentation: As directed by Departmental Representative.
 - .1 Upon completion of: Framing and services before concealment of Work, and as directed by Departmental Representative.

Part 2 Products

Not used.

Part 3 **Execution**
Not used.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations
- .2 Province of Saskatchewan
 - .1 Occupational Health and Safety Act 1996, updated 2014.

1.2 SAFETY PLAN

- .1 Develop written site-specific Health and Safety Plan based on hazard assessment prior to beginning site Work and continue to implement, maintain, and enforce plan until final demobilization from site. Health and Safety Plan must address project specifications.
- .2 Departmental Representative may respond in writing, where deficiencies or concerns are noted and may request re-submission with correction of deficiencies or concerns.

1.3 RESPONSIBILITY

- .1 The "Prime Contractor" according applicable local jurisdiction, is responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.
- .2 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

1.4 SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit site-specific Health and Safety Plan within 7 days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include:
 - .1 Results of site-specific safety hazard assessment.
 - .2 Results of safety and health risk or hazard analysis for site tasks and operation.
- .3 Submit 2 copies of Contractor's authorized representative's work site health and safety inspection reports weekly to Departmental Representative.
- .4 Submit copies of reports or directions issued by Federal, Provincial and Territorial health and safety inspectors.
- .5 Submit copies of incident and accident reports.
- .6 Submit WHMIS MSDS - Material Safety Data Sheets.
- .7 Departmental Representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within 10 days after receipt of plan. Revise plan as appropriate and resubmit plan to Departmental

Representative within 5 days after receipt of comments from Departmental Representative.

- .8 Departmental Representative review of Contractor's final Health and Safety plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction Health and Safety.
- .9 Medical Surveillance: Where prescribed by legislation, regulation or safety program, submit certification of medical surveillance for site personnel prior to commencement of Work, and submit additional certifications for any new site personnel to Departmental Representative.
- .10 On-site Contingency and Emergency Response Plan: address standard operating procedures to be implemented during emergency situations.

1.5 FILING OF NOTICE

- .1 If required by authority having jurisdiction, file Notice of Project with Provincial authorities prior to beginning of Work.

1.6 SAFETY ASSESSMENT

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

1.7 MEETINGS

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

1.8 REGULATORY REQUIREMENTS

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

1.9 COMPLIANCE REQUIREMENTS

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

1.10 UNFORESEEN HAZARDS

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

1.11 HEALTH AND SAFETY CO-ORDINATOR

- .1 Employ and assign to Work, competent and authorized representative as Health and Safety Co-ordinator. Health and Safety Co-ordinator must:
 - .1 Have working knowledge of occupational safety and health regulations.
 - .2 Be responsible for completing Contractor's Health and Safety Training Sessions and ensuring that personnel not successfully completing required training are not permitted to enter site to perform Work.

- .3 Be responsible for implementing, enforcing daily and monitoring site-specific Contractor's Health and Safety Plan.
- .4 Be on site during execution of Work.

1.12 POSTING OF DOCUMENTS

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

1.13 CORRECTION OF NON-COMPLIANCE

- .1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by Departmental Representative.
- .2 Provide Departmental Representative with written report of action taken to correct non-compliance of health and safety issues identified.
- .3 Departmental Representative may stop Work if non-compliance of health and safety regulations is not corrected.

1.14 BLASTING

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

1.15 POWDER ACTUATED DEVICES

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

1.16 WORK STOPPAGE

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

1.17 FIRE PROTECTION

- .1 Comply with requirements of the local Fire Commissioner's Office.
- .2 Provide and maintain temporary fire protection equipment during performance of Work required by governing codes, regulations and bylaws.
- .3 Burning rubbish and construction waste materials is not permitted on site.
- .4 Maintain placed or installed firestopping to protect the portions of the Work during construction.

Part 2 Products
Not used.

Part 3 Execution
Not used.

END OF SECTION

Part 1 General

1.1 REFERENCES AND CODES

- .1 Perform Work in accordance with 2015 National Building Code of Canada (NBC) including amendments up to tender closing date, and other codes of provincial or local application; in case of conflict or discrepancy, more stringent requirements apply. The following governing standards are also to apply.
 - .1 Canadian Electrical Code, 2015.
 - .2 National Plumbing Code of Canada, 2015.
 - .3 National Fire Code of Canada, 2015.
- .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 if material resembling spray or trowel-applied asbestos is encountered during demolition work. Notify Departmental Representative.
- .2 PCB: Polychlorinated Biphenyl: Stop work immediately if material resembling Polychlorinated Biphenyl is encountered during demolition work. Notify Departmental Representative.
- .3 Mould: Stop work immediately if 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

Not used.

Part 3 Execution

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 wherever it is in progress.
- .2 Give timely notice requesting inspection if Work is designated for special tests, inspections, or approvals whether by Departmental Representative instructions, or by 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 not be in accordance with Contract Documents. If, upon examination, such work is found not in accordance with Contract Documents, correct Work and pay cost of examination and correction. If Work is found in accordance with Contract Documents, cost of examination and replacement will be borne by Departmental Representative.

1.2 INDEPENDENT INSPECTION AGENCIES

- .1 Independent Inspection/Testing Agencies may be engaged by Departmental Representative for purpose of inspecting and 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 testing, appointed agency will request additional inspection and 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 re-inspection.

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 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, Owner will deduct from Contract Price difference in value between Work performed and that called for by Contract Documents, amount of which will be determined by Departmental Representative.

1.6 REPORTS

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

1.7 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's review with reasonable promptness and in orderly sequence, to not cause delays in Work.
- .4 Failure to prepare mock-ups in ample time is not considered sufficient reason for extension of Contract Time, and no claim for extension for such default will be allowed.
- .5 If requested, Departmental Representative will assist in preparing schedule-fixing dates for preparation.

- .6 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.
- .2 Refer to Section 01 91 31 – Commissioning Plan for definitive requirements.

Part 2 Products

Not used.

Part 3 Execution

Not used.

END OF SECTION

Part 1 General

1.1 SUBMITTALS

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

1.2 INSTALLATION AND REMOVAL

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

1.3 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.
- .3 Departmental Representative will pay for utility charges at prevailing rates.

1.4 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°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.
- .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 Departmental Representative will pay utility charges when temporary heat source is existing building equipment.
- .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.

1.5 TEMPORARY POWER AND LIGHT

- .1 Departmental Representative will pay for temporary power during construction for temporary lighting and operating of power tools.
- .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 Departmental Representative.
- .4 Provide and maintain temporary lighting throughout project. Ensure level of illumination on all floors and stairs is not less than 162 lx.
- .5 Electrical power and lighting systems installed under this Contract may be used for construction requirements only with prior approval of Departmental Representative, provided guarantees are not affected. Make good damage to electrical system caused by use under this Contract. Replace lamps that have been used for more than 3 months.

FIRE PROTECTION

- .6 Provide and maintain temporary fire protection equipment during performance of Work required by governing codes, regulations and bylaws.
- .7 Burning rubbish and construction waste materials is not permitted on site.

Part 2 Products

Not used.

Part 3 Execution

Not used.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CAN/CSA S269.2-M87 (R2003), Access Scaffolding for Construction Purposes.
- .2 Public Works Government Services Canada (PWGSC) Standard Acquisition Clauses and Conditions (SACC)-ID: R0202D, Title: General Conditions 'C', In Effect as of: May 14, 2004.

1.2 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 that require gravel to prevent tracking of mud.
- .3 Indicate use of supplemental or other staging area.
- .4 Provide construction facilities to execute work expeditiously.
- .5 Remove from site all such work after use.

1.4 SCAFFOLDING

- .1 Scaffolding in accordance with CSA S269.2.
- .2 Provide and maintain scaffolding, ramps, ladders, swing staging, platforms, temporary stairs.

1.5 HOISTING

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

1.6 ELEVATORS

- .1 Designated existing elevators are to be used by construction personnel and for transporting of materials. Co-ordinate use with Departmental Representative.
- .2 Provide protective coverings for finish surfaces of cars and entrances.

1.7 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.

1.8 CONSTRUCTION PARKING

- .1 Parking will be permitted on site provided it does not disrupt performance of Work.
- .2 Provide and maintain adequate access to project site.
- .3 Clean runways and taxi areas where used by Contractor's equipment.

1.9 SECURITY

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

1.10 OFFICES

- .1 Provide office heated to 22°C, lighted 750 lx, ventilated, and 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.

1.11 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.

1.12 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.

1.13 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

Not used.

Part 3 Execution

Not used.

END OF SECTION

Part 1 General

1.1 INSTALLATION AND REMOVAL

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

1.2 GUARD RAILS AND BARRIERS

- .1 Provide secure, rigid guard rails and barricades around open shafts, open stair wells, along side retaining walls, open edges of floors and roofs.
- .2 Provide as required by governing authorities.

1.3 DUST TIGHT BARRIERS

- .1 Provide dust tight barriers and screens or partitions to localize dust generating activities, and for protection of workers and finished areas of Work.
- .2 Maintain and relocate protection until such work is complete.
- .3 Coordinate location and security measures with Departmental Representative on Site.

1.4 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.

1.5 PROTECTION OF APPLIED FINISHES

- .1 Provide protection for finished and partially finished surfaces and equipment during performance of Work.
- .2 Provide necessary screens, covers, and hoardings.
- .3 Confirm locations and installation schedule with Departmental Representative three (3) days prior to installation.
- .4 Be responsible for damage incurred due to lack of or improper protection.

1.6 PROTECTION OF SURROUNDING WORK

- .1 Provide protection for finished and partially finished Work from damage.
- .2 Provide necessary cover and protection.
- .3 Be responsible for damage incurred due to lack of or proper or appropriate protection.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Within text of each specifications section, reference may be made to reference standards. Conform to these reference standards, in whole or in part as specifically requested in specifications.
- .2 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.
- .3 Cost for such testing will be borne by Departmental Representative in event of conformance with Contract Documents or by Contractor in event of non-conformance.

1.2 QUALITY OF PRODUCTS

- .1 Products, materials, equipment, and articles incorporated in Work are to be new, not damaged nor 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 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 nameplates.

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 by Departmental Representative. Unload, handle, and store such products.

1.6 MANUFACTURER'S INSTRUCTIONS

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

1.7 QUALITY OF WORK

- .1 Ensure Quality of Work is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed. Immediately notify

Departmental Representative if required Work is such as to make it impractical to produce required results.

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

1.8 CO-ORDINATION

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

1.9 CONCEALMENT

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

1.10 REMEDIAL WORK

- .1 Refer to Section 01 73 00 - Execution Requirements.
- .2 Perform remedial work required to repair or replace parts or portions of Work identified as defective or unacceptable. Co-ordinate adjacent affected Work as required. Perform in a manner to neither damage nor put at risk any portion of Work.
- .3 For remedial work, employ specialists familiar with materials affected.

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 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.

Part 2 Products
Not used.

Part 3 Execution
Not used.

END OF SECTION

Part 1 General

1.1 LOCATION OF EQUIPMENT AND FIXTURES

- .1 Location of equipment, fixtures and outlets indicated or specified are to be considered as approximate.
- .2 Locate equipment, fixtures and distribution systems to provide minimum interference and maximum usable space and in accordance with manufacturer's recommendations for safety, access and maintenance.
- .3 Inform Departmental Representative of impending installation and obtain approval for actual location.
- .4 Submit field drawings to indicate relative position of various services and equipment when required by Departmental Representative.

Part 2 Products

Not used.

Part 3 Execution

Not used.

END OF SECTION

Part 1 General

1.1 SUBMITTALS

- .1 Submit 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 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 separate contractor.
 - .7 Written permission of affected separate contractor.
 - .8 Date and time work will be executed.

1.2 MATERIALS

- .1 As 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 that 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 parts together, to integrate with other Work.

- .3 Uncover Work to install ill-timed Work.
- .4 Remove and replace defective and non-conforming Work.
- .5 Provide openings in non-structural elements of Work for penetrations of mechanical and electrical Work.
- .6 Execute Work by methods to avoid damage to other Work, and that will provide proper surfaces to receive patching and finishing.
- .7 Cut rigid materials using masonry saw or core drill. Pneumatic or impact tools not allowed on masonry work without prior approval.
- .8 Restore work with new products in accordance with requirements of Contract Documents.
- .9 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.
- .10 Refinish surfaces to match adjacent finishes: Refinish continuous surfaces to nearest intersection. Refinish assemblies by refinishing entire unit.
- .11 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 Remove waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

Part 2 Products

Not used.

Part 3 Execution

Not used.

END OF SECTION

Part 1 General

1.1 PROJECT CLEANLINESS

- .1 Maintain Work in tidy condition, free from accumulation of waste products and debris, other than that caused by Owner or other Contractors.
- .2 Remove waste materials from site at daily regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site, unless approved by Departmental Representative.
- .3 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .4 Provide on-site containers for collection of waste materials and debris.
- .5 Provide and use marked separate bins for recycling. Refer to Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .6 Dispose of waste materials and debris off site.
- .7 Clean interior areas prior to start of finishing work, and maintain areas free of dust and other contaminants during finishing operations.
- .8 Store volatile waste in covered metal containers, and remove from premises at end of each working day.
- .9 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.
- .10 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.
- .11 Schedule cleaning operations so that resulting dust, debris, and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

1.2 FINAL CLEANING

- .1 When Work is Substantially Performed, remove surplus products, tools, construction machinery, and equipment not required for performance of remaining Work.
- .2 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.
- .3 Prior to final review remove surplus products, tools, construction machinery, and equipment.
- .4 Remove waste products and debris other than that caused by Owner or other Contractors.
- .5 Remove waste materials from site at regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site.
- .6 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.

- .7 Clean and polish glass, mirrors, hardware, wall tile, stainless steel, chrome, porcelain enamel, baked enamel, plastic laminate, and mechanical and electrical fixtures. Replace broken, scratched or disfigured glass.
- .8 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, walls, and floors.
- .9 Clean lighting reflectors, lenses, and other lighting surfaces.
- .10 Vacuum clean and dust building interiors, behind grilles and screens.
- .11 Wax, seal, shampoo or prepare floor finishes, as recommended by manufacturer.
- .12 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.
- .13 Clean equipment and fixtures to sanitary condition; clean or replace filters of mechanical equipment.
- .14 Remove debris and surplus materials from crawl areas and other accessible concealed spaces.

1.3 WASTE MANAGEMENT AND DISPOSAL

- .1 Remove waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

Part 2 Products
Not used.

Part 3 Execution
Not used.

END OF SECTION

Part 1 General

1.1 STORAGE, HANDLING AND PROTECTION

- .1 Store materials to be re-used in locations as directed by Departmental Representative.
- .2 Unless specified otherwise, materials for removal become Contractor's property.
- .3 Protect structural components not removed for demolition from movement or damage.
- .4 Support affected structures. If safety of building is endangered, cease operations and immediately notify Departmental Representative.
- .5 Protect drainage, mechanical, and electrical systems from damage and blockage.

1.2 DISPOSAL OF WASTES

- .1 Remove waste materials as deconstruction/disassembly Work progresses.
- .2 Do not dispose of waste, volatile materials, mineral spirits, oil, nor paint thinner into waterways, storm, or sanitary sewers.

Part 2 Products

Not used.

Part 3 Execution

3.1 APPLICATION

- .1 Handle waste materials in accordance with appropriate regulations and codes.

3.2 CLEANING

- .1 Remove tools and waste materials on completion of Work, and leave work area in clean and orderly condition.
- .2 Clean-up work area as work progresses.

3.3 DIVERSION OF MATERIALS

- .1 On-site sale of salvaged, recovered, reusable, and recyclable material is not permitted.

END OF SECTION

Part 1 General

1.1 ADMINISTRATIVE REQUIREMENTS

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

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: Remove waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

Part 2 **Products**
Not used.

Part 3 **Execution**
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 Contractor's Representative and Departmental Representative, in accordance with Section 01 31 19 - Project Meetings to:
 - .1 Verify Project requirements.
 - .2 Review warranty requirements.
 - .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 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, two print 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 MECHANICAL AND ELECTRICAL SUBMITTALS

- .1 For submittals related to Mechanical work, refer to Section 21 05 01.
- .2 For submittals related to Electrical work, refer to Section 26 05 00.

1.4 O&M MANUALS - 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 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.
- .6 Text: Manufacturer's printed data, or typewritten data.
- .7 Drawings: Provide with reinforced punched binder tab.
 - .1 Bind in with text; fold larger drawings to size of text pages.
- .8 Provide 1:1 scaled CAD files in .dwg format on CD or DVD.

1.5 O&M MANUALS - CONTENTS

- .1 Binder Cover and Binder Edge
 - .1 Include: Building Name, address, project name, project number (GOC#), completed date.
- .2 Title Page
 - .1 O&M Manual for... Building name, address, date, general contractor information: name address, phone number.
 - .2 Consultant name address, phone number.
 - .3 Table of contents indicates each binder's contents.
- .3 Index and tabs
 - .1 Dividers with permanently marked tabs separate each section and sub section.
 - .2 Tab labels typed, not hand written.
 - .3 Main tab for each specification section.
- .4 Tab A: Signed Letter of Warranty, to include:
 - .1 Date.
 - .2 Project name.
 - .3 Project number (GOC#).
 - .4 Building Location.
 - .5 Warranty start date and end, to be from date of substantial, declared by Consultant.
 - .6 Organization, names and phone numbers of persons to call for warranty services.
 - .7 All warranties to be included from all contractors in this section and extended warranties.
- .5 Tab B: Contact Information for all Subcontractors and Suppliers, including:
 - .1 Name, address, telephone number of manufacturer, installing contractor.
 - .2 24-hour number for emergency service for all equipment in this section identified by equipment.
- .6 Tab C: All Reports and Permits:
 - .1 TAB reports.
 - .2 Pre-functional tests.
 - .3 Start up reports.

- .4 Completed performance verification forms (found in the Tender Documents).
- .5 Cabling verifications.
- .6 ESA certification.
- .7 TSSA certification.
- .8 Fire alarm certification.
- .9 Seismic certification.
- .10 All permits, including electrical, building, plumbing.
- .7 Tab D: As-Built Drawings:
 - .1 Marked-up by contractor, changes marked in red to also be given to Consultant.
- .8 Tab E: Operation and Shutdown:
 - .1 Sequence of Operation-outline how the systems installed were designed to work.
 - .2 Accurate Sequence of Operation, with detailed instruction in proper sequence, for each mode of operation.
 - .3 Emergency Operation: Functions of equipment that can be operated while other functions disabled. Included only for alternate abnormal operations that can follow when there is a partial failure, malfunctioning of components, or other unusual condition.
 - .4 Shutdown Procedure: Instructions for stopping and securing the equipment after operation. If a particular sequence is required, step-by-step instructions given in that order.
- .9 Tab F: CMMS Data Sheets:
 - .1 All equipment that is to be deleted, removed, added, or replaced is to have a CMMS inventory sheet completed and included in the O&M Manual.
- .10 Tab G: Shop Drawings:
 - .1 Copy of all reviewed "by the Consultant" shop drawings.
- .11 Tab H: Maintenance:
 - .1 Copy of specific service and maintenance manuals.
 - .2 Preventative and corrective maintenance, with service procedures and schedules.
 - .3 Schedule for preventive maintenance in a printed format and electronic format compatible with Owner's system.
 - .4 Recommended frequency of performance for each preventive maintenance task, cleaning, inspection and scheduled overhauls or reconditioning.
 - .5 Cleaning: Instructions and schedules for all routine cleaning and inspection recommended, including recommended cleaners and lubricants.

- .6 Inspection: Periodic inspection of equipment required for operation, cleaning or other reasons, with items to be inspected indicated and inspection criteria given for motors, controls, filters, and any other maintenance items.
- .7 Instructions for minor repairs or adjustments required for preventive maintenance routines.
- .8 Listing of any special tools required to service or maintain the equipment.
- .12 Last Tab: Miscellaneous Items:
 - .1 Health and Safety submittals including: site specific hazard assessment, safety manual TOC and company safety policy, MSDS sheets (if applicable) signed site orientations for worker, copy of first aid certificate, copy of emergency plan and muster location.
 - .2 Special requirements for equipment, not to be used for reports.

1.6 AS-BUILT DOCUMENTS AND SAMPLES

- .1 Maintain, in addition to requirements in General Conditions, at site for Departmental Representative one record copy of:
 - .1 Contract Drawings.
 - .2 Specifications.
 - .3 Addenda.
 - .4 Change Orders and other modifications to Contract.
 - .5 Reviewed shop drawings, product data, and samples.
 - .6 Field test records.
 - .7 Inspection certificates.
 - .8 Manufacturer's certificates.
- .2 Store as-built documents and samples in field office apart from documents used for construction.
 - .1 Provide files, racks, and secure storage.
- .3 Label as-built documents and file in accordance with Section number listings in List of Contents of this Project Manual.
 - .1 Label each document "AS-BUILT DOCUMENTS" in neat, large, printed letters.
- .4 Maintain as-built documents in clean, dry and legible condition.
 - .1 Do not use as-built documents for construction purposes.
- .5 Keep as-built documents and samples available for inspection by Departmental Representative.
- .6 Record as-built information on drawings and in designated copy of Project Manual provided by Departmental Representative.
- .7 Record information concurrently with construction progress. Do not conceal Work until required information is recorded.

- .8 Maintain information during construction on project site drawings and accurately record deviations of newly installed or existing works from Contract documents.
- .9 Use red felt tip marking pens for recording information.
- .10 Mark on one set of prints and at completion of project and prior to final inspection; neatly transfer notations to second set.
- .11 Ensure but do not limit recording of following information on as-built drawings:
 - .1 Locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of structure.
 - .2 Changes made by Change Order.
 - .3 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.
 - .4 Field changes of dimension and detail.
 - .5 Details not on original Contract Drawings.
 - .6 References to related shop drawings and modifications.
- .12 Incorporate as-built information into CAD drawings.
- .13 Submit as-built drawings to Departmental Representative.
 - .1 Provide in electronic form as CAD .dwg format, on CD or DVD.
- .14 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.

1.7 RECORD DOCUMENTS

- .1 Prior to Substantial Performance of the Work, provide on CD or DVD the marked-up information from the as-built documents to a master set of drawing files provided by the Departmental Representative:
- .2 Mark revised documents as "RECORD DOCUMENTS". Include all revisions.
- .3 Indicate changes on the electronic set of record drawings. Provide updated record drawings in .dwg format.
- .4 Submit completed record documents to Departmental Representative on CD or DVD.

1.8 EQUIPMENT AND SYSTEMS

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

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

1.9 MATERIALS AND FINISHES

- .1 Building products, applied materials, and finishes: include product data, with catalogue number, size, composition, and colour and texture designations.
- .2 Instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- .3 Moisture-protection and weather-exposed products: include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- .4 Additional requirements: as specified in individual specifications sections.

1.10 MAINTENANCE MATERIALS

- .1 Spare Parts:
 - .1 Provide spare parts, in quantities specified in individual specification sections.
 - .2 Provide items of same manufacture and quality as items in Work.
 - .3 Deliver to 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.

1.11 DELIVERY, STORAGE AND HANDLING

- .1 Store spare parts, maintenance materials, and special tools in manner to prevent damage or deterioration.
- .2 Store in original and undamaged condition with manufacturer's seal and labels intact.
- .3 Store components subject to damage from weather in weatherproof enclosures.
- .4 Store paints and freezable materials in a heated and ventilated room.
- .5 Remove and replace damaged products at own expense and for review by Departmental Representative.

1.12 WARRANTIES AND BONDS

- .1 Develop warranty management plan to contain information relevant to Warranties.
- .2 Submit warranty management plan, 30 days before planned pre-warranty conference, to Departmental Representative approval.
- .3 Warranty management plan to include required actions and documents to assure that Departmental Representative receives warranties to which it is entitled.

- .4 Provide plan in narrative form and contain sufficient detail to make it suitable for use by future maintenance and repair personnel.
- .5 Submit warranty information made available during construction phase, to Departmental Representative for review prior to each monthly pay estimate.
- .6 Assemble approved information in binder, submit upon acceptance of work and organize binder as follows:
 - .1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.
 - .2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.
 - .3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten days after completion of applicable item of work.
 - .4 Verify that documents are in proper form, contain full information, and are notarized.
 - .5 Co-execute submittals when required.
 - .6 Retain warranties and bonds until time specified for submittal.
- .7 Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial Performance is determined.
- .8 Conduct joint 4 month and 9 month warranty inspection, measured from time of acceptance, by Departmental Representative.
- .9 Include information contained in warranty management plan as follows:
 - .1 Roles and responsibilities of personnel associated with warranty process, including points of contact and telephone numbers within the organizations of Contractors, subcontractors, manufacturers or suppliers involved.
 - .2 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.
- .3 Contractor's plans for attendance at 4 and 9 month post-construction warranty inspections.
- .4 Procedure and status of tagging of equipment covered by extended warranties.
- .5 Post copies of instructions near selected pieces of equipment where operation is critical for warranty and/or safety reasons.
- .10 Respond in timely manner to oral or written notification of required construction warranty repair work.
- .11 Written verification to follow oral instructions.
 - .1 Failure to respond will be cause for the Departmental Representative to proceed with action against Contractor.

1.13 WARRANTY TAGS

- .1 Tag, at time of installation, each warranted item. Provide durable, oil and water resistant tag approved by Departmental Representative.
- .2 Attach tags with copper wire and spray with waterproof silicone coating.
- .3 Leave date of acceptance until project is accepted for occupancy.
- .4 Indicate following information on tag:
 - .1 Type of product/material.
 - .2 Model number.
 - .3 Serial number.
 - .4 Contract number.
 - .5 Warranty period.
 - .6 Inspector's signature.
 - .7 Construction Contractor.

Part 2 Products

Not Used.

Part 3 Execution

Not Used.

END OF SECTION

Part 1 General

1.1 ADMINISTRATIVE REQUIREMENTS

- .1 Demonstrate operation and maintenance of equipment and systems to designated personnel two weeks prior to date of substantial performance.
- .2 Departmental Representative: Provide list of personnel to receive instructions, and co-ordinate their attendance at agreed-upon times.
- .3 Preparation:
 - .1 Verify conditions for demonstration and instructions comply with requirements.
 - .2 Verify designated personnel are present.
 - .3 Ensure equipment has been inspected and put into operation in accordance with Section 01 91 13 – General Commissioning Requirements.
 - .4 Ensure testing, adjusting, and balancing have been performed in accordance with Section 01 91 13 - General Commissioning (Cx) Requirements, and equipment and systems are fully operational.
- .4 Demonstration and Instructions:
 - .1 Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, and maintenance of each item of equipment at agreed-upon times, at the equipment location.
 - .2 Instruct personnel in phases of operation and maintenance using operation and maintenance manuals as basis of instruction.
 - .3 Review contents of manual in detail to explain aspects of operation and maintenance.
 - .4 Prepare and insert additional data in operations and maintenance manuals when needed during instructions.
- .5 Time Allocated for Instructions: Ensure amount of time provided for instruction of each item of equipment or system is adequate for full orientation and training of designated personnel.

1.2 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit schedule of time and date for demonstration of each item of equipment and each system two weeks prior to designated dates, for Departmental Representative's approval.
- .3 Submit reports within one week after completion of demonstration, that demonstration and instructions have been satisfactorily completed.
- .4 Give time and date of each demonstration, with list of persons present.
- .5 Provide copies of completed operation and maintenance manuals for use in demonstrations and instructions.

1.3 QUALITY ASSURANCE

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

Part 2 Products
Not used.

Part 3 Execution
Not used.

END OF SECTION

PART 1 GENERAL**1.1 REFERENCES**

- .1 CSA Z320-11 – Building Commissioning Standard and Check Sheets.

1.2 SUMMARY

- .1 Section Includes:
 - .1 General requirements relating to commissioning of project's components and systems, specifying general requirements to functional performance testing of components, equipment, sub-systems, systems, and integrated systems.
- .2 Acronyms:
 - .1 Cx - Commissioning.
 - .2 EMCS - Energy Monitoring and Control Systems.
 - .3 FPT – Functional Performance Testing.
 - .4 O & M - Operation and Maintenance.
 - .5 TAB - Testing, Adjusting, and Balancing.

1.3 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 Functional Performance Testing responsibilities have been completed. Objectives:
 - .1 Verify installed equipment, systems, and integrated systems operate in accordance with contract documents, and design criteria and intent.
 - .2 Effectively train O & M staff.
- .2 Basis of Design - The basis of design is the documentation of the primary thought processes and assumptions behind design decisions that were made to meet the Owner's Project Requirements. The basis of design describes the systems, components, conditions and methods chosen to meet the intent. Some reiterating of the Owner's Project Requirements may be included.
- .3 Owner's Project Requirements: Dynamic document that provides the explanation of the ideas, concepts and criteria that are considered to be very important to the Owner. It is initially the outcome of the programming and conceptual design phases.
- .4 Contractor to appoint Contractor's Cx agent and assist 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.
- .5 Design Criteria: Client's requirements or determined by designer. To meet Project functional and operational requirements.

1.4 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.
- .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 that 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 include transfer of critical knowledge to facility operational personnel.
- .6 Departmental Representative will issue Interim Acceptance Certificate when:
 - .1 Completed Cx documentation has been received and reviewed for suitability by Departmental Representative.
 - .2 Equipment, components and systems have been fully commissioned and functional as per the design intent within the context of the Owner Requirement.
 - .3 Final O&M and Training Manual received, review and approve by Departmental Representative for suitability.
 - .4 Completion of Training session Operational and Maintenance staff.

1.5 NON-CONFORMANCE TO FUNCTIONAL PERFORMANCE 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 non-functional 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. Costs to be in form of progress payment reductions or hold-back assessments.

1.6 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.

INAC Fit-Up

Fort Qu'Appelle, Saskatchewan

Page 3 of 10

- .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, and 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.

1.7 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.

1.8 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.

1.9 COMMISSIONING DOCUMENTATION

- .1 Refer to Section 01 91 33 - Commissioning (Cx) Forms for requirements and instructions for use.

INAC Fit-Up

Fort Qu'Appelle, Saskatchewan

Page 4 of 10

- .2 Departmental Representative to review and approve Cx documentation.
- .3 Provide completed and approved Cx documentation to Departmental Representative.

1.10 COMMISSIONING SCHEDULE

- .1 Provide detailed Cx schedule as part of construction schedule in accordance with Section 01 32 16 - Construction Progress Schedules - Bar (GANTT) Chart. Update schedule as necessary during the work to reflect progress on components and systems.
- .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.

1.11 COMMISSIONING MEETINGS

- .1 Convene Cx meetings following project meetings: Section 01 32 16 - Construction Progress Schedules - Bar (GANTT) Chart and as specified.
- .2 Purpose: 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, 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 Contractor, who will record and distribute minutes.
- .7 Ensure subcontractors and relevant manufacturer representatives are present at 60% and subsequent Cx meetings and as required.

1.12 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.

1.13 WITNESSING OF STARTING AND TESTING

- .1 Provide 14 days notice prior to commencement.

INAC Fit-Up

Fort Qu'Appelle, Saskatchewan

Page 5 of 10

- .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.

1.14 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 Confirm review of test results and documentation from Departmental Representative before delivery to site.
- .2 Obtain manufacturers' installation, start-up, and operations instructions and review with Departmental Representative prior to start-up of components, equipment, and systems.
 - .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.

1.15 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 static verification 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 functional performance testing: Include repetition of tests after correcting deficiencies.
 - .5 Post-substantial verification: Include fine-tuning.

INAC Fit-Up

Fort Qu'Appelle, Saskatchewan

Page 6 of 10

- .3 Correct deficiencies and obtain approval from Departmental Representative after distinct phases have been completed and before commencing next phase.
- .4 Document required tests on approved functional performance testing 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 remove from site and replace with new.
 - .2 Subject new equipment/systems to specified start-up procedures.

1.16 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.

1.17 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.

1.18 TEST RESULTS

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

1.19 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 functional performance testing of systems have been completed.

1.20 INSTRUMENTS / EQUIPMENT

- .1 Submit to Departmental Representative for review:
 - .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.

1.21 COMMISSIONING FUNCTIONAL PERFORMANCE TESTING

- .1 Carry out Cx:
 - .1 Under actual 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 functional performance testing.

1.22 WITNESSING COMMISSIONING

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

1.23 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, with Cx report.

1.24 COMMISSIONING CONSTRAINTS

- .1 Since access into secure or sensitive areas will be very difficult after occupancy it is necessary to complete Cx of occupancy, weather, and seasonal sensitive

equipment and systems in these areas before issuance of the Interim Certificate, using, if necessary, simulated thermal loads.

1.25 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.

1.26 EXTENT OF VERIFICATION

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

1.27 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.

1.28 SUNDRY CHECKS AND ADJUSTMENTS

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

1.29 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.

1.30 COMPLETION OF COMMISSIONING

- .1 Upon completion of Cx leave systems in normal operating mode.

INAC Fit-Up

Fort Qu'Appelle, Saskatchewan

Page 9 of 10

- .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.

1.31 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.

1.32 TRAINING

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

1.33 MAINTENANCE MATERIALS, SPARE PARTS, SPECIAL TOOLS

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

1.34 OCCUPANCY

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

1.35 INSTALLED INSTRUMENTATION

- .1 Use instruments installed under Contract for TAB and functional performance testing 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.

1.36 FUNCTIONAL PERFORMANCE TESTING 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.

INAC Fit-Up

Fort Qu'Appelle, Saskatchewan

Page 10 of 10

1.37 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

Not Used.

PART 3 EXECUTION

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 Society of Heating, Refrigerating, and Air-Conditioning Engineers.
 - .1 ASHRAE Guideline 0-2005, The Commissioning Process.
 - .2 ASHRAE Guideline 1.1-2007, The HVAC Commissioning Process.
- .2 Canadian Standards Association (CSA)
 - .1 CSA Z320-11, Building Commissioning.
- .3 National Fire Protection Association (NFPA)
 - .1 NFPA 13-2013, Installation of Sprinkler Systems.
 - .2 NFPA 14-2013, Installation of Standpipe and Hose Systems.
 - .3 NFPA 20-2013, Installation of Stationary Pumps for Fire Protection.
- .4 Public Works and Government Service Canada (PWGSC)
- .5 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC S537-13 Standard for the Verification of Fire Alarm Systems

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 design 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 EMCS - Energy Monitoring and Control Systems.
 - .3 FPT – Functional Performance Testing.
 - .4 MSDS - Material Safety Data Sheets.
 - .5 TAB - Testing, Adjusting and Balancing.
 - .6 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 the 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 completed Cx Plan for review and further obtain Departmental Representative's 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 4 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 PSPC Quality Assurance Commissioning Manager: Confirm Cx processes, forms, and procedures are developed in the Cx Plan by the Departmental Representative to deliver a fully operational project.
 - .3 Departmental Representative is responsible for:
 - .1 Work closely with members of Cx Team.
 - .2 Monitoring of Cx activities, training, development of Cx documentation.
 - .3 Protection of health, safety, and comfort of occupants and O & M personnel.
 - .4 Review for performance, reliability, durability of operation, accessibility, maintainability, operational efficiency under conditions of operation.
 - .5 Review of Cx documentation from operational perspective Organizing Cx.
 - .6 Monitoring operations Cx activities.
 - .7 Witnessing, certifying accuracy of reported results.
 - .8 Witnessing and certifying TAB and other tests.
 - .9 Ensuring implementation of final Cx Plan.
 - .10 Performing verification of performance of installed systems and equipment.
 - .11 Implementation of Training Plan.
 - .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 Department Representative and PWGSC Cx Manager for administrative and coordination purposes.
 - .5 Contractor's Cx agent implements specified Cx activities including:
 - .1 Revise, refine and update CX plan.

- .2 Demonstrations.
- .3 Training.
- .4 Testing.
- .5 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 Include functional performance testing.
 - .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.
 - .1 Include IAQ or Environmental Specialist for Indoor Air Quality management.
 - .5 Contractor's TAB agency:
 - .1 Equipment and systems involving measurement and adjusting of flow rates and pressures to meet indicated or specified values. Includes, but not limited to, ducted air and hydronic systems, fans, pumps, and terminal units.
 - .2 TAB is a construction contractor's activity that permits Designer to certify results of functional performance testing test of installed design to satisfaction of Commissioning Manager.
 - .6 Client: Responsible for intrusion and access security systems.
- .2 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 Changes to heating or cooling loads beyond scope of EMCS.
 - .3 Changes to EMCS control strategies beyond level of training provided to O & M personnel.
 - .4 Redistribution of electrical services.

- .5 Modifications of fire alarm systems.
- .6 Modifications to voice communications systems.
- .3 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 The following list outlines the extent of Cx.
 - .1 Structural and Architectural systems:
 - .1 Doors, related hardware:
 - .1 New doors and hardware.
 - .2 Mechanical systems and associated equipment:
 - .1 Plumbing systems:
 - .1 Domestic CWS and HWS.
 - .2 Regular sanitary waste systems.
 - .1 Kitchenette Sinks.
 - .2 Filter Cold Water Spouts.
 - .2 HVAC and exhaust systems:
 - .1 General exhaust systems, including transfer fan.
 - .2 New variable air volume (VAV) boxes.
 - .3 Heating systems:
 - .1 Zone reheat coils.
 - .4 HVAC systems:
 - .1 Ductwork.
 - .2 Zone variable air volume (VAVs) boxes.
 - .5 Exhaust systems:
 - .1 General exhaust fans.
 - .3 Fire and life safety systems:
 - .1 Wet pipe sprinkler systems.
 - .2 Fire dampers.
 - .3 Fire extinguishers.
 - .4 Indoor Air Quality
 - .1 Indoor air quality (IAQ) in areas listed upon completion of construction.
 - .5 EMCS:
 - .1 Master Control Unit (MCU).
 - .2 Local Control Unit (LCU).
 - .3 Equipment Control Unit (ECU).
 - .4 Terminal Control Unit (TCU).
 - .5 Thermostats (VAVs, Induction Units, and Wall Fin Radiation).
 - .6 Sensors.

- .3 Commission electrical systems and equipment:
 - .1 Low voltage below 750 V:
 - .1 Existing electrical panels (limited to updated panel schedules)
 - .2 Receptacles
 - .3 Line voltage light switches
 - .2 Lighting systems:
 - .1 Lighting equipment.
 - .2 Line voltage lighting control devices
 - .3 Low voltage lighting control devices
 - .4 Emergency lighting systems, including battery packs.
 - .5 Fire exit emergency signage.
 - .3 Fire alarm systems, equipment:
 - .1 New fire alarm devices.
 - .4 Other systems and equipment:
 - .1 Access control panel, devices, and software.
 - .2 Sound masking equipment and devices.

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, including any extended manufacturer's 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 Updated panel schedules.
 - .8 Preventative maintenance program
 - .9 Contractor's and sub contractor's as-built drawing

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 functional performance testing.
- .3 Deliverables: provide:
 - .1 Cx Specifications.
 - .2 Startup, pre-Cx activities and documentation for systems, and equipment.
 - .3 Completed static verification forms.
 - .4 Completed start-up report forms.
 - .5 Completed functional performance testing report forms.
 - .6 Results of functional performance testing and Inspections.
 - .7 Description of Cx activities and documentation.
 - .8 Description of Cx of integrated systems and documentation.
 - .9 Tests performed by Departmental Representative.
 - .10 Training Plans.
 - .11 Cx Reports.
 - .12 Prescribed activities during warranty period.
 - .13 Complete installation and verification forms
- .4 Departmental Representative to witness and certify tests and reports of results provided to Departmental Representative.
- .5 Departmental Representative to participate.

1.11 PRE-CONSTRUCTION CX ACTIVITIES AND RELATED DOCUMENTATION

- .1 During demolition phase, prior to the commencement of construction, the existing RTU duct distribution modified in the Contract Documents require pre-construction TAB and modification at specifically identified sample locations listed in Section 23 05 93 – Testing, Adjusting and Balancing for HVAC.
 - .1 Contractor and Contractor's Cx Agent shall oversee and coordinate the pre-construction TAB with TAB Contractor and all required sub-contractors.
- .2 Departmental Representative will monitor tests.
- .3 Departmental Representative to approve completed TAB reports.

1.12 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 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 EMCS:
 - .1 EMCS trending to be available as supporting documentation for functional performance testing.
 - .2 Perform point-by-point testing in parallel with start-up.
 - .3 Carry out point-by-point verification.
 - .4 Demonstrate performance of systems, to be witnessed by Departmental Representative prior to start of 10 day Final Acceptance Test period.
 - .5 Perform final Cx and operational tests during demonstration period and 30 day test period.
 - .6 Only additional testing after foregoing have been successfully completed to be "Off-Season Tests".
- .2 Pre-Cx activities - LIFE SAFETY SYSTEMS
 - .1 Include equipment and systems identified above.
 - .1 Standpipe and hose systems.
 - .2 Fire extinguishers.
 - .2 Reports of test results to be witnessed and certified by Departmental Representative before verification.
- .3 Pre-Cx activities - ELECTRICAL:
 - .1 Low voltage distribution systems under 750 V.
 - .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 partial verification in accordance with ULC requirements.
 - .4 Low voltage systems: include:
 - .1 Lighting control systems.
 - .5 Access Control System: Include verification by Departmental Representative.

1.13 START-UP

- .1 Start up components, equipment and systems.
- .2 Equipment manufacturer, supplier, installing specialist sub-contractor, as appropriate, to start-up, under Contractor's direction, following equipment, systems:
 - .1 Plumbing systems:
 - .1 Domestic CWS and HWS.

-
- .2 Drainage System.
 - .3 Plumbing fixtures:
 - .1 Floor Drains.
 - .2 Trap Primers.
 - .3 Kitchenette Sinks.
 - .4 Filtered Cold Water Spouts.
 - .2 HVAC and exhaust systems:
 - .1 Heating systems:
 - .1 Zone reheat coils.
 - .2 Wall fin radiation.
 - .3 Zone reheat control valves.
 - .4 Wall fin radiation control valves.
 - .2 HVAC systems:
 - .1 Ductwork.
 - .2 Zone variable air volume (VAV) boxes.
 - .3 Exhaust systems:
 - .1 Washroom exhaust fans.
 - .2 General exhaust fans.
 - .3 Fire and life safety systems:
 - .1 Standpipe and hose systems.
 - .2 Fire dampers.
 - .3 Fire extinguishers.
 - .4 EMCS:
 - .1 Master Control Unit (MCU).
 - .2 Local Control Unit (LCU).
 - .3 Equipment Control Unit (ECU).
 - .4 Terminal Control Unit (TCU).
 - .5 Thermostats (VAVs, Induction Units, and Wall Fin Radiation)
 - .6 Sensors.
 - .7 Actuators.
 - .3 Departmental Representative to monitor some of these start-up activities.
 - .1 Rectify start-up deficiencies to satisfaction of Departmental Representative.
 - .4 Functional Performance Testing:
 - .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 static verification, start-up, and function performance testing forms.

- .4 Departmental Representative approve completed function performance testing reports and provide to Consultant.
- .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 function performance testing report or report of system startup and testing.

1.14 CX ACTIVITIES AND RELATED DOCUMENTATION

- .1 Perform Cx by specified Cx agency using procedures developed by Departmental Representative 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 function performance testing 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.

1.15 CX OF INTEGRATED SYSTEMS AND RELATED DOCUMENTATION

- .1 Cx to be performed by specified Cx specialist, using procedures developed by Departmental Representative 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 and reviewed by the Departmental Representative.
- .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 systems:
 - .1 Zone variable air volume (VAVs) boxes.
 - .2 Zone reheat coils.
 - .3 EMCS.
 - .4 EMCS Controllers:
 - .1 Master Control Unit (MCU).
 - .2 Local Control Unit (LCU).
 - .3 Equipment Control Unit (ECU).
 - .4 Terminal Control Unit (TCU).
 - .5 Thermostats.
 - .6 Washroom exhaust fans.
 - .7 General exhaust fans.
 - .2 Fire and life safety systems:
 - .1 Standpipe and hose systems.

- .2 Fire alarm systems.
- .3 Indoor Air Quality
 - .1 Indoor air quality (IAQ) in areas listed upon completion of construction.
 - .1 Tenant Fit Up
- .4 Fire alarm systems.
- .5 Emergency lighting systems.
- .6 Line and Low Voltage Lighting Controls
- .7 Access Control System.
- .8 Sound Masking System.
- .6 Identification:
 - .1 In later stages of Cx, before hand-over and acceptance, Departmental Representative, Consultant, Contractor, Project Manager, Property Manager 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.

1.16 STATIC VERIFICATION CHECK LISTS

- .1 Refer to Section 01 91 33 - Commissioning (Cx) Forms.

1.17 START-UP REPORT FORMS

- .1 Refer to Section 01 91 33 - Commissioning (Cx) Forms.

1.18 FUNCTIONAL PERFORMANCE TESTING FORMS

- .1 Refer to Section 01 91 33 - Commissioning (Cx) Forms.

1.19 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.

1.20 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: 30 days before start of Cx.
 - .4 Cx procedures: 4 weeks after award of contract.

- .5 Cx Report format: 6 weeks after contract award.
- .6 Submission of list of instrumentation with relevant certificates: 14 days before start of Cx.
- .7 Notification of intention to start TAB: 21 days before start of TAB.
- .8 TAB: After successful start-up, correction of deficiencies and verification of normal and safe operation.
- .9 Notification of intention to start Cx: 14 days before start of Cx.
- .10 Notification of intention to start Cx of integrated systems: After Cx of related systems is completed 14 days before start of integrated system Cx.
- .11 Identification of deferred Cx.
- .12 Implementation of training plans.
- .13 Cx reports: Immediately upon successful completion of Cx.
- .2 Detailed training schedule to demonstrate no conflicts with testing, completion of project and hand-over to Department Representative.
- .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 Contractor, Contractor's Cx agent, and Departmental Representative will monitor progress of Cx against this schedule.
- .4 Cx Schedules for Mechanical Systems:
 - .1 The schedule of commissioning activities will be produced in a bar chart format to a scale that will ensure legibility. This bar chart will show sequences of testing equipment and systems, interrelationship between tests, duration of tests and training periods. It will also show commissioning resources which will be committed to this project to ensure completion by prescribed dates, the Training Plan and the commissioning Documentation Plan.
 - .2 HVAC Systems:
 - .1 Sections of ductwork, piping and conduit systems to be concealed will be tested and certified to be to specified standards before being concealed.
 - .2 HVAC systems: Initially started up, "bumped" in a stand-alone mode (i.e. without controls, fire alarms or smoke detectors) and pre-start up inspections completed.
 - .3 Start only after all dust-producing construction procedures have been completed and all areas are dust-free.
 - .4 At this point, they may be started to replace temporary heating systems.
 - .5 Operate to permit TAB and to ensure full compliance with contract documents when weatherstripping, caulking, and sealing of the exterior envelope has been completed, partitions and doors are installed, and ceiling return plenums are in place.
 - .6 Commissioned at same time as TAB of HVAC systems.

- .3 HVAC and related hydronic systems: Test in conjunction with EMCS, and fire and smoke detection systems.
- .4 Plumbing systems:
 - .1 Filled, pressure booster pumps “bumped” in a stand-alone mode, and pre-start-up inspections completed. Thereafter flushing, cleaning and disinfection processes will take place.
 - .2 Plumbing and other piping systems: Tested in conjunction with related control systems.
- .5 Items that may have detrimental effect on operation and maintenance (e.g. noise, vibration) will receive preliminary attention at this point. Further attention to these items will occur as commissioning proceeds.
- .6 Integrated systems: Performance of HVAC systems, fire protection systems, EMCS, and other systems forming part of integrated systems to be verified after TAB of systems to ensure full compliance with prescribed requirements.
- .7 EMCS: Outline testing and commissioning in the EMCS specifications and clearly define conditions for acceptance. Clearly define point-by-point and end-to-end testing. Point-by-point and end-to-end testing to be carried out by the installing Contractor, monitored by Designer, and verified as part of system verification. Demonstrate operation of all systems under all operating conditions and over full operating range prior to 30-day test period, witnessed by the Designer, Commissioning Agent (or Commissioning Manager) and Project Manager. Include simulated opposite-season tests. Verify EMCS programming and operation after TAB of HVAC systems; include specified 30-day test period.
- .8 Standpipe and hose systems: Standpipe risers will be installed as construction progresses and may be used for fire protection purposes during construction. Provide fire hoses. Test completed system in accordance with requirement of NFPA 14.
- .9 Sprinkler systems: Test in accordance with requirements of NFPA 13.
- .10 Integrated fire protection systems:
 - .1 Upon completion of individual system tests, test of integrated systems will be performed to verify that all components work together.
 - .2 After fire alarm connections are completed and the jockey pump has been commissioned, flow tests of the sprinkler system will be conducted.
- .11 Final commissioning activities: Upon completion of commissioning to the satisfaction of Departmental Representative, lock control devices in final positions, indelibly mark settings, and include in TAB and FPT Reports.
- .5 CX Schedules for Electrical Systems:
 - .1 A schedule of commissioning activities will be produced by contractor in a bar chart format to a scale that will ensure legibility. Bar chart to show sequences of testing equipment and systems, interrelationship between tests, duration of tests and training periods. Show commissioning resources committed to project to ensure completion by prescribed dates, Training Plan and Commissioning Documentation Plan.

- .2 Low voltage systems: Include sound masking and low voltage lighting.
- .3 Emergency lighting systems: Perform tests by interrupting normal power. Thereafter adequacy of coverage will be verified.
- .4 Fire alarm systems: Conduct partial system verification only after all aspects of life safety and security systems are complete. Testing to be monitored by Designer and include complete verification in accordance with CAN/ULC requirements. After receipt by Commissioning Manager of Commissioning Report, commissioning specialist will demonstrate all devices and zones to Commissioning Manager, Project Manager, and Property Manager.
- .5 Submit reports of these tests, Departmental Representative who will verify reported results.
- .6 Upon completion of commissioning to satisfaction of the Departmental Representative and Commissioning Manager, lock control devices in their final positions, indelibly mark settings and include in Commissioning Reports.

1.21 CX REPORTS

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

1.22 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.

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, and include in Cx Reports.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION
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 STATIC VERIFICATION/START-UP CHECK LISTS

- .1 Include the following data:
 - .1 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 necessary to prepare for start-up and functional performance testing, and used during operation and maintenance of equipment.
 - .2 Product manufacturer's installation instructions and recommended checks.
 - .3 Special procedures as specified in relevant technical sections.
 - .4 Items considered good installation and engineering industry practices deemed appropriate for proper and efficient operation.
- .2 Prior to functional performance testing of systems, complete items on static, installation verification and start-up forms related to systems and obtain Departmental Representative's approval.
- .3 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.
- .4 Use check lists for equipment installation. Document check list verifying checks have been made, indicate deficiencies and corrective action taken.
- .5 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 O & M at completion of project.
- .6 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 FUNCTIONAL PERFORMANCE TESTING FORMS

- .1 Functional performance testing 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 Functional performance testing forms include those developed by Contractor records measured data and readings taken during functional testing and functional performance testing procedures.
- .3 Prior to functional performance testing of integrated system, complete functional performance testing forms of related systems and obtain Departmental Representative's approval.

1.4 AFD SERVICE PROVIDER FORMS

- .1 Complete AFD service provider Equipment Data Collection Form for all equipment that will be the responsibility of AFD service provider to perform planned maintenance.

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 Consultant.

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 to 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 Report 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 Systems Operation Manual.

1.8 LANGUAGE

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

Products

Not Used.

Execution

Not Used.

END OF SECTION

Insert All Reports Required for: HVAC Controls Electric & Electronic

Electric & Electronic Control Devices							
Designation	Floor #	Located in Room #	Device				Notes
			Description	Installation is Acceptable (Y/N)	Calibration is Complete (Y/N)	Operating Set-Point	

Submitted Documentation	Rec'd. (Y/N)	Notes
Manufacturer's Shop Drawings		
Performance Data		
Installation and Start-Up Manual		
O&M Manuals		
Factory Test Results		
Operating Sequence and Control Strategy		
Warranty Certificate		
Comments		

Installation Checks			
Check if Acceptable; Provide Comment if Not Acceptable	A	NA	Comment
General			
Installation is compliant with manufacturer's instructions	<input type="checkbox"/>	<input type="checkbox"/>	
Manufacturer's recommended & specified spare parts provided	<input type="checkbox"/>	<input type="checkbox"/>	
Permanent label affixed	<input type="checkbox"/>	<input type="checkbox"/>	
Mountings checked and shipping bolts/ restraints have been removed	<input type="checkbox"/>	<input type="checkbox"/>	
Maintenance access to all serviceable items is acceptable	<input type="checkbox"/>	<input type="checkbox"/>	
Pipe fittings complete and piping supports are acceptable, as specified.	<input type="checkbox"/>	<input type="checkbox"/>	
Wall insulation blocks installed behind temperature controller mounted on outside wall, as specified.	<input type="checkbox"/>	<input type="checkbox"/>	
Tamper-proof cover installed over control device, as specified.	<input type="checkbox"/>	<input type="checkbox"/>	
Hydronic pipe insulation and offset mount installation complete, as specified.	<input type="checkbox"/>	<input type="checkbox"/>	
Installation is correct for flow direction of media being measured.	<input type="checkbox"/>	<input type="checkbox"/>	
Test plugs, sensors and wells installed, as specified.	<input type="checkbox"/>	<input type="checkbox"/>	
All control devices, pipe insertion wells and outdoor sensor shields are installed and operational.	<input type="checkbox"/>	<input type="checkbox"/>	
All control device installations checked against drawings and specification to confirm all devices, gauges and other devices are installed as specified.	<input type="checkbox"/>	<input type="checkbox"/>	
The operating range of the control device is a suitable match for the application it is being installed for.	<input type="checkbox"/>	<input type="checkbox"/>	
The range of travel for all electronic actuated devices is a suitable match for the application it is being installed for.	<input type="checkbox"/>	<input type="checkbox"/>	
The closure of all electronic actuated devices is set for minimal leakage when closed and adjusted for travel ranges as specified.	<input type="checkbox"/>	<input type="checkbox"/>	
The control set-point for all devices is set as specified.	<input type="checkbox"/>	<input type="checkbox"/>	
The control schedule and other similar programming for all electronic programmable controllers is set-up as specified.	<input type="checkbox"/>	<input type="checkbox"/>	
Electrical and Controls			
All electrical connections are secure and electrical enclosure covers are secured in place.	<input type="checkbox"/>	<input type="checkbox"/>	
Grounding is installed.	<input type="checkbox"/>	<input type="checkbox"/>	
Safeties are installed and operational.	<input type="checkbox"/>	<input type="checkbox"/>	
All control devices and wiring is complete.	<input type="checkbox"/>	<input type="checkbox"/>	
All control system interlocks are connected and operational.	<input type="checkbox"/>	<input type="checkbox"/>	
All safeties remain in the control circuit when HOA switched to the Hand position.	<input type="checkbox"/>	<input type="checkbox"/>	
Installation is compliant with manufacturer's instructions.	<input type="checkbox"/>	<input type="checkbox"/>	

Summary of Issues:

System	Description

Recommendations:

System	Description

Witnessed by:	Name	Company	Date

Customer Training Attendance

Date: _____

Training Topic: HVAC Electric and Electronic Control Systems

Demonstrated By: _____

Demonstration Firm: _____

In accordance with specification and product manufacturer requirements, 4 hours of training have been provided to the Owner's Representative on site.

Attendees

Name	Signature	Representing

Comments:

Insert All Reports Required for: Dampers – Balancing

Balancing Damper Verification					
Designation	Floor #	Located in (or above) Room #	Balancing Damper		Notes
			Installation is Acceptable (Y/N)	Damper marked as adjusted (Y/N)	

Insert All Reports Required for: Dampers – Operating

Motorized Damper Verification							
Designation	Floor #	Located in Room #	Motorized Damper				Notes
			Installation is Acceptable (Y/N)	Blades Move Without Binding (Y/N)	Actuator Adjustment Acceptable (Y/N)	Closure of Outdoor Damper is Acceptable (Y/N/N. App.)	

Insert All Reports Required for: Dampers – Fire & Smoke

Fire Damper Commissioning Report Verification						
Designation	Floor #	Located in (or above) Room #	Duct Services Room #	Fire Damper		Notes
				Access is Acceptable (Y/N)	Damper is Open (Y/N)	

Insert All Reports Required for: Fans – Supply/ Exhaust/ Transfer

Exhaust Fan #1 (EF-X) Check List

Project Name:		Report Date:		Project #:	
Specification Section:		Substantial Completion Date:		Commissioner's Project #:	

Submitted Documentation	Rec'd. (Y/N)	Notes
Manufacturer's Shop Drawings		
Performance Data		
Installation and Start-Up Manual		
O&M Manuals		
Factory Test Results		
Operating Sequence and Control Strategy		
Warranty Certificate		
Fan Alignment Report		
Vibration Testing Report		
Comments		

Installation Checks			
Check if Acceptable; Provide Comment if Not Acceptable	A	NA	Comment
General			
Installation is compliant with manufacturer's instructions	<input type="checkbox"/>	<input type="checkbox"/>	
Manufacturer's recommended & specified spare parts provided	<input type="checkbox"/>	<input type="checkbox"/>	
Permanent label affixed	<input type="checkbox"/>	<input type="checkbox"/>	
Casing in good condition: no dents, leaks. The Door gasket in installed.	<input type="checkbox"/>	<input type="checkbox"/>	
Access door closes tightly without air or water leakage	<input type="checkbox"/>	<input type="checkbox"/>	
Mountings checked and shipping bolts/ restraints have been removed	<input type="checkbox"/>	<input type="checkbox"/>	
Vibration Isolation installed, adjusted and shipping bolts/ restraints have been removed	<input type="checkbox"/>	<input type="checkbox"/>	
Duct/ Flex connection is acceptable	<input type="checkbox"/>	<input type="checkbox"/>	
Maintenance access to all serviceable items is acceptable	<input type="checkbox"/>	<input type="checkbox"/>	
Sound attenuation is installed	<input type="checkbox"/>	<input type="checkbox"/>	
Thermal insulation installed, as specified	<input type="checkbox"/>	<input type="checkbox"/>	
Instrumentation (thermometers, gauges, flow measurement manifolds, etc.) installed, as specified	<input type="checkbox"/>	<input type="checkbox"/>	
All Smoke and Fire dampers installed - ready for use	<input type="checkbox"/>	<input type="checkbox"/>	
All Motorized dampers and actuators installed - ready for use	<input type="checkbox"/>	<input type="checkbox"/>	
Construction debris removed and cleaned, as specified	<input type="checkbox"/>	<input type="checkbox"/>	
Construction filters replaced by new clean filters – all filter installed	<input type="checkbox"/>	<input type="checkbox"/>	
Fan Bearings lubricated	<input type="checkbox"/>	<input type="checkbox"/>	
Fan belt quality and tension are acceptable	<input type="checkbox"/>	<input type="checkbox"/>	
Fan drive properly aligned	<input type="checkbox"/>	<input type="checkbox"/>	
Fan turns freely	<input type="checkbox"/>	<input type="checkbox"/>	
Drive guard or shield is properly installed	<input type="checkbox"/>	<input type="checkbox"/>	
Seismic anchoring installed and functional, where applicable	<input type="checkbox"/>	<input type="checkbox"/>	
Ducts			
Sound attenuation is installed	<input type="checkbox"/>	<input type="checkbox"/>	
The application of duct joint sealant is complete, as specified.	<input type="checkbox"/>	<input type="checkbox"/>	
No apparent sever duct restrictions.	<input type="checkbox"/>	<input type="checkbox"/>	
All turning vanes are installed as specified and ready for use	<input type="checkbox"/>	<input type="checkbox"/>	
All outdoor air ventilation sources are not located near sources of pollutants or exhaust air louvers.	<input type="checkbox"/>	<input type="checkbox"/>	
The installed starter overload breakers are the correct size.	<input type="checkbox"/>	<input type="checkbox"/>	
All ductwork pressure testing is complete and ductwork is ready for use.	<input type="checkbox"/>	<input type="checkbox"/>	
All branch duct control dampers are installed and ready for use.	<input type="checkbox"/>	<input type="checkbox"/>	
All ductwork is clean and ready for use, as specified.	<input type="checkbox"/>	<input type="checkbox"/>	
All balancing dampers are installed and ready for use.	<input type="checkbox"/>	<input type="checkbox"/>	
TAB contractor is scheduled to be site for AHU start-up.	<input type="checkbox"/>	<input type="checkbox"/>	

Installation Checks			
Check if Acceptable; Provide Comment if Not Acceptable	A	NA	Comment
Electrical and Controls			
Properly labeled power Local Disconnect is located within required distance of the unit and it powers down the unit when switched.	<input type="checkbox"/>	<input type="checkbox"/>	
All electrical connections are secure and electrical enclosure covers are secured in place.	<input type="checkbox"/>	<input type="checkbox"/>	
Grounding is installed.	<input type="checkbox"/>	<input type="checkbox"/>	
Safeties are installed and operational.	<input type="checkbox"/>	<input type="checkbox"/>	
The installed starter overload breakers are the correct size.	<input type="checkbox"/>	<input type="checkbox"/>	
All control devices and wiring is complete.	<input type="checkbox"/>	<input type="checkbox"/>	
All control system interlocks are connected and operational.	<input type="checkbox"/>	<input type="checkbox"/>	
HOA switch checked in all positions to operate as specified.	<input type="checkbox"/>	<input type="checkbox"/>	
Smoke detectors are installed and operational.	<input type="checkbox"/>	<input type="checkbox"/>	
All safeties remain in the control circuit when HOA switched to the Hand position.	<input type="checkbox"/>	<input type="checkbox"/>	
Installation is compliant with manufacturer's instructions.	<input type="checkbox"/>	<input type="checkbox"/>	
Fan rotation direction is correct.	<input type="checkbox"/>	<input type="checkbox"/>	

Installation Checks			
Check if Acceptable; Provide Comment if Not Acceptable	A	NA	Comment
Variable Speed Drive (VSD) / Variable Frequency Drive (VFD)			
Installation is compliant with manufacturer's instructions.	<input type="checkbox"/>	<input type="checkbox"/>	
Drive location is not subject to excessive moisture or dirt.	<input type="checkbox"/>	<input type="checkbox"/>	
Drive location is not subject to excessive temperature or vibration.	<input type="checkbox"/>	<input type="checkbox"/>	
Drive is mounted to wall or supported from a house keeping pad.	<input type="checkbox"/>	<input type="checkbox"/>	
Drive cooling air flow path is clean and unobstructed.	<input type="checkbox"/>	<input type="checkbox"/>	
Drive includes a permanent CSA or ULC label.	<input type="checkbox"/>	<input type="checkbox"/>	
VSD/ VFD interlocked to control system and operating under normal control	<input type="checkbox"/>	<input type="checkbox"/>	
VSD/ VFD is programmed with all programmed settings documented on-site	<input type="checkbox"/>	<input type="checkbox"/>	
VSD/ VFD minimum speed set at _____ Hz.	<input type="checkbox"/>	<input type="checkbox"/>	
VSD/ VFD maximum speed set at _____ Hz.	<input type="checkbox"/>	<input type="checkbox"/>	
Accel time set to _____ s and Decel time set to _____ s	<input type="checkbox"/>	<input type="checkbox"/>	
HOA & by-pass switch checked in all positions to operate as specified.	<input type="checkbox"/>	<input type="checkbox"/>	
All safeties remain in the control circuit when HOA switched to the Hand & by-pass positions.	<input type="checkbox"/>	<input type="checkbox"/>	
All interface control ranges and electrical signal isolation have been coordinated with the EMCS contractor, as applicable.	<input type="checkbox"/>	<input type="checkbox"/>	
VSD/ VFD restarts in Auto from power failure.	<input type="checkbox"/>	<input type="checkbox"/>	
VSD/VFD power and ground wiring as specified and in compliance with manufacturer requirements.	<input type="checkbox"/>	<input type="checkbox"/>	
Grounding provisions across the motor bearings have been provided to mitigate premature motor bearing failure with VFD use.	<input type="checkbox"/>	<input type="checkbox"/>	
VSD/ VFD password documented with owner	<input type="checkbox"/>	<input type="checkbox"/>	
VSD/ VFD response to loss of control signal is set to _____ Hz.	<input type="checkbox"/>	<input type="checkbox"/>	
VSD/ VFD output pulse resolution is set to MHz, to minimize audible noise and coordinated with driven bearing allowances	<input type="checkbox"/>	<input type="checkbox"/>	
Input voltage is _____ V	<input type="checkbox"/>	<input type="checkbox"/>	
VSD/ VFD FLA to motor is less than 105% of motor FLA rating	<input type="checkbox"/>	<input type="checkbox"/>	
Drive size is suitable selection for motor size.	<input type="checkbox"/>	<input type="checkbox"/>	
The motor is inverter duty rated and suitable for use with VSD/ VFD.	<input type="checkbox"/>	<input type="checkbox"/>	

Installation Checks			
Check if Acceptable; Provide Comment if Not Acceptable	A	NA	Comment
Sensors			
EMCS pressure, temperature and flow devices and sensors installed as specified.	<input type="checkbox"/>	<input type="checkbox"/>	
EMCS sensor indications are in agreement with physical gauges, as available.	<input type="checkbox"/>	<input type="checkbox"/>	
Testing and Balancing			
The installed balancing devices were suitable to complete balancing in compliance with AABC and specified requirements.	<input type="checkbox"/>	<input type="checkbox"/>	
Operational Checks			
Fan has no unusual noise or vibration when in use.	<input type="checkbox"/>	<input type="checkbox"/>	
All dampers stroke fully without binding, spans calibrated and EMCS control is in agreement with physical damper positions.	<input type="checkbox"/>	<input type="checkbox"/>	

Summary of Issues:

System	Description

Recommendations:

System	Description

Witnessed by:	Name	Company	Date

Customer Training Attendance

Date: _____

Training Topic: Fans – Supply/ Exhaust/ Transfer Systems

Demonstrated By: _____

Demonstration Firm: _____

In accordance with specification and product manufacturer requirements, 4 hours of training have been provided to the Owner's Representative on site.

Attendees

Name	Signature	Representing

Comments:

Insert All Reports Required for: Air Terminals – VAV/ By-Pass/ Fan-Powered

Submitted Documentation	Rec'd. (Y/N)	Notes
Manufacturer's Shop Drawings		
Performance Data		
Installation and Start-Up Manual		
O&M Manuals		
Factory Test Results		
Operating Sequence and Control Strategy		
Warranty Certificate		
Comments		

Installation Checks			
Check if Acceptable; Provide Comment if Not Acceptable	A	NA	Comment
General			
Installation is compliant with manufacturer's instructions	<input type="checkbox"/>	<input type="checkbox"/>	
Manufacturer's recommended & specified spare parts provided	<input type="checkbox"/>	<input type="checkbox"/>	
Permanent label affixed	<input type="checkbox"/>	<input type="checkbox"/>	
Mountings checked and shipping bolts/ restraints have been removed	<input type="checkbox"/>	<input type="checkbox"/>	
Maintenance access to all serviceable items is acceptable	<input type="checkbox"/>	<input type="checkbox"/>	
Installation is correct for flow direction of media being measured.	<input type="checkbox"/>	<input type="checkbox"/>	
Maintenance access to all serviceable items is acceptable	<input type="checkbox"/>	<input type="checkbox"/>	
Test plugs, sensors and wells installed, as specified.	<input type="checkbox"/>	<input type="checkbox"/>	
All control devices and air flow measurement manifolds are installed and operational.	<input type="checkbox"/>	<input type="checkbox"/>	
All control device installations checked against drawings and specification to confirm all devices, gauges and other devices are installed as specified.	<input type="checkbox"/>	<input type="checkbox"/>	
The operating range of the control device is a suitable match for the application it is being installed for.	<input type="checkbox"/>	<input type="checkbox"/>	
The range of air flow for the devices is a suitable match for the application it is being installed for.	<input type="checkbox"/>	<input type="checkbox"/>	
The operational radiant and discharge sound levels are within specified limits.	<input type="checkbox"/>	<input type="checkbox"/>	
All boxes are controlling across the full range of air flow specified for each zone.	<input type="checkbox"/>	<input type="checkbox"/>	
Communication between all VAV controllers is operational as specified.	<input type="checkbox"/>	<input type="checkbox"/>	

Installation Checks			
Check if Acceptable; Provide Comment if Not Acceptable	A	NA	Comment
Ducts			
Sound attenuation is installed	<input type="checkbox"/>	<input type="checkbox"/>	
The application of duct joint sealant is complete, as specified.	<input type="checkbox"/>	<input type="checkbox"/>	
No apparent sever duct restrictions.	<input type="checkbox"/>	<input type="checkbox"/>	
All turning vanes are installed as specified and ready for use	<input type="checkbox"/>	<input type="checkbox"/>	
All outdoor air ventilation sources are not located near sources of pollutants or exhaust air louvers.	<input type="checkbox"/>	<input type="checkbox"/>	
The installed starter overload breakers are the correct size.	<input type="checkbox"/>	<input type="checkbox"/>	
All ductwork pressure testing is complete and ductwork is ready for use.	<input type="checkbox"/>	<input type="checkbox"/>	
All branch duct control dampers are installed and ready for use.	<input type="checkbox"/>	<input type="checkbox"/>	
All ductwork is clean and ready for use, as specified.	<input type="checkbox"/>	<input type="checkbox"/>	
All balancing dampers are installed and ready for use.	<input type="checkbox"/>	<input type="checkbox"/>	
TAB contractor is scheduled to be site for AHU start-up.	<input type="checkbox"/>	<input type="checkbox"/>	
Electrical and Controls			
Properly labeled power Local Disconnect is located within required distance of the unit and it powers down the unit when switched.	<input type="checkbox"/>	<input type="checkbox"/>	
All electrical connections are secure and electrical enclosure covers are secured in place.	<input type="checkbox"/>	<input type="checkbox"/>	
Grounding is installed.	<input type="checkbox"/>	<input type="checkbox"/>	
Safeties are installed and operational.	<input type="checkbox"/>	<input type="checkbox"/>	
All control devices and wiring is complete.	<input type="checkbox"/>	<input type="checkbox"/>	
All control system interlocks are connected and operational.	<input type="checkbox"/>	<input type="checkbox"/>	
HOA switch checked in all positions to operate as specified.	<input type="checkbox"/>	<input type="checkbox"/>	
Smoke detectors are installed and operational.	<input type="checkbox"/>	<input type="checkbox"/>	
All safeties remain in the control circuit when HOA switched to the Hand position.	<input type="checkbox"/>	<input type="checkbox"/>	
Installation is compliant with manufacturer's instructions.	<input type="checkbox"/>	<input type="checkbox"/>	

Summary of Issues:

System	Description

Recommendations:

System	Description

Witnessed by:	Name	Company	Date

Customer Training Attendance

Date: _____

Training Topic: Air Terminals – VAV/ By-Pass/ Fan-Powered Systems

Demonstrated By: _____

Demonstration Firm: _____

In accordance with specification and product manufacturer requirements, 4 hours of training have been provided to the Owner's Representative on site.

Attendees

Name	Signature	Representing

Comments:

Insert All Reports Required for: Duct Heaters – N. Gas/ Hydronic/ Electric

Submitted Documentation	Rec'd. (Y/N)	Notes
Manufacturer's Shop Drawings		
Performance Data		
Installation and Start-Up Manual		
O&M Manuals		
Factory Test Results		
Operating Sequence and Control Strategy		
Warranty Certificate		
Comments		

Installation Checks			
Check if Acceptable; Provide Comment if Not Acceptable	A	NA	Comment
General			
Installation is compliant with manufacturer's instructions	<input type="checkbox"/>	<input type="checkbox"/>	
Manufacturer's recommended & specified spare parts provided	<input type="checkbox"/>	<input type="checkbox"/>	
Permanent label affixed	<input type="checkbox"/>	<input type="checkbox"/>	
Casing in good condition: no dents, leaks. The Door gasket in installed.	<input type="checkbox"/>	<input type="checkbox"/>	
Pipe, duct and electrical fittings and accessories complete.	<input type="checkbox"/>	<input type="checkbox"/>	
Condensate drain piping installed with suitable grade to nearest drain, as applicable.	<input type="checkbox"/>	<input type="checkbox"/>	
Vibration Isolation installed, adjusted and shipping bolts/ restraints have been removed	<input type="checkbox"/>	<input type="checkbox"/>	
Test plugs, sensors and wells installed, as specified.	<input type="checkbox"/>	<input type="checkbox"/>	
Maintenance access to all serviceable items is acceptable	<input type="checkbox"/>	<input type="checkbox"/>	
Thermal insulation installed, as specified	<input type="checkbox"/>	<input type="checkbox"/>	
Instrumentation (thermometers, gauges, flow measurement manifolds, etc.) installed, as specified	<input type="checkbox"/>	<input type="checkbox"/>	
Combustion and ventilation air installed in compliance with the greater of code or manufacturer requirements and with the authority having jurisdiction, as applicable.	<input type="checkbox"/>	<input type="checkbox"/>	
Construction debris removed and cleaned, as specified	<input type="checkbox"/>	<input type="checkbox"/>	
Manufacturer warranty start-up check-list complete.	<input type="checkbox"/>	<input type="checkbox"/>	
Seismic anchoring installed and functional, where applicable	<input type="checkbox"/>	<input type="checkbox"/>	
Carbon dioxide detectors are installed and operational, as req'd.	<input type="checkbox"/>	<input type="checkbox"/>	
Draft Fan (if applicable)			
Installation is compliant with manufacturer's instructions	<input type="checkbox"/>	<input type="checkbox"/>	
Manufacturer's recommended & specified spare parts provided	<input type="checkbox"/>	<input type="checkbox"/>	
Permanent label affixed	<input type="checkbox"/>	<input type="checkbox"/>	
Mountings checked and shipping bolts/ restraints have been removed.	<input type="checkbox"/>	<input type="checkbox"/>	
Vibration Isolation installed, adjusted and shipping bolts/ restraints have been removed.	<input type="checkbox"/>	<input type="checkbox"/>	
Plenums free of debris.	<input type="checkbox"/>	<input type="checkbox"/>	
Fan rotation direction is correct.	<input type="checkbox"/>	<input type="checkbox"/>	
Fan rotates freely.	<input type="checkbox"/>	<input type="checkbox"/>	
Fan Bearings lubricated	<input type="checkbox"/>	<input type="checkbox"/>	
Drive guard or shield is properly installed.	<input type="checkbox"/>	<input type="checkbox"/>	
Starter installed and sized in coordination with the motor.	<input type="checkbox"/>	<input type="checkbox"/>	
Motor properly aligned.	<input type="checkbox"/>	<input type="checkbox"/>	
Grounding is installed.	<input type="checkbox"/>	<input type="checkbox"/>	
Safeties are installed and operational.	<input type="checkbox"/>	<input type="checkbox"/>	
The installed starter overload breakers are the correct size.	<input type="checkbox"/>	<input type="checkbox"/>	
All control devices and wiring is complete.	<input type="checkbox"/>	<input type="checkbox"/>	
All control system interlocks are connected and operational.	<input type="checkbox"/>	<input type="checkbox"/>	
Smoke detectors are installed and operational.	<input type="checkbox"/>	<input type="checkbox"/>	

--	--	--	--

Installation Checks			
Check if Acceptable; Provide Comment if Not Acceptable	A	NA	Comment
Gas Train			
Gas train installed in compliance with NFPA, FM, IRI and local authority having jurisdiction requirements.	<input type="checkbox"/>	<input type="checkbox"/>	
Gas train leak testing proves to be acceptable.	<input type="checkbox"/>	<input type="checkbox"/>	
Gas train vents are terminated in compliance with code and local authority having jurisdiction requirements.	<input type="checkbox"/>	<input type="checkbox"/>	
Gas train safeties are installed and operational.	<input type="checkbox"/>	<input type="checkbox"/>	
Drip leg provided in gas main.	<input type="checkbox"/>	<input type="checkbox"/>	
Gas cock orientation is compliant with manufacturer requirements.	<input type="checkbox"/>	<input type="checkbox"/>	
Gas cocks are all accessible and move freely.	<input type="checkbox"/>	<input type="checkbox"/>	
Gas cocks confirmed to not leak with other gas train valves open.	<input type="checkbox"/>	<input type="checkbox"/>	
Gas meter installation compliant with product manufacturer and gas utility requirements.	<input type="checkbox"/>	<input type="checkbox"/>	
Gas meter is located in a non-turbulent section of piping and is accessible for testing and service.	<input type="checkbox"/>	<input type="checkbox"/>	
Wiring of the gas meter remote monitoring device is compliant with manufacturer, specification, EMCS and electrical code requirements.	<input type="checkbox"/>	<input type="checkbox"/>	
Gas pressure is adjusted and verified to be within an acceptable range for the boiler and gas train components.	<input type="checkbox"/>	<input type="checkbox"/>	
Gas PRV is confirmed operational.	<input type="checkbox"/>	<input type="checkbox"/>	
Gas pressure sensor limits are appropriate for the installation.	<input type="checkbox"/>	<input type="checkbox"/>	
High gas pressure switch installation is in compliance with manufacturer requirements.	<input type="checkbox"/>	<input type="checkbox"/>	
High gas pressure switch wiring is in compliance with manufacturer requirements.	<input type="checkbox"/>	<input type="checkbox"/>	
Low gas pressure switch installation is in compliance with manufacturer requirements.	<input type="checkbox"/>	<input type="checkbox"/>	
Low gas pressure switch wiring is in compliance with manufacturer requirements.	<input type="checkbox"/>	<input type="checkbox"/>	
Gas control valve installation is in compliance with manufacturer requirements.	<input type="checkbox"/>	<input type="checkbox"/>	
Gas control valve is accessible and travels freely.	<input type="checkbox"/>	<input type="checkbox"/>	
Gas control valve confirmed to not leak with other gas train valves open.	<input type="checkbox"/>	<input type="checkbox"/>	
Gas control valve confirmed to have no physical damage.	<input type="checkbox"/>	<input type="checkbox"/>	
Gas control valve nameplate readings are confirmed to actual readings.	<input type="checkbox"/>	<input type="checkbox"/>	
Drum relief valve setting confirmed adequate for application.	<input type="checkbox"/>	<input type="checkbox"/>	
Drum relief valve discharge piping confirmed to be acceptable.	<input type="checkbox"/>	<input type="checkbox"/>	
Drip leg provided in gas main.	<input type="checkbox"/>	<input type="checkbox"/>	
Stop-Check valve pressure rating confirmed acceptable for duty.	<input type="checkbox"/>	<input type="checkbox"/>	
Stop-Check valve installation is in compliance with manufacturer	<input type="checkbox"/>	<input type="checkbox"/>	

requirements			
	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	

Installation Checks			
Check if Acceptable; Provide Comment if Not Acceptable	A	NA	Comment
Electrical and Controls			
Properly labeled power Local Disconnect is located within required distance of the unit and it powers down the unit when switched.	<input type="checkbox"/>	<input type="checkbox"/>	
All electrical connections are secure and electrical enclosure covers are secured in place.	<input type="checkbox"/>	<input type="checkbox"/>	
Grounding is installed.	<input type="checkbox"/>	<input type="checkbox"/>	
Safeties are installed and operational.	<input type="checkbox"/>	<input type="checkbox"/>	
The installed starter overload breakers are the correct size.	<input type="checkbox"/>	<input type="checkbox"/>	
All control devices and wiring is complete.	<input type="checkbox"/>	<input type="checkbox"/>	
All control system interlocks are connected and operational.	<input type="checkbox"/>	<input type="checkbox"/>	
Smoke detectors are installed and operational.	<input type="checkbox"/>	<input type="checkbox"/>	
All safeties remain in the control circuit when HOA switched to the Hand position.	<input type="checkbox"/>	<input type="checkbox"/>	
Installation is compliant with manufacturer's instructions.	<input type="checkbox"/>	<input type="checkbox"/>	
Flue/ Chimney			
Flue/ Chimney installation is in compliance with manufacturer requirements.	<input type="checkbox"/>	<input type="checkbox"/>	
Flue/ Chimney installed with slope towards boiler in compliance with manufacturer and burner supplier requirements.	<input type="checkbox"/>	<input type="checkbox"/>	
Flue/ Chimney installed with clearance in compliance with code, manufacturer and authority having jurisdiction requirements.	<input type="checkbox"/>	<input type="checkbox"/>	
Protection in place to prevent burning hazard.	<input type="checkbox"/>	<input type="checkbox"/>	
Flue/ Chimney discharge is protected from rain entry and ice-build-up/ other blockage.	<input type="checkbox"/>	<input type="checkbox"/>	
Flue/ Chimney draft confirmed to meet minimum requirements for the application.	<input type="checkbox"/>	<input type="checkbox"/>	
Flue/ Chimney leak testing proves to be acceptable.	<input type="checkbox"/>	<input type="checkbox"/>	

Installation Checks			
Check if Acceptable; Provide Comment if Not Acceptable	A	NA	Comment
Sensors and Gauges			
EMCS and other pressure, temperature and flow devices and sensors installed as specified.	<input type="checkbox"/>	<input type="checkbox"/>	
EMCS and other sensor indications are in agreement with physical gauges, as available.	<input type="checkbox"/>	<input type="checkbox"/>	

Testing and Balancing			
The installed balancing devices were suitable to complete balancing in compliance with AABC and specified requirements.	<input type="checkbox"/>	<input type="checkbox"/>	

Summary of Issues:

System	Description

Recommendations:

System	Description

Witnessed by:

Name	Company	Date

Customer Training Attendance

Date: _____

Training Topic: Duct Heaters – N. Gas/ Hydronic / Electric

Demonstrated By: _____

Demonstration Firm: _____

In accordance with specification and product manufacturer requirements, __ hours of training have been provided to the Owner's Representative on site.

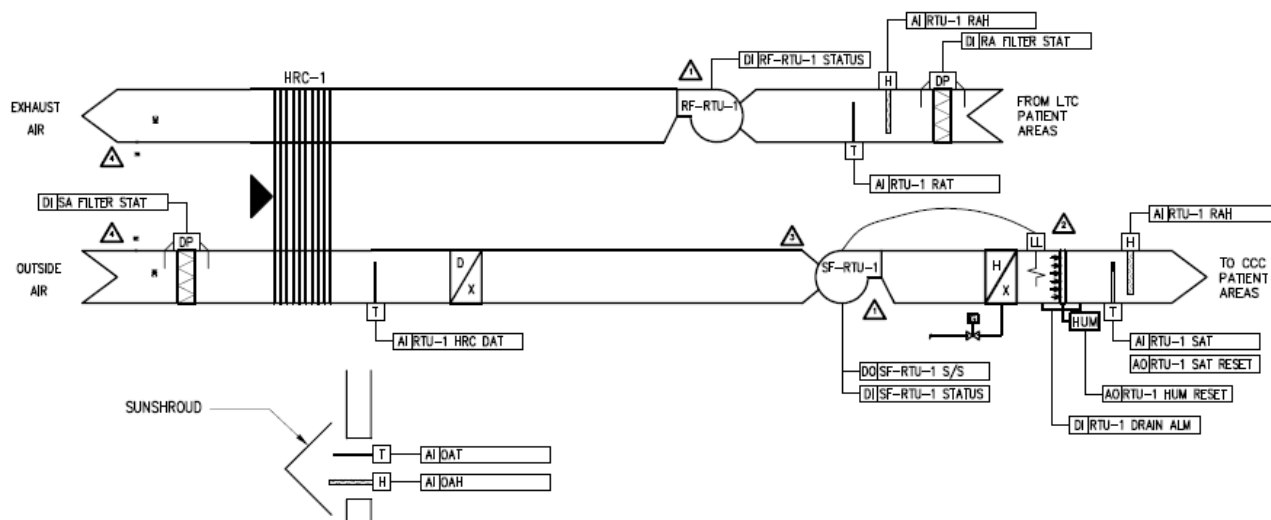
Attendees

Name	Signature	Representing

Comments:

Insert All Reports Required for: Energy Monitoring and Control Systems (EMCS)

Roof Top Unit #1 (RTU-X) Controls Schematic (Replace example schematic with project system schematic):



Roof Top Unit #1 (RTU-1) Controls Point Check List:

I/O Type	Point		Point to Point Verified (Y/N)	Point Value Verified (Y/N)	Point on OWS (Y/N)	Notes
	Name	Description				
DI	RTU1.SA.FILTER	RTU-1 Supply Air Filter Status				
AI	RTU1.HRC.DAT	RTU-1 Heat Recovery Coil Discharge Air Temperature				
AI	RTU1.SAT	RTU-1 Supply Air Temperature				
DO	RTU1.SF.SS	RTU-1 Supply Fan Start Stop				
DI	RTU1.SF.STATUS	RTU-1 Supply Fan Status				
AO	RTU1.SAT.RESET	RTU-1 Supply Air Temperature Reset				
DI	RTU1.LTD	RTU-1 Low Temperature Detector				
DI	RTU1.DRAIN.ALM	RTU-1 Drain Alarm				
AO	RTU1.HUM.CNTL	RTU-1 Humidifier Control				
AI	RTU1.SAT	RTU-1 Supply Air Temperature				
AI	RTU1.SAH	RTU-1 Supply Air Humidity				
DI	RTU1.RA.FILTER	RTU-1 Return Air Filter Status				
AI	RTU1.RAH	RTU-1 Return Air Humidity				
AI	RTU1.RAT	RTU-1 Return Air Temperature				
DO	RTU1.RF.SS	RTU-1 Return Fan Start Stop				
DI	RTU1.RF.STATUS	RTU-1 Return Fan Status				
AI	OAT	Outdoor Air Temperature				

AI	OAH	Outdoor Air Humidity				
----	-----	----------------------	--	--	--	--

Roof Top Unit #1 (RTU-X) Sequence of Operations Verification:

Sequence of Operation	Verified (Y/N)	Comments
RTU starts and runs continuously in Occupied Mode from the Control Scheduler		
RTU stops and stays off in an UnOccupied Mode from the Control Scheduler		
Occupied Mode: mech. clg. maintains space temperature, as specified		
Occupied Mode: mech. htg. maintains space temperature, as specified		
Occupied Mode: mech. humid. maintains return air humidity, as specified		
Occupied Mode: both filter alarms report to OWS when plugged filter is simulated		
Occupied Mode: mech. clg. locked-out below 5 C		
Occupied Mode: mech. humid. lock-out when mechanical clg. Enabled		
Occupied Mode: LTD shuts down unit and all devices to emergency fail-safe, as specified		
Unoccupied Mode: all devices move normal fail-safe, as specified		

Summary of Issues:

System	Description

Recommendations:

System	Description

	Name	Company	Date
Witnessed by:			

Customer Training Attendance

Date: _____

Training Topic: Energy Monitoring and Control Systems (EMCS)

Demonstrated By: _____

Demonstration Firm: _____

In accordance with specification and product manufacturer requirements, __ hours of training have been provided to the Owner's Representative on site.

Attendees

Name	Signature	Representing

Comments:

Insert All Reports Required for: Lighting Controls

Lighting Control Check List:

Lighting Control Verification						
Controller Designation	Floor #	Room #	Equipment Installation			Notes
			Installation is Acceptable	Responds to change in control	Control Schedule Programmed	
			(Y/N)	(Y/N)	(Y/N)	

Installation Checks			
Check if Acceptable; Provide Comment if Not Acceptable	A	NA	Comment
Electrical and Controls			
All electrical connections are complete and electrical enclosure covers are secured in place.	<input type="checkbox"/>	<input type="checkbox"/>	
Identification labeling is device tagging is complete.	<input type="checkbox"/>	<input type="checkbox"/>	
All programming complete and system is fully operational.	<input type="checkbox"/>	<input type="checkbox"/>	
All control system interlocks are connected and operational.	<input type="checkbox"/>	<input type="checkbox"/>	
All control devices and wiring is complete.	<input type="checkbox"/>	<input type="checkbox"/>	
Control Interface is provided and is user friendly.	<input type="checkbox"/>	<input type="checkbox"/>	
Operations Manual provided and training complete.	<input type="checkbox"/>	<input type="checkbox"/>	

Summary of Issues:

System	Description

Recommendations:

System	Description

Witnessed by:	Name	Company	Date

Customer Training Attendance

Date: _____

Training Topic: Lighting Controls

Demonstrated By: _____

Demonstration Firm: _____

In accordance with specification and product manufacturer requirements, __ hours of training have been provided to the Owner's Representative on site.

Attendees

Name	Signature	Representing

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 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 functional performance 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 Functional Performance Testing 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 per session 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**
Not Used.

Part 3 **Execution**
Not Used.

END OF SECTION