

## SPECIFICATION

Greening of Government Operations  
Southside Base Buoy Maintenance Facility

St John's, Newfoundland

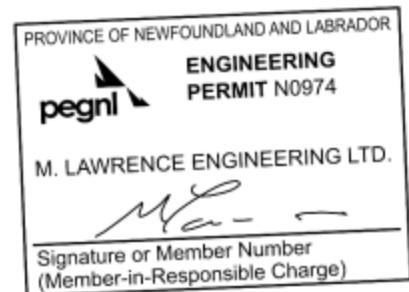
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Project F6879-189205

Prepared for: Department of Fisheries and Oceans

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**END OF SECTION**

Approved: 2006-03-31

**Part 1            General**

**1.1                SCOPE OF WORK**

- .1        The contractor is to supply and install two (2) new high-volume low-speed destratification fans. The fans are to be secured to existing structure. Power is to be fed from existing panels 'LC' and 'LA'. Installation of the fans is to include the power connections and controls. The fan controls are to be supplied with the fan and include a smart wall controller.

The contractor is to remove all existing destrat fans, controls, conduit, and power back to panel.

The contractor is to relocate an existing supply air branch duct.

The contractor is to supply and install new LED lighting upgrade for the Facility. Contractor is to remove existing lighting fixtures and replace with new as specified on drawings. All existing lighting fixtures are to be return to building owner.

**1.2                WORK COVERED BY CONTRACT DOCUMENTS**

- .1        Work of this Contract comprises renovation of existing facility, located at as described; and further identified on the drawings and specifications.

**1.3                CONTRACTOR USE OF PREMISES**

- .1        Restricted use of site as directed by the Departmental Representative.
- .2        Limit use of premises for Work, for storage, and for access, to allow:
  - .1        Owner occupancy.
  - .2        Partial owner occupancy.
  - .3        Work by other contractors.
  - .4        Public usage.
- .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 which remain.
- .6        Repair or replace portions of existing work which have been altered during construction operations to match existing or adjoining work.
- .7        At completion of operations condition of existing work: equal to or better than that which existed before new work started.

#### **1.4 OWNER OCCUPANCY**

- .1 Owner will occupy premises during entire construction period for execution of normal operations.
- .2 Co-operate with Owner in scheduling operations to minimize conflict and to facilitate Owner usage.

#### **1.5 DOCUMENTS REQUIRED**

- .1 Maintain at job site, one copy each document as follows:
  - .1 Contract Drawings.
  - .2 Specifications.
  - .3 Addenda.
  - .4 Reviewed Shop Drawings.
  - .5 List of Outstanding Shop Drawings.
  - .6 Change Orders.
  - .7 Other Modifications to Contract.
  - .8 Field Test Reports.
  - .9 Copy of Approved Work Schedule.
  - .10 Health and Safety Plan and Other Safety Related Documents.
  - .11 Other documents as specified.

#### **1.6 FAMILIARIZATION WITH SITE**

- .1 Before submitting a bid, it is recommended that bidders visit the site and its surroundings to review and verify the form, nature and extent of the work, materials needed for the completion of the work, the means of access to the site, severity, exposure and uncertainty of weather, any accommodations they may require, and in general shall obtain all necessary information as to risks, contingencies and other circumstances which may influence or affect their bid or costs to do the work. No allowance shall be made subsequently in this connection on account of error or negligence to properly observe and determine the conditions that will apply.
- .2 Contractors, bidders or those they invite to site are to review specification Section 01 35 29 - Health and Safety Requirements before visiting site. Take all appropriate safety measures for any visit to site, either before or after acceptance of bid.

#### **1.7 CODES AND STANDARDS**

- .1 Perform work in accordance with the latest edition of the National Building Code of Canada, and any other code of provincial or local application including all amendments up to project bid closing date provided that in any case of conflict or discrepancy, the more stringent requirements shall apply.
- .2 Materials and workmanship must meet or exceed requirements of specified standards, codes and referenced documents.

**1.8 SETTING OUT WORK**

- .1 Set grades and layout work in detail from control points and grades established by Departmental Representative.
- .2 Assume full responsibility for and execute complete layout of work to locations, lines and elevations indicated or as directed by Departmental Representative.
- .3 Provide devices needed to layout and construct work.
- .4 Supply such devices required to facilitate Departmental Representative's inspection of work.
- .5 Supply stakes and other survey markers required for laying out work.

**1.9 PERMITS**

- .1 Obtain and pay for all permits, certificates and licenses as required by Municipal, Provincial, Federal and other Authorities.
- .2 Provide appropriate notifications of project to municipal and provincial inspection authorities.
- .3 Obtain compliance certificates as prescribed by legislative and regulatory provisions of municipal, provincial and federal authorities as applicable to the performance of work.
- .4 Submit to Departmental Representative, copy of application submissions and approval documents received for above referenced authorities.
- .5 Comply with all requirements, recommendations and advice by all regulatory authorities unless otherwise agreed in writing by Departmental Representative. Make requests for such deviations to these requirements sufficiently in advance of related work.

**1.10 CUTTING, FITTING AND PATCHING**

- .1 Execute cutting, including excavation, fitting and patching required to make work fit properly.

**1.11 ACCEPTANCE**

- .1 Prior to the issuance of the Certificate of Substantial Performance, in company with Departmental Representative, make a check of all work. Correct all discrepancies before final inspection and acceptance.

**1.12 WORKS COORDINATION**

- .1 Responsible for coordinating the work of the various trades, where the work of such trades interfaces with each other.
- .2 Convene meetings between trades whose work interfaces and ensure that they are fully aware of the areas and the extent of where interfacing is required. Provide each trade with

the plans and specifications of the interfacing trade, as required, to assist them in planning and carrying out their respective work.

- .3 Canada will not be responsible for or held accountable for any extra costs incurred as a result of the failure to carry out coordination work. Disputes between the various trades as a result of their not being informed of the areas and extent of interface work shall be the sole responsibility of the General Contractor and shall be resolved at no extra cost to Canada.

### **1.13 WORK SCHEDULE**

- .1 Submit within 7 work days of notification of acceptance of bid, a construction schedule showing commencement and completion of all work within the time stated on the Bid and Acceptance Form and the date stated in the bid acceptance letter.
- .2 Provide sufficient details in schedule to clearly illustrate entire implementation plan, depicting efficient coordination of tasks and resources, to achieve completion of work on time and permit effective monitoring of work progress in relation to established milestones.
- .3 As a minimum, work schedule to be prepared and submitted in the form of Bar (GANTT) Charts, indicating work activities, tasks and other project elements, their anticipated durations and planned dates for achieving key activities and major project milestones provided in sufficient details and supported by narratives to demonstrate a reasonable plan for completion of project within designated time. Generally Bar Charts derived from commercially available computerized project management system are preferred but not mandatory.
- .4 Submit schedule updates on a minimum bi-weekly basis and more often, when requested by Departmental Representative, due to frequent changing project conditions. Provide a narrative explanation of necessary changes and schedule revisions at each update.
- .5 The schedule, including all updates, shall be to Departmental Representative's approval. Take necessary measures to complete work within approved time. Do not change schedule without Departmental Representative's approval.
- .6 All work on the project will be completed within the time indicated on the Bid and Acceptance Form.

### **1.14 CONTRACTOR'S USE OF SITE**

- .1 Responsible for arranging the storage of materials on or off site, and any materials stored at the site which interfere with any of the day to day activities at or near the site will be moved promptly at the Contractor's expense, upon request by Departmental Representative.
- .2 Exercise care so as not to obstruct or damage public or private property in the area.
- .3 At completion of work, restore area to its original condition. Damage to ground property will be repaired by Contractor. Remove all construction materials, residue, excess, etc., and leave site in a condition acceptable to Departmental Representative.

**1.15 WORK COMMENCEMENT**

- .1 Mobilization to project site is to commence immediately after acceptance of bid and submission of Site Specific Safety Plan and insurance and bonding documentation, unless otherwise agreed by Departmental Representative. Contractor is responsible of all mobilization and demobilization costs including arranging for and providing helicopter transport to and from site for equipment, materials and labour required to complete the work.
- .2 Project work on site is to commence as soon as possible, with a continuous reasonable work force, unless otherwise agreed by Departmental Representative.
- .3 Weather conditions, short construction season, delivery challenges and the location of the work site may require the use of longer working days and additional work force to complete the project within the specified completion time.
- .4 Make every effort to ensure that sufficient material and equipment is delivered to site at the earliest possible date after acceptance of bid and replenished as required.

**Part 2 Products**

**2.1 NOT USED**

- .1 Not used.

**Part 3 Execution**

**3.1 NOT USED**

- .1 Not used.

**END OF SECTION**

**Part 1            General**

**1.1                RELATED REQUIREMENTS**

- .1            Section 01 56 00.

**1.2                ACCESS AND EGRESS**

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

**1.3                USE OF SITE AND FACILITIES**

- .1            Execute work with least possible interference or disturbance to normal use of premises. Make arrangements with Departmental Representative to facilitate work as stated.
- .2            Maintain existing services to building and provide for personnel and vehicle access.
- .3            Where security is reduced by work provide temporary means to maintain security.
- .4            Departmental Representative will assign sanitary facilities for use by Contractor's personnel. Keep facilities clean.

**1.4                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.

**1.5                EXISTING SERVICES**

- .1            Notify, Departmental Representative and utility companies of intended interruption of services and obtain required permission.
- .2            Where Work involves breaking into or connecting to existing services, give Departmental Representative 48 hours of notice for necessary interruption of mechanical or electrical service throughout course of work. Keep duration of interruptions minimum..
- .3            Construct barriers in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.

**1.6                SECURITY**

- .1            Where security has been reduced by Work of Contract, provide temporary means to maintain security.
- .2            Security clearances:
  - .1            Personnel employed on this project will be subject to security check. Obtain clearance, as instructed, for each individual who will require to enter premises.



- .2 Obtain requisite clearance, as instructed, for each individual required to enter premises.
- .3 Personnel will be checked daily at start of work shift and provided with pass which must be worn at all times. Pass must be returned at end of work shift and personnel checked out.
- .4 Contractor's personnel will require satisfactory RCMP initiated security screening in order to complete Work in premises and on site.

**1.7 BUILDING SMOKING ENVIRONMENT**

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

**Part 2 Products**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 Execution**

**3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

**Part 1            General**

**1.1                ADMINISTRATIVE**

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

**1.2                PRECONSTRUCTION MEETING**

- .1     Within 14 days after award of Contract, request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.
- .2     Departmental Representative, Consultant, Contractor, and major Subcontractors will be in attendance.
- .3     Establish time and location of meeting and notify parties concerned minimum 14 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.
  - .3     Schedule of submission of shop drawings.
  - .4     Requirements for temporary facilities, site sign, offices, storage sheds, utilities, fences.
  - .5     Delivery schedule of specified equipment.
  - .6     Site security.

- .7 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements.
- .8 Record drawings.
- .9 Maintenance manuals.
- .10 Take-over procedures, acceptance, warranties.
- .11 Monthly progress claims, administrative procedures, photographs, hold backs.
- .12 Appointment of inspection and testing agencies or firms.
- .13 Insurances, transcript of policies.

**1.3 PROGRESS MEETINGS**

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

**Part 2 Products**

**2.1 NOT USED**

- .1 Not Used.

**Part 3            Execution**

**3.1                NOT USED**

.1            Not Used.

**END OF SECTION**

**Part 1            General**

**1.1                ADMINISTRATIVE**

- .1        Submit to Consultant submittals listed for review. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.
- .2        Do not proceed with Work affected by submittal until review is complete.
- .3        Present shop drawings, product data, samples and mock-ups in SI Metric units.
- .4        Review submittals prior to submission to Consultant. 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.
- .5        Notify Consultant, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
- .6        Verify field measurements and affected adjacent Work are co-ordinated.
- .7        Contractor's responsibility for errors and omissions in submission is not relieved by Consultant's review of submittals.
- .8        Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Consultant review.
- .9        Keep one reviewed copy of each submission on site.

**1.2                SHOP DRAWINGS AND PRODUCT DATA**

- .1        The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.
- .2        Submit drawings stamped and signed by professional engineer registered or licensed in Province of Canada where necessary.
- .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 4 days for Consultant's review of each submission.

- .5 Adjustments made on shop drawings by Consultant 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 Consultant may require, consistent with Contract Documents. When resubmitting, notify Consultant 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 Consultant's review, distribute copies.
- .10 Submit electronic copy of shop drawings for each requirement requested in specification Sections and as Consultant may reasonably request.
- .11 Submit electronic copies of product data sheets or brochures for requirements requested in specification Sections and as requested by Consultant where shop drawings will not be prepared due to standardized manufacture of product.

- .12 Submit electronic copies of certificates for requirements requested in specification Sections and as requested by Consultant.
  - .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.
- .13 Submit electronic copies of manufacturers' instructions for requirements requested in specification Sections and as requested by Consultant.
  - .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.
- .14 Submit electronic copies of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Consultant.
- .15 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 Consultant.
- .17 Delete information not applicable to project.
- .18 Supplement standard information to provide details applicable to project.
- .19 If upon review by Consultant, 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 is for sole purpose of ascertaining conformance with general concept.
  - .1 This review shall not mean approval of 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.

**Part 2            Products**

**2.1                NOT USED**

.1            Not Used.

**Part 3            Execution**

**3.1                NOT USED**

.1            Not Used

**END OF SECTION**



## **1.1 RELATED WORK**

- .1 Section 01 35 29 - Health and Safety Requirements.
- .2 Section 01 33 00 – Submittal Procedures

## **1.2 REFERENCES**

- .1 Fire Protection Standards issued by Fire Protection Services of Human Resources Development Canada as follows:
  - .1 National Fire Code - Standard for Construction Operations – latest edition ([http://www.hrsdc.gc.ca/eng/labour/fire\\_protection/policies\\_standards/commissioner/301/page00.shtml](http://www.hrsdc.gc.ca/eng/labour/fire_protection/policies_standards/commissioner/301/page00.shtml)).
  - .2 National Fire Code - Standard for Welding and Cutting – latest edition ([http://www.hrsdc.gc.ca/eng/labour/fire\\_protection/policies\\_standards/commissioner/302/page00.shtml](http://www.hrsdc.gc.ca/eng/labour/fire_protection/policies_standards/commissioner/302/page00.shtml)).
  - .3 FCC standards, may also be viewed at the Regional Labour Canada Office located at Baine Johnson Centre, 10 Fort William Place, St. John's, NL, A1C 1K4; Telephone 1-800-641-4049; fax 1-709-772-5985.

## **1.3 DEFINITIONS**

- .1 Hot Work defined as:
  - .1 Welding work.
  - .2 Cutting of materials by use of torch or other open flame devices.
  - .3 Grinding with equipment which produces sparks.

## **1.4 SUBMITTALS**

- .1 Submit copy of Hot Work Procedures and sample of Hot Work permit to Departmental Representative for review, within five (5) calendar days after notification of acceptance of bid.
- .2 Submit in accordance with the Submittal General Requirements specified in Section 01 33 00.

## **1.5 FIRE SAFETY REQUIREMENTS**

- .1 Implement and follow fire safety measures during Work. Comply with following:
  - .1 National Fire Code, latest edition.
  - .2 Fire Protection Standards FCC 301 and FCC 302 – latest edition.
  - .3 Federal and Provincial Occupational Health and Safety Acts and Regulations as specified in Section 01 35 29 – Health and Safety Requirements.
- .2 In event of conflict between any provisions of above authorities the most stringent provision will apply. Should a dispute arise in determining the most stringent requirement, Departmental Representative will advise on the course of action to be followed.

## **1.6 HOT WORK AUTHORIZATION**

- .1 Obtain Departmental Representative's written "Authorization to Proceed" before conducting any form of Hot work on site.
- .2 To obtain authorization submit to Departmental Representative:
  - .1 Contractor's typewritten Hot Work Procedures to be followed on site as specified below.
  - .2 Description of the type and frequency of Hot Work required.
  - .3 Sample Hot Work Permit to be used.
- .3 Upon review and confirmation that effective fire safety measures will be implemented during performance of hot work, Departmental Representative will provide authorization to proceed as follows:
  - .1 Issue one written "Authorization to Proceed" covering the entire project for duration of work or;
  - .2 Separate work, or segregate certain parts of work, into individual entities. Each entity requiring a separately written "Authorization to Proceed" from Departmental Representative. Follow Departmental Representative's directives in this regard.
- .4 Requirement for individual authorization based on:
  - .1 Nature or phasing of work;
  - .2 Risk to Facility operations;
  - .3 Quantity of various trades needing to perform hot work on project or;
  - .4 Other situation deemed necessary by Departmental Representative to ensure fire safety on premises.
- .5 Do not perform any Hot Work until receipt of Departmental Representative's written "Authorization to Proceed" for that portion of work.

## **1.7 HOT WORK PROCEDURES**

- .1 Develop and implement safety procedures and work practices to be followed during the performance of Hot Work.
- .2 Procedures to include:
  - .1 Requirement to perform hazard assessment of site and immediate hot work area for each hot work event in accordance with Hazard Assessment and Safety Plan requirements of Section 01 35 29.
  - .2 Use of a Hot Work Permit system for each hot work event.
  - .3 The step by step process of how to prepare and issue permit.
  - .4 Permit shall be issued by Contractor's site Superintendent, or other authorized person designated by Contractor, granting permission to worker or subcontractor to proceed with hot work.
  - .5 Provision of a designated person to carryout a Fire Safety Watch for a minimum of 60 minutes immediately upon completion of the hot work.

- .6 Compliance with fire safety codes and standards specified herein and occupational health and safety regulations specified Section 01 35 29.
- .3 Generic procedures, if used, must be edited and supplemented with pertinent information tailored to reflect specific project conditions. Clearly label as being the Hot Work Procedures applicable to this contract.
- .4 Hot Work Procedures shall clearly establish worker instructions and responsibilities of:
  - .1 Worker(s),
  - .2 Authorized person issuing the Hot Work Permit,
  - .3 Fire Safety Watcher,
  - .4 Subcontractors and Contractor.
- .5 Brief all workers and subcontractors on Hot Work Procedures and Permit system established for project. Stringently enforce compliance.
  - .1 Failure to comply with the established procedures may result in the issuance of a Non-Compliance Notification at Departmental Representative's discretion with possible disciplinary measures imposed as specified in Section 01 35 29.

## **1.8 HOT WORK PERMIT**

- .1 Hot Work Permit to include, as a minimum, the following data:
  - .1 Project name and project number.
  - .2 Building name, address and specific room or area where hot work will be performed.
  - .3 Date when permit issued.
  - .4 Description of hot work type to be performed.
  - .5 Special precautions required, including type of fire extinguisher needed.
  - .6 Name and signature of person authorized to issue the permit.
  - .7 Name of worker (clearly printed) to which the permit is being issued.
  - .8 Time Duration that permit is valid (not to exceed 8 hours). Indicate start time and date, and completion time and date.
  - .9 Worker signature with date and time upon hot work termination.
  - .10 Specified time period requiring safety watch.
  - .11 Name and signature of designated Fire Safety Watcher, complete with time and date when safety watch terminated, certifying that surrounding area was under continual surveillance and inspection during the full watch time period specified in Permit and commenced immediately upon completion of Hot Work.
- .2 Permit to be typewritten form. Industry Standard forms shall only be used if all data specified above is included on form.
- .3 Each Hot Work Permit to be completed in full and signed as follows:
  - .1 Authorized person issuing Permit before hot work commences.
  - .2 Worker upon completion of Hot Work.
  - .3 Fire Safety Watcher upon termination of safety watch.

.4 Returned to Contractor's Site Superintendent for safe keeping.

**1.9 DOCUMENTS ON SITE**

- .1 Keep Hot Work Permits and Hazard assessment documentation on site for duration of Work.
- .2 Upon request, make available to Departmental Representative or to authorized safety representative for inspection.

**END OF SECTION**

**Part 1 General**

**1.1 SECTION INCLUDES**

- .1 Health and safety considerations required to ensure that PWGSC shows due diligence towards health and safety on construction sites, and meets the requirements laid out in PWGSC/RPB Departmental Policy DP 073 - Occupational Health and Safety - Construction.

**1.2 RELATED SECTIONS**

- .1 Section 01 33 00 – Submittal Procedures.

**1.3 DEFINITIONS**

- .1 COSH: Canada Occupational Health and Safety Regulations made under Part II of the Canada Labour Code.
- .2 Competent Person: means a person who is:
  - .1 Qualified by virtue of personal knowledge, training and experience to perform assigned work in a manner that will ensure the health and safety of persons in the workplace, and;
  - .2 Knowledgeable about the provisions of occupational health and safety statutes and regulations that apply to the Work and;
  - .3 Knowledgeable about potential or actual danger to health or safety associated with the Work.
- .3 Medical Aid Injury: any minor injury for which medical treatment was provided and the cost of which is covered by Workers' Compensation Board of the province in which the injury was incurred.
- .4 PPE: personal protective equipment.
- .5 Work Site: where used in this section shall mean areas, located at the premises where Work is undertaken, used by Contractor to perform all of the activities associated with the performance of the Work.

**1.4 REFERENCES**

- .1 Province of Newfoundland and Labrador
  - .1 Occupational Health and Safety Act, R.S.N. [1990].

**1.5 SUBMITTALS**

- .1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit site-specific Health and Safety Plan: Within 7 days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include:
  - .1 Results of site specific safety hazard assessment.

- .2 Results of safety and health risk or hazard analysis for site tasks and operation found in work plan.
- .3 Submit copies of reports or directions issued by Federal, Provincial and Territorial health and safety inspectors.
- .4 Submit building permit, compliance
- .5 Submit name of Contractor's Representative designated to perform health and safety supervision in site.
- .6 Submit Certificate of clearance from Workplace Health Safety and Compensation Commission (Assessment Services Department) of Newfoundland and Labrador.
- .7 Submit copies of incident and accident reports.
- .8 Submit WHMIS MSDS - Material Safety Data Sheets.
- .9 Submit revisions and updates made to the Plan during the course of Work.
- .10 Departmental Representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within 7 days after receipt of plan. Revise plan as appropriate and resubmit plan to Departmental Representative within 7 days after receipt of comments from Departmental Representative.
- .11 Departmental Representative's review of Contractor's final Health and Safety plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction Health and Safety.
- .12 On-site Contingency and Emergency Response Plan: address standard operating procedures to be implemented during emergency situations.

## **1.6 FILING OF NOTICE**

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

## **1.7 SAFETY ASSESSMENT**

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

## **1.8 MEETINGS**

- .1 Schedule and administer Health and Safety meeting with Departmental Representative prior to commencement of Work in attendance have:
  - .1 Superintendent of Work
  - .2 Contractor's designated Health & Safety Site Representative
  - .3 Subcontractor's Health and Safety Site Representative
  - .4 Health and Safety Site Coordinator
- .2 Conduct regularly scheduled tool box and safety meetings during the Work in conformance with Occupational Health and Safety regulations.

- .3 Keep documents on site.

## **1.9 REGULATORY REQUIREMENTS**

- .1 Do Work in accordance with Regulatory Requirements.

## **1.10 PROJECT/SITE CONDITIONS**

- .1 Work at site will involve contact with:
  - .1 Working in close proximity of water.
  - .2 Remote site location.
  - .3 Wet and slippery conditions.
  - .4 Inclement weather conditions.
  - .5 Heavy lifting.
  - .6 Working at heights.
  - .7 Cutting tools and other construction power tools.
  - .8 Hazardous materials, including lead paint.
  - .9 Sharp objects (construction debris).
  - .10 Surrounding steep terrain/cliffs/risk of falling.
- .2 Above items shall not be construed as being complete and inclusive of potential health, and safety hazards encountered during work.
- .3 Include above items into hazard assessment process.

## **1.11 GENERAL REQUIREMENTS**

- .1 Develop written site-specific Health and Safety Plan based on hazard assessment prior to beginning site Work and continue to implement, maintain, and enforce plan until final demobilization from site. Health and Safety Plan must address project specifications.
- .2 Health and Safety Plan shall include the following components:
  - .1 List of health risks and safety hazards identified by hazard assessment.
  - .2 Control measures used to mitigate risks and hazards identified.
  - .3 On-site Contingency and Emergency Response Plan as specified below.
  - .4 On-site Communication Plan as specified below.
  - .5 Name of Contractor's designated Health & Safety Site Representative and information showing proof of his/her competence and reporting relationship in Contractor's company.
  - .6 Names, competence and reporting relationship of other supervisory personnel used in the Work for occupational health and safety purposes.
- .3 On-site Contingency and Emergency Response Plan shall include:
  - .1 Operational procedures, evacuation measures and communication process to be implemented in the event of an emergency.

- .2 Evacuation Plan: site and floor plan layouts showing escape routes, marshaling areas. Details on alarm notification methods, fire drills, location of fire-fighting equipment and other related data.
- .3 Name, duties and responsibilities of persons designated as Emergency Warden(s) and deputies.
- .4 Emergency Contacts: name and telephone number of officials from:
  - .1 General Contractor and subcontractors.
  - .2 Pertinent Federal and Provincial Departments and Authorities having jurisdiction.
  - .3 Local emergency resource organizations.
- .4 On-site Communication Plan:
  - .1 Procedures for sharing of work related safety information to workers and subcontractors, including emergency and evacuation measures.
- .5 Address all activities of the Work including those of subcontractors.
- .6 Review Health and Safety Plan regularly during the Work. Update as conditions warrant to address emerging risks and hazards, such as whenever new trade or subcontractor arrive at Work Site.
- .7 Departmental Representative may respond in writing, where deficiencies or concerns are noted and may request re-submission with correction of deficiencies or concerns.
- .8 Keep documentation on site for duration of the Work.

#### **1.12 RESPONSIBILITY**

- .1 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.
- .2 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.

#### **1.13 COMPLIANCE REQUIREMENTS**

- .1 Comply with the Occupational Health and Safety Act for the Province of Newfoundland and Labrador, and the Occupational Health and Safety Regulations made pursuant to the Act..
- .2 Comply with Canada Labour Code Part II, (entitled Occupational Health and Safety) and the Canada Occupational Health and Safety Regulations (COSH) as well as any other regulations made pursuant to the Act.
  - .1 The Canada Labour Code can be viewed at: [www.http://laws.justice.gc.ca/en/L-2/](http://laws.justice.gc.ca/en/L-2/)
  - .2 COSH can be viewed at: [www.http://laws.justice.gc.ca/eng/SOR-86-304/ne.html](http://laws.justice.gc.ca/eng/SOR-86-304/ne.html).



- .3 A copy may be obtained at: Canadian Government Publishing Public Works & Government Services Canada Ottawa, Ontario, K1A 0S9 Tel: (819) 956-4800 (1-800-635-7943) Publication No. L31-85/2000 E or F).
- .3 Observe construction safety measures of:
  - .1 Part 8 of National Building Code.
  - .2 Municipal by-laws and ordinances.
- .4 In case of conflict or discrepancy between any specified requirements, the more stringent shall apply.
- .5 Maintain Workers Compensation Coverage in good standing for duration of Contract. Provide proof through submission of Certificate of Clearance from Workplace Health, Safety and Compensation Commission (Assessment Services Department) of Newfoundland and Labrador.
- .6 Obtain and maintain worker medical surveillance documentation where prescribed by legislation or regulation.

#### **1.14 UNFORSEEN HAZARDS**

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

#### **1.15 HAZARDOUS PRODUCTS**

- .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS).
- .2 Keep MSDS data sheets for all products delivered to site.
  - .1 Post on site.
  - .2 Submit copy to Departmental Representative.

#### **1.16 SITE CONTROL AND ACCESS**

- .1 Control the Work and entry points to Work Site. Approve and grant access only to workers and authorized persons. Immediately stop and remove non-authorized persons.
  - .1 Departmental Representative will provide names of those persons authorized by Departmental Representative to enter onto Work Site and will ensure that such authorized persons have the required knowledge and training on Health and Safety pertinent to their reason for being at the site, however, Contractor remains responsible for the health and safety of authorized persons while at the Work Site.
- .2 Isolate Work Site from other areas of the premises by use of appropriate means.
  - .1 Erect fences, hoarding, barricades and temporary lighting as required to effectively delineate the Work Site, stop non-authorized entry, and to protect pedestrians and vehicular traffic around and adjacent to the Work and create a safe environment.

- .2 Post signage at entry points and other strategic locations indicating restricted access and conditions for access.
- .3 Provide safety orientation session to persons granted access to Work Site. Advise of hazards and safety rules to be observed while on site.
- .4 Ensure persons granted site access wear appropriate PPE. Supply PPE to inspection authorities who require access to conduct tests or perform inspections.
- .5 Secure Work Site against entry when inactive or unoccupied and to protect persons against harm. Provide security guard where adequate protection cannot be achieved by other mean

**1.17 PROTECTION**

- .1 Should unforeseen or peculiar safety related hazard or condition become evident during performance of Work, immediately take measures to rectify situation and prevent damage or harm. Advise Departmental Representative verbally and in writing.

**1.18 PERMITS**

- .1 Post permits, licenses and compliance Certificates at Work Site.
- .2 Where a particular permit or compliance certificate cannot be obtained, notify Departmental Representative in writing and obtain approval to proceed before carrying out applicable portion of work.

**1.19 SAFETY SUPERVISION**

- .1 Employ Health & Safety Site Representative responsible for daily supervision of health and safety of the Work.
- .2 Health & Safety Site Representative may be the Superintendent of the Work or other person designated by Contractor and shall be assigned the responsibility and authority to:
  - .1 Implement, monitor and enforce daily compliance with health and safety requirements of the Work
  - .2 Monitor and enforce Contractor's site-specific Health and Safety Plan.
  - .3 Conduct site safety orientation session to persons granted access to Work Site.
  - .4 Ensure that persons allowed site access are knowledgeable and trained in health and safety pertinent to their activities at the site or are escorted by a competent person while on the Work Site.
  - .5 Stop the Work as deemed necessary for reasons of health and safety.
- .3 Health & Safety Site Representative must:
  - .1 Be qualified and competent person in occupational health and safety.
  - .2 Have site-related working experience specific to activities of the Work.
  - .3 Be on Work Site at all times during execution of the Work.
  - .4 All supervisory personnel assigned to the Work shall also be competent persons.
  - .5 Inspections:
    - .1 Conduct regularly scheduled safety inspections of the Work on a minimum daily basis. Record deficiencies and remedial action taken.

- .2 Conduct Formal Inspections on a minimum monthly basis. Use standardized safety inspection forms. Distribute to subcontractors.
- .3 Follow-up and ensure corrective measures are taken.
- .6 Keep inspection reports and supervision related documentation site.

**1.20 TRAINING**

- .1 Use only skilled workers on Work Site who are effectively trained in occupational health and safety procedures and practices pertinent to their assigned task.
- .2 Maintain employee records and evidence of training received. Make data available to Departmental Representative upon request.
- .3 When unforeseen or peculiar safety-related hazard, or condition occur during performance of Work, follow procedures in place for Employee's Right to Refuse Work in accordance with Acts and Regulations of Province having jurisdiction and advise Departmental Representative verbally and in writing.
- .4 All workers dealing with hazardous materials are required to provide evidence of training, in accordance with Provincial regulations.

**1.21 MINIMUM SITE SAFETY RULES**

- .1 Notwithstanding requirement to abide by federal and provincial health and safety regulations; ensure the following minimum safety rules are obeyed by persons granted access to Work Site:
  - .1 Wear appropriate PPE pertinent to the Work or assigned task; minimum being hard hat, safety footwear, safety glasses safety vest and hearing protection.
  - .2 Immediately report unsafe condition at site, near-miss accident, injury and damage.
  - .3 Maintain site and storage areas in a tidy condition free of hazards causing injury.
  - .4 Obey warning signs and safety tags.
- .2 Brief persons of disciplinary protocols to be taken for non-compliance. Post rules on site.

**1.22 SITE RECORDS**

- .1 Maintain on Work Site copy of safety related documentation and reports stipulated to be produced in compliance with Acts and Regulations of authorities having jurisdiction and of those documents specified herein.
- .2 Upon request, make available to Departmental Representative or authorized Safety Officer for inspection.

**1.23 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.
- .2 Post other documents as specified herein, including:

- .1 Site specific Health and Safety Plan.
- .2 WHMIS data sheets.

**1.24 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.

**1.25 INCIDENT REPORTING**

- .1 Investigate and report the following incidents to Departmental Representative:
  - .1 Incidents requiring notification to Provincial Department of Occupational Safety and Health, Workers Compensation Board or to other regulatory Agency.
  - .2 Medical aid injuries.
  - .3 Property damage in excess of \$10,000.00.
- .2 Submit report in writing.

**1.26 WORK STOPPAGE**

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

**Part 2 Products**

**2.1 NOT USED**

- .1 Not used.

**Part 3 Execution**

**3.1 NOT USED**

- .1 Not used.

**END OF SECTION**

## **1.1 DEFINITIONS**

- .1 Hazardous Material: Product, substance, or organism that is used for its original purpose; and that is either dangerous goods or a material that may cause adverse impact to the environment or adversely affect health of persons, animals, or plant life when released into the environment.

## **1.2 DISPOSAL OF WASTES AND HAZARDOUS MATERIALS**

- .1 Do not bury rubbish and waste materials on site.
- .2 Do not dispose of hazardous waste or volatile materials, such as mineral spirits, paints, thinners, oil or fuel into waterways, storm or sanitary sewers or waste landfill sites.
- .3 Store, handle and dispose of hazardous materials and hazardous waste in accordance with applicable federal and provincial laws, regulations, codes and guidelines.
- .4 Dispose of construction waste materials and demolition debris, resulting from work, at approved landfill sites only. Carryout such disposal in strict accordance with provincial and municipal rules and regulations. Separate out and prevent improper disposal of items banned from landfills.
- .5 Establish methods and undertake construction practices which will minimize waste and optimize use of construction materials. Separate at source all construction waste materials, demolition debris and product packaging and delivery containers into various waste categories in order to maximize recycling abilities of various materials and avoid disposal of debris at landfill site(s) in a "mixed state". Where recycling firms, specializing in recycling of specific materials exist, transport such materials to the recycling facility and avoid disposal at landfill sites.
- .6 Communicate with landfill operator prior to commencement of work, to determine what specific construction, demolition and renovation waste materials have been banned from disposal at the landfill and at transfer stations.

## **1.3 DRAINAGE**

- .1 Provide temporary drainage and pumping as necessary to keep excavations and site free from water.
- .2 Do not pump water containing suspended materials into waterways, sewer or drainage systems.
- .3 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with governing regulations and requirements.
- .4 Pumped water must meet applicable federal, provincial, and municipal standards before it can be discharged to a surface water body. If regulatory guidelines exceedences are noted, the Departmental Representative has the right to issue stop pumping instructions to the Contractor. Contractor will not be compensated for any delays associated with retrofitting equipment to meet guidelines.

## **1.4 PERMITS**

- .1 All guidelines and instructions stated on permits must be strictly adhered to.

**1.5 WORK ADJACENT TO WATERWAYS**

- .1 Do not operate construction equipment in waterways.
- .2 Do not use waterway beds for borrow material.
- .3 Do not dump excavated fill, waste material or debris in waterways.
- .4 At borrow sites, design and construct temporary crossings to minimize erosion to waterways in strict conformance with provincial and federal environmental regulations.
- .5 Do not skid logs or construction materials across waterways.
- .6 Ensure refueling of any type of equipment does not, either directly or indirectly, create pollution by causing or permitting any leaks or spills.
- .7 Maintain equipment in good working condition with no fluid leaks, loose hoses or fittings.

**1.6 POLLUTION CONTROL**

- .1 Maintain temporary erosion and pollution control features installed under this contract.
- .2 Control emissions from equipment and plant to local authorities emission requirements.
- .3 Cover or wet down dry materials and rubbish to prevent blowing dust and debris.
- .4 Have emergency spill response equipment and rapid clean-up kit, appropriate to work, at site. Locate adjacent to work and where hazardous materials are stored. Provide personal protective equipment as required for clean-up.
- .5 Report, to Federal and Provincial Department of the Environment, spills of petroleum and other hazardous materials as well as accidents having potential of polluting the environment. Also notify Departmental Representative and submit a written spill report to Departmental Representative within 24 hours of occurrence.

**1.7 WILDLIFE PROTECTION**

- .1 Should sea bird nests be encountered during work, immediately notify Departmental Representative for directives to be followed.
  - .1 Do not disturb nest site and neighbouring vegetation until nesting is completed.
  - .2 Minimize work immediately adjacent to such areas until nesting is completed.

**END OF SECTION**

**Part 1            General**

**1.1                INSPECTION**

- .1     Allow Departmental Representative, Consultant access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.
- .2     Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by Departmental Representative, Consultant instructions, or law of Place of Work.
- .3     If Contractor covers or permits to be covered Work that has been designated for special tests, inspections or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.
- .4     Departmental Representative will order part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction. If such Work is found in accordance with Contract Documents, Departmental Representative shall pay cost of examination and replacement.

**1.2                ACCESS TO WORK**

- .1     Allow inspection/testing agencies access to Work, off site manufacturing and fabrication plants.
- .2     Co-operate to provide reasonable facilities for such access.

**1.3                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.

**1.4                EQUIPMENT AND SYSTEMS**

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

**Part 2            Products**

**2.1                NOT USED**

.1            Not Used.

**Part 3            Execution**

**3.1                NOT USED**

.1            Not Used.

**END OF SECTION**



**Part 1            General**

**1.1                RELATED SECTIONS**

- .1            Section 01 33 00.

**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 which have to be gravelled to prevent tracking of mud.
- .3            Indicate use of supplemental or other staging area.
- .4            Provide construction facilities in order to execute work expeditiously.
- .5            Remove from site all such work after use.

**1.4                SCAFFOLDING**

- .1            Scaffolding in accordance with CAN/CSA-S269.2.
- .2            Provide and maintain scaffolding, ladders as required to complete the work.

**1.5                HOISTING**

- .1            Provide, operate and maintain hoists cranes as required for moving of workers, materials and equipment.
- .2            Hoists cranes to be operated by qualified operator.

**1.6                SITE STORAGE/LOADING**

- .1            Do not unreasonably encumber premises with products.

**1.7                CONSTRUCTION PARKING**

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

**1.8 SECURITY**

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

**1.9 CONSTRUCTION SIGNAGE**

- .1 No signs or advertisements, other than warning signs, are permitted on site.
- .2 Signs and notices for safety and instruction in both official languages Graphic symbols to CAN/CSA-Z321.
- .3 Maintain approved signs and notices in good condition for duration of project, and dispose of off site on completion of project or earlier if directed by Departmental Representative.

**1.10 CLEAN-UP**

- .1 Remove construction debris, waste materials, packaging material from work site daily.
- .2 Clean dirt or mud tracked onto paved or surfaced roadways.
- .3 Store materials resulting from demolition activities that are salvageable.
- .4 Stack stored new or salvaged material not in construction facilities.

**Part 2 Products**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 Execution**

**3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

**Part 1            General**

**1.1                INSTALLATION AND REMOVAL**

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

**1.2                HOARDING**

- .1        Erect temporary site enclosures using construction grade lumber framing and exterior grade fir plywood to CSA O121.
- .2        Apply plywood panels vertically.

**1.3                GUARD RAILS AND BARRICADES**

- .1        Provide secure, rigid guard rails and barricades around deep excavations, open shafts, open stair wells, open edges of floors and roofs.

**1.4                WEATHER ENCLOSURES**

- .1        Provide weather tight closures to unfinished door and window openings, tops of shafts and other openings in floors and roofs.
- .2        Close off floor areas where walls are not finished; seal off other openings; enclose building interior work for temporary heat.

**1.5                DUST TIGHT SCREENS**

- .1        Provide dust tight screens or partitions to localize dust generating activities, and for protection of workers, finished areas of Work and public.
- .2        Maintain and relocate protection until such work is complete.

**1.6                ACCESS TO SITE**

- .1        Provide and maintain access to adjacent facilities.

**1.7                PUBLIC TRAFFIC FLOW**

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

**1.8                FIRE ROUTES**

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

**1.9 CONSTRUCTION SIGN AND NOTICES**

- .1 Contractor or subcontractor advertisement signboards are not permitted on site.
- .2 Only notices of safety or instructions are permitted on site.
- .3 Maintenance and Disposal of Site Signs: Maintain approved signs and notices in good condition for duration of project and dispose of off-site on completion of project earlier if directed by Departmental Representative.

**1.10 REMOVAL OF TEMPORARY FACILITIES**

- .1 Remove temporary facilities from site when directed by Departmental Representative.

**Part 2 Products**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 Execution**

**3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

Approved: 2006-03-31

**Part 1            General**

**1.1                QUALITY**

- .1        Products, materials, equipment and articles incorporated in Work shall be new, not damaged or defective, and of best quality for purpose intended. If requested, furnish evidence as to type, source and quality of products provided.
- .2        Procurement policy is to acquire, in cost effective manner, items containing highest percentage of recycled and recovered materials practicable consistent with maintaining satisfactory levels of competition. Make reasonable efforts to use recycled and recovered materials and in otherwise utilizing recycled and recovered materials in execution of work.
- .3        Defective products, whenever identified prior to completion of Work, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is precaution against oversight or error. Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.
- .4        Should disputes arise as to quality or fitness of products, decision rests strictly with Departmental Representative based upon requirements of Contract Documents.
- .5        Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout building.
- .6        Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations, except where required for operating instructions, or when located in mechanical or electrical rooms.

**1.2                AVAILABILITY**

- .1        Immediately upon signing Contract, review product delivery requirements and anticipate foreseeable supply delays for items. If delays in supply of products are foreseeable, notify Consultant of such, in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of Work.
- .2        In event of failure to notify Consultant 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.

**1.3                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 Remove and replace damaged products at own expense and to satisfaction of Departmental Representative.
- .4 Touch-up damaged factory finished surfaces to Consultant's satisfaction. Use touch-up materials to match original. Do not paint over name plates.

#### **1.4 TRANSPORTATION**

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

#### **1.5 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 Consultant 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.

#### **1.6 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 Consultant 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.

#### **1.7 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.

#### **1.8 CONCEALMENT**

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

**Part 2            Products**

**2.1                NOT USED**

.1                Not Used.

**Part 3            Execution**

**3.1                NOT USED**

.1                Not Used.

**END OF SECTION**

**Part 1            General**

**1.1                RELATED SECTIONS**

- .1        Section 01 74 21.

**1.2                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.

**1.3                FINAL CLEANING**

- .1        When Work is Substantially Performed remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.
- .2        Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.
- .3        Prior to final review remove surplus products, tools, construction machinery and equipment.



- .4 Remove waste products and debris other than that caused by Owner 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, unless approved by Departmental Representative.
- .6 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .7 Clean and polish glass, mirrors, hardware, wall tile, stainless steel, chrome, porcelain enamel, baked enamel, plastic laminate, and mechanical and electrical fixtures. Replace broken, scratched or disfigured glass.
- .8 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, walls and floors.
- .9 Clean lighting reflectors, lenses, and other lighting surfaces.
- .10 Vacuum clean and dust building interiors, behind grilles, louvres and screens.
- .11 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.
- .12 Clean equipment and fixtures to sanitary condition; clean or replace filters of mechanical equipment.

**Part 2 Products**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 Execution**

**3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

**Part 1            General**

**1.1                WASTE MANAGEMENT GOALS**

- .1        Prior to start of Work conduct meeting with Departmental Representative to review and discuss Waste Management Plan and Goals.
- .2        Accomplish maximum control of solid construction waste.
- .3        Preserve environment and prevent pollution and environment damage.

**1.2                MATERIALS SOURCE SEPARATION PROGRAM (MSSP)**

- .1        Prepare MSSP and have ready for use prior to project start-up.
- .2        Implement MSSP for waste generated on project in compliance with approved methods and as reviewed by Departmental Representative.
- .3        Provide on-site facilities for collection, handling, and storage of anticipated quantities of reusable and recyclable materials.
- .4        Provide containers to deposit reusable and recyclable materials.
- .5        Locate containers in locations, to facilitate deposit of materials without hindering daily operations.
- .6        Locate separated materials in areas which minimize material damage.
- .7        Collect, handle, store on-site, and transport off-site, salvaged materials in separate condition.
  - .1        Transport to approved and authorized recycling facility.

**1.3                STORAGE, HANDLING AND PROTECTION**

- .1        Store, materials to be reused, recycled and salvaged in locations as directed by Departmental Representative.
- .2        Unless specified otherwise, materials for removal become Contractor's property.
- .3        Protect, stockpile, store and catalogue salvaged items.
- .4        Separate non-salvageable materials from salvaged items. Transport and deliver non-salvageable items to licensed disposal facility.

**1.4                DISPOSAL OF WASTES**

- .1        Do not bury rubbish or waste materials.
- .2        Do not dispose of waste into waterways, storm, or sanitary sewers.

- .3 Remove materials from deconstruction as deconstruction/disassembly Work progresses.

**Part 2 Products**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 Execution**

**3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

**Part 1            General**

**1.1                RELATED REQUIREMENTS**

- .1    Section 01 31 19
- .2    Section 01 33 00
- .3    Section 01 45 00
- .4    Section 01 79 00.

**1.2                ADMINISTRATIVE REQUIREMENTS**

- .1    Pre-warranty Meeting:
  - .1    Convene meeting 2 weeks prior to contract completion with Departmental Representative in accordance with Section 01 31 19 - Project Meetings to:
    - .1    Verify Project requirements.
    - .2    Review manufacturer's installation instructions and 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.

**1.3                ACTION AND INFORMATIONAL SUBMITTALS**

- .1    Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2    Two weeks prior to Substantial Performance of the Work, submit to the Consultant, one electronic copy of operating and maintenance manuals in English.
- .3    Provide spare parts, maintenance materials and special tools of same quality and manufacture as products provided in Work.
- .4    Provide evidence, if requested, for type, source and quality of products supplied.

**1.4                FORMAT**

- .1    Organize data as instructional manual.
- .2    Electronic.

- .3 When multiple binders are used correlate data into related consistent groupings.
  - .1 Identify contents of each binder on spine.
- .4 Cover: identify title 'Project Record Documents'; list title of project and identify subject matter of contents.
- .5 Arrange content by systems under Section numbers and sequence of Table of Contents.
- .6 Text: manufacturer's printed data, or typewritten data.
- .7 Drawings: electronic.

## **1.5 CONTENTS - PROJECT RECORD DOCUMENTS**

- .1 Table of Contents for Each Volume: provide title of project;
  - .1 Date of submission; names.
  - .2 Addresses, and telephone numbers of Consultant and Contractor with name of responsible parties.
  - .3 Schedule of products and systems, indexed to content of volume.
- .2 For each product or system:
  - .1 List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.
- .3 Product Data: mark each sheet to identify specific products and component parts, and data applicable to installation; delete inapplicable information.
- .4 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.
- .5 Typewritten Text: as required to supplement product data.
  - .1 Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 01 45 00 - Quality Control.
- .6 Training: refer to Section 01 79 00 - Demonstration and Training.

## **1.6 AS -BUILT DOCUMENTS AND SAMPLES**

- .1 Maintain, in addition to requirements in General Conditions, at site for Consultant 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 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual.
  - .1 Label each document "PROJECT RECORD" in neat, large, printed letters.
- .3 Maintain record documents in clean, dry and legible condition.
  - .1 Do not use record documents for construction purposes.
- .4 Keep record documents and samples available for inspection by Consultant.

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

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

## **1.8 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 list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- .12 Include test and balancing reports as specified in Section 01 45 00 - Quality Control.
- .13 Additional requirements: as specified in individual specification sections.

## **1.9 MAINTENANCE MATERIALS**

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

## **1.10 WARRANTIES AND BONDS**

- .1 Develop warranty management plan to contain information relevant to Warranties.
- .2 Submit warranty management plan, 14 days before planned pre-warranty conference, to Departmental Representative approval.
- .3 Warranty management plan to include required actions and documents to assure that Departmental Representative receives warranties to which it is entitled.
- .4 Provide plan in narrative form and contain sufficient detail to make it suitable for use by future maintenance and repair personnel.

- .5 Submit, warranty information made available during construction phase, to Departmental Representative for approval prior to each monthly pay estimate.
- .6 Assemble approved information in binder, submit upon acceptance of work and organize binder as follows:
  - .1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.
  - .2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.
  - .3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten days after completion of applicable item of work.
  - .4 Verify that documents are in proper form, contain full information, and are notarized.
  - .5 Co-execute submittals when required.
  - .6 Retain warranties and bonds until time specified for submittal.
- .7 Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial Performance is determined.
- .8 Conduct joint 9 month warranty inspection, measured from time of acceptance, by Departmental Representative.
- .9 Include information contained in warranty management plan as follows:
  - .1 Roles and responsibilities of personnel associated with warranty process, including points of contact and telephone numbers within the organizations of Contractors, subcontractors, manufacturers or suppliers involved.
  - .2 Listing and status of delivery of Certificates of Warranty for extended warranty items.
  - .3 Provide list for each warranted equipment, item, feature of construction or system indicating:
    - .1 Name of item.
    - .2 Model and serial numbers.
    - .3 Location where installed.
    - .4 Name and phone numbers of manufacturers or suppliers.
    - .5 Names, addresses and telephone numbers of sources of spare parts.
    - .6 Warranties and terms of warranty: include one-year overall warranty of construction. Indicate items that have extended warranties and show separate warranty expiration dates.
    - .7 Cross-reference to warranty certificates as applicable.
    - .8 Starting point and duration of warranty period.
    - .9 Summary of maintenance procedures required to continue warranty in force.
    - .10 Cross-Reference to specific pertinent Operation and Maintenance manuals.
    - .11 Organization, names and phone numbers of persons to call for warranty service.



- .12 Typical response time and repair time expected for various warranted equipment.
- .4 Contractor's plans for attendance 9 month post-construction warranty inspections.
- .5 Procedure and status of tagging of equipment covered by extended warranties.
- .6 Post copies of instructions near selected pieces of equipment where operation is critical for warranty and/or safety reasons.
- .10 Respond in timely manner to oral or written notification of required construction warranty repair work.
- .11 Written verification to follow oral instructions.
- .1 Failure to respond will be cause for the Departmental Representative to proceed with action against Contractor.

**Part 2 Products**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 Execution**

**3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

**Part 1            General**

**1.1                RELATED REQUIREMENTS**

- .1        Section 01 33 00.

**1.2                ADMINISTRATIVE REQUIREMENTS**

- .1        Demonstrate operation and maintenance of equipment and systems to Owner's personnel 2 weeks prior to date of substantial performance.
- .2        Owner: provide list of personnel to receive instructions, and co-ordinate their attendance at agreed-upon times.
- .3        Preparation:
  - .1        Verify conditions for demonstration and instructions comply with requirements.
  - .2        Verify designated personnel are present.
  - .3        Ensure equipment has been inspected and put into operation.
  - .4        Ensure testing, adjusting, and balancing has been performed.
- .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 designated location.
  - .2        Instruct personnel in phases of operation and maintenance using operation and maintenance manuals as basis of instruction.
  - .3        Review contents of manual in detail to explain aspects of operation and maintenance.
  - .4        Prepare and insert additional data in operations and maintenance manuals when needed during instructions.

**1.3                ACTION AND INFORMATIONAL SUBMITTALS**

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

**1.4 QUALITY ASSURANCE**

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

**Part 2 Products**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 Execution**

**3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

**Part 1            General**

**1.1            RELATED SECTIONS:**

- 01 33 00 – Submittal Procedures
- 01 35 23 – Health, Safety and Environmental for Construction
- 01 45 00 – Quality Control
- 01 61 00 – Common Product Requirements
- 01 74 21 – Construction/Demolition Waste Management Plan
- 01 78 00 – Closeout Submittals.
- 07 84 00 - Fire Stopping & Smoke Seals
- 08 31 00 - Access Doors for Mechanical Systems
- 23 05 93 – Testing, Adjusting and Balancing for HVAC

**1.2            SUBMITTALS**

- .1    Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2    Shop drawings to show:
  - .1    Mounting arrangements.
  - .2    Operating and maintenance clearances.
- .3    Shop drawings and product data accompanied by:
  - .1    Detailed drawings of bases, supports, and anchor bolts.
  - .2    Acoustical sound power data, where applicable.
  - .3    Points of operation on performance curves.
  - .4    Manufacturer to certify current model production.
  - .5    Certification of compliance to applicable codes.
- .4    In addition to transmittal letter referred to in Section 01 33 00 - Submittal Procedures: use MCAC "Shop Drawing Submittal Title Sheet". Identify section and paragraph number.
- .5    Closeout Submittals:
  - .1    Provide operation and maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.
  - .2    Operation and maintenance manual approved by, and final copies deposited with, Consultant before final inspection.
  - .3    Operation data to include:
    - .1    Control schematics for systems including environmental controls.

- .2 Description of systems and their controls.
- .3 Description of operation of systems at various loads together with reset schedules and seasonal variances.
- .4 Operation instruction for systems and component.
- .5 Description of actions to be taken in event of equipment failure.
- .4 Maintenance data to include:
  - .1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
  - .2 Data to include schedules of tasks, frequency, tools required and task time.
- .5 Performance data to include:
  - .1 Equipment manufacturer's performance datasheets with point of operation as left after commissioning is complete.
  - .2 Equipment performance verification test results.
  - .3 Testing, adjusting and balancing reports as specified in Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.
- .6 Approvals:
  - .1 Submit 1 copy of draft Operation and Maintenance Manual to Consultant for approval.
  - .2 Make changes as required and re-submit as directed by Consultant.
- .7 Additional data:
  - .1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.
- .8 Site records:
  - .1 Provide sets of white prints as required for each phase of work. Mark changes as work progresses and as changes occur. Include changes to existing mechanical systems, control systems and low voltage control wiring.
  - .2 Transfer information weekly to reproducibles, revising reproducibles to show work as actually installed.
  - .3 Use different colour waterproof ink for each service.
  - .4 Make available for reference purposes and inspection.
- .9 As-built drawings:
  - .1 Prior to start of Testing, Adjusting and Balancing for HVAC, finalize production of as-built drawings.
  - .2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: - "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (Date).
  - .3 Submit to Consultant for approval and make corrections as directed.
  - .4 Perform testing, adjusting and balancing for HVAC using as-built drawings.
  - .5 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.

- .10 Submit copies of as-built drawings for inclusion in final TAB report.

### **1.3 QUALITY ASSURANCE**

- .1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.

### **1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Packaging Waste Management: remove for reuse of packaging materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

## **Part 2 Products**

### **2.1 NOT USED**

## **Part 3 Execution**

### **3.1 CLEANING**

- .1 Clean interior and exterior of all systems including strainers. Vacuum interior of ductwork and air handling units.

### **3.2 FIELD QUALITY CONTROL**

- .1 Manufacturer's Field Services:
  - .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.
  - .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
  - .3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.
  - .4 Provide manufacturer's field services:
    - .1 Boilers
    - .2 AC System

### **3.3 DEMONSTRATION**

- .1 Consultant will use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.
- .2 Trial usage to apply to following equipment and systems:
  - .1 Controls.

- .3 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, trouble-shooting and servicing of all systems and equipment during regular work hours, prior to acceptance.
- .4 Use operation and maintenance manual, as-built drawings, and audio visual aids as part of instruction materials.

**3.4 PROTECTION**

- .1 Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system.

**3.5 USE OF SYSTEMS**

- .1 Use of existing permanent heating and or ventilating systems for supplying temporary heat or ventilation is not permitted.

**END OF SECTION**

**Part 1 General**

**1.1 RELATED REQUIREMENTS**

- .1 03 30 00 – Cast-In-Place Concrete.
- .2 01 78 00 – Closeout Submittals

**1.2 REFERENCES**

- .1 American Society of Mechanical Engineers (ASME)
  - .1 ASME B31.1-07, Power Piping.
- .2 ASTM International
  - .1 ASTM A125-1996(2007), Standard Specification for Steel Springs, Helical, Heat-Treated.
  - .2 ASTM A307-07b, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
  - .3 ASTM A563-07a, Standard Specification for Carbon and Alloy Steel Nuts.
- .3 Factory Mutual (FM)
- .4 Manufacturer's Standardization Society of the Valves and Fittings Industry (MSS)
  - .1 MSS SP58-2002, Pipe Hangers and Supports - Materials, Design and Manufacture.
  - .2 MSS SP69-2003, Pipe Hangers and Supports - Selection and Application.
  - .3 MSS SP89-2003, Pipe Hangers and Supports - Fabrication and Installation Practices.
- .5 Underwriter's Laboratories of Canada (ULC)

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Provide manufacturer's printed product literature and data sheets for hangers and supports and include product characteristics, performance criteria, physical size, finish and limitations.

**1.4 CLOSEOUT SUBMITTALS**

- .1 Provide maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.



**Part 2 Products**

**2.1 SYSTEM DESCRIPTION**

- .1 Design Requirements:
  - .1 Design hangers and supports to support systems under conditions of operation, allow free expansion and contraction, prevent excessive stresses from being introduced into pipework or connected equipment.

**2.2 EQUIPMENT SUPPORTS**

- .1 Fabricate equipment supports not provided by equipment manufacturer from structural grade steel meeting requirements. Submit calculations with shop drawings.

**2.3 EQUIPMENT ANCHOR BOLTS AND TEMPLATES**

- .1 Provide templates to ensure accurate location of anchor bolts.

**Part 3 Execution**

**3.1 MANUFACTURER'S INSTRUCTIONS**

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

**3.2 INSTALLATION**

- .1 Install in accordance with:
  - .1 Manufacturer's instructions and recommendations.
- .2 Vibration Control Devices:
  - .1 Install on piping systems at pumps, boilers, chillers, cooling towers, and as indicated.
- .3 Provide supplementary structural steelwork where structural bearings do not exist or where concrete inserts are not in correct locations.

**3.3 HANGER INSTALLATION**

- .1 Install hanger so that rod is vertical under operating conditions.
- .2 Adjust hangers to equalize load.
- .3 Support from structural members. Where structural bearing does not exist or inserts are not in suitable locations, provide supplementary structural steel members.

**3.4 FINAL ADJUSTMENT**

- .1 Adjust hangers and supports:

- .1 Ensure that rod is vertical under operating conditions.
- .2 Equalize loads.

**END OF SECTION**

**Part 1 General**

**1.1 SUMMARY**

- .1 Related Sections:
  - .1 Section 23 05 00 - Common Work Results for HVAC.
  - .2 Section 07 84 00 - Firestopping.
  - .3 Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.
  - .4 Section 23 05 94 - Pressure Testing of Ducted Air Systems.

**1.2 REFERENCES**

- .1 American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE).
- .2 American Society for Testing and Materials International, (ASTM).
  - .1 ASTM A480/A480M-03c, Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet and Strip.
  - .2 ASTM A635/A635M-02, Standard Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Carbon, Hot Rolled.
  - .3 ASTM A653/A653M-03, Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.
- .3 National Fire Protection Association (NFPA).
  - .1 NFPA 90A-02, Standard for the Installation of Air-Conditioning and Ventilating Systems.
  - .2 NFPA 90B-02, Standard for the Installation of Warm Air Heating and Air-Conditioning Systems.
- .4 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA).
  - .1 SMACNA HVAC Duct Construction Standards - Metal and Flexible, 2nd Edition 1995 and Addendum No. 1, [1997].
  - .2 SMACNA HVAC Air Duct Leakage Test Manual, 1985, 1st Edition.

**1.3 SUBMITTALS**

- .1 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures.

**Part 2 Products**

**2.1 SEAL CLASSIFICATION**

- .1 Classification as follows:

Maximum Pressure Pa	SMACNA Seal Class
500	C

Maximum Pressure Pa	SMACNA Seal Class
250	C
125	C
125	Unsealed*

- .1 Seal classification:
  - .1 Class C: transverse joints and connections made air tight with gaskets, sealant, tape, or combination thereof. Longitudinal seams unsealed.
  - .2 Unsealed seams and joints for:
    - .1 Return ducts located within conditioned space or in spaces used as return air plenum.
    - .2 Supply ducts located within the conditioned space to which they supply air, except when upstream of a control device.

## 2.2 SEALANT

- .1 Sealant: oil resistant, water borne, polymer type flame resistant duct sealant. Temperature range of minus 30 degrees C to plus 93 degrees C.

## 2.3 TAPE

- .1 Tape: polyvinyl treated, open weave fiberglass tape, 50 mm wide.

## 2.4 DUCT LEAKAGE

- .1 In accordance with SMACNA HVAC Air Duct Leakage Test Manual.

## 2.5 FITTINGS

- .1 Fabrication: to SMACNA.
- .2 Radiused elbows.
  - .1 Rectangular: standard radius. Centreline radius: 1.5 times width of duct, or short radius with single thickness turning vanes.
  - .2 Round: five piece. Centreline radius: 1.5 times diameter.
- .3 Mitred elbows, rectangular:
  - .1 To 400 mm: with single thickness turning vanes.
  - .2 Over 400 mm: with double thickness turning vanes.
- .4 Branches:
  - .1 Rectangular main and branch: with radius on branch 1.5 times width of duct.
  - .2 Round main and branch: enter main duct at 45 degrees.
  - .3 Provide volume control damper in branch duct near connection to main duct.
  - .4 Main duct branches: with splitter damper.
- .5 Transitions:
  - .1 Diverging: 20 degrees maximum included angle.

- .2 Converging: 30 degrees maximum included angle.
- .6 Offsets:
  - .1 Full radiused elbows.

## 2.6 FIRE STOPPING

- .1 Retaining angles around duct, on both sides of fire separation in accordance with Section 07 84 00 - Firestopping.
- .2 Fire stopping material and installation must not distort duct.

## 2.7 GALVANIZED STEEL

- .1 Lock forming quality: to ASTM A653/A653M, zinc coating.
- .2 Thickness, fabrication and reinforcement: to SMACNA.
- .3 Joints: to SMACNA. Proprietary manufactured flanged duct joint to be considered to be a class A seal.

## 2.8 HANGERS AND SUPPORTS

- .1 Hangers and Supports: in accordance with Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.
  - .1 Strap hangers: of same material as duct but next sheet metal thickness heavier than duct.
    - .1 Maximum size duct supported by strap hanger: 500.
  - .2 Hanger configuration: to SMACNA.
  - .3 Hangers: galvanized steel angle with black steel rods to SMACNA following table:

Duct Size (mm)	Angle Size (mm)	Rod Size (mm)
up to 750	25 x 25 x 3	6
751 to 1050	40 x 40 x 3	6
1051 to 1500	40 x 40 x 3	10
1501 to 2100	50 x 50 x 3	10
2101 to 2400	50 x 50 x 5	10
2401 and over	50 x 50 x 6	10

- .4 Upper hanger attachments:
  - .1 For concrete: manufactured concrete inserts.
  - .2 For steel joist: manufactured joist clamp.
  - .3 For steel beams: manufactured beam clamps:

## Part 3 Execution

### 3.1 GENERAL

- .1 Do work in accordance with SMACNA.

- .2 Do not break continuity of insulation vapour barrier with hangers or rods.
- .3 Support risers in accordance with SMACNA.
- .4 Install breakaway joints in ductwork on sides of fire separation.
- .5 Install proprietary manufactured flanged duct joints in accordance with manufacturer's instructions.

### **3.2 HANGERS**

- .1 Strap hangers: install in accordance with SMACNA.
- .2 Angle hangers: complete with locking nuts and washers.
- .3 Hanger spacing: in accordance with SMACNA

### **3.3 WATERTIGHT DUCT**

- .1 Provide watertight duct for:
  - .1 Fresh air intake.
  - .2 Minimum 3000 mm from duct mounted humidifier in all directions.
  - .3 As indicated.
- .2 Form bottom of horizontal duct without longitudinal seams.
  - .1 Weld joints of bottom and side sheets.
  - .2 Seal other joints with duct sealer.
- .3 Slope horizontal branch ductwork down towards hood, louver or humidifier served.
  - .1 Slope header ducts down toward risers.
- .4 Fit base of riser with 150 mm deep drain sump and 32 mm drain connected, with deep seal trap and discharging to open funnel drain.

### **3.4 SEALING AND TAPING**

- .1 Apply sealant to outside of joint to manufacturer's recommendations.
- .2 Bed tape in sealant and recoat with minimum of one coat of sealant to manufacturers recommendations.

### **3.5 LEAKAGE TESTS**

- .1 Refer to Section 23 05 94 - Pressure Testing of Ducted Air Systems.
- .2 In accordance with SMACNA HVAC Duct Leakage Test Manual.
- .3 Do leakage tests in sections.
- .4 Make trial leakage tests as instructed to demonstrate workmanship.

- .5 Do not install additional ductwork until trial test has been passed.
- .6 Test section minimum of 30 m long with not less than three branch takeoffs and two 90 degrees elbows.
- .7 Complete test before performance insulation or concealment Work.

**END OF SECTION**

**Part 1            General**

**1.1                RELATED REQUIREMENTS**

21 00 00 - Fire Suppression

23 00 00 - Heating, Ventilating, and Air Conditioning (HVAC)

23 09 13 - Instrumentation and Control Devices for HVAC

25 00 00 - Integrated Automation

26 00 00 - Electrical

**1.2                SECTION INCLUDES**

- .1        The ceiling-mounted circulation fan is the model scheduled with the capacities indicated. The fan shall be furnished with standard mounting hardware and variable speed control to provide cooling and destratification.
- .2        The fan speed control system is the model scheduled with the capacities indicated. The fan shall be furnished with a wall controller and upper temperature sensor.

**1.3                SUMMARY OF WORK**

- .1        Installation of the fan, miscellaneous or structural metal work (if required), field electrical wiring, cable, conduit, fuses and disconnect switches, other than those addressed in the installation scope of work, shall be provided by others. Consult the appropriate installation scope of work for information on the available factory installation options, overview of customer and installer responsibilities, and details on installation site requirements.
- .2        Installation of the wall controller and upper temperature sensor, field electrical wiring, cable, conduit, fuses, and disconnect switches, other than those address in the installation scope of work, shall be provided by others. Consult the appropriate installation scope of work for information on the available factory installation options, overview of customer and installer responsibilities, and details on installation site requirements.

**1.4                REFERENCES**

- .1        National Fire Protection Agency (NFPA)
- .2        Underwriters Laboratory (UL)
- .3        Restriction of Hazardous Substances (ROHS)
- .4        International Organization for Standardization (ISO)
- .5        National Electrical Manufacturers Association (NEMA)



- .6 National Electric Code (NEC)
- .7 Occupational Safety and Health Administration (OSHA)

## **1.5 SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Provide manufacturer's printed product literature and data sheets for fans include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Installation Guide:
  - .1 The manufacturer shall furnish a copy of all operating and maintenance instructions for the fan. All data is subject to change without notice.

## **1.6 QUALITY ASSURANCE**

- .1 Certifications
  - .1 The fan assembly, as a system, shall be Intertek/ETL-certified and built pursuant to the guidelines set forth by UL standard 507 and CSA standard 22.2 No. 113.
  - .2 The fan shall be compliant with NFPA 13—Standard for the Installation of Sprinkler Systems, NFPA 72—National Fire Alarm and Signaling Code, and NFPA 70-2011—National Electric Code (NEC).
  - .3 Controllers shall comply with National Electrical Code (NEC) and Underwriters Laboratory (UL) standards and shall be labeled where required by code.
- .2 Manufacturer Qualifications
  - .1 The fan and any accessories shall be supplied by Big Ass Fans, which has a minimum of ten (10) years of product experience.
  - .2 ISO 9001-certified
  - .3 The manufacturer shall not be listed on the Air Movement and Control Association International Inc. (AMCA) Certified Ratings Program (CRP) Non-Licensed Products report in the previous 18 months.

## **1.7 DELIVERY, STORAGE, AND HANDLING**

- .1 Deliver product in original, undamaged packaging with identification labels intact. The fan shall be new, free from defects, and factory tested.
- .2 The fan and its components must be stored in a safe, dry location until installation.
- .3 The wall control components shall be new, free from defects, and factory tested. The product is packaged in static shielding materials for ESD protection.

## 1.8 WARRANTY

- .1 The manufacturer shall replace any products or components defective in material or workmanship for the customer free of charge (FOB Lexington, KY), pursuant to the complete terms and conditions of the Non-Prorated Warranty in accordance to the following schedule:

Airfoils	Lifetime (Parts)
Hub	Lifetime (Parts)
Motor	15 years (Parts) †
Gearbox	15 years (Parts) †
Light Kit	5 Years (Parts)
Variable Frequency Drive	15 years (Parts) †
Wall Control components	1 year (Parts)
All other fan components	15 years (Parts) †
Labor	1 year

† 15-year parts warranty only valid with factory installation; 7-year parts without factory installation. "Lifetime" means a period ending seven (7) years after the manufacturer discontinues manufacturing the product.

†† All reasonable costs of repair or replacement will be paid or reimbursed provided customer obtains pre-approval; full warranty contains details.

## Part 2 Product

### 2.1 MANUFACTURER

- .1 Delta T Corporation, dba Big Ass S, PO Box 11307, Lexington, Kentucky 40575. Phone (877) 244-3267. Fax (859) 233-0139. Website: [www.bigassfans.com](http://www.bigassfans.com).
- .2 Alternates will be acceptable when identified during the tender period.

### 2.2 HIGH VOLUME, LOW SPEED FANS

- .1 Complete Unit
- .1 Regulatory Requirements: The entire fan assembly (without light kit) shall be Intertek/ETL-certified and built pursuant to the construction guidelines set forth by UL standard 507 and CSA standard 22.2.
- .2 Sustainability Characteristics: The fan shall be designed to move an effective amount of air for cooling and destratification in a variety of applications (including industrial and agricultural) over an extended life. The fan components shall be designed specifically for high volume, low speed fans to ensure lower operational noise. Sound levels from the fan operating at maximum speed measured in a laboratory setting shall not exceed 55 dBA. Actual results of sound measurements in the field may vary due to sound reflective surfaces and environmental conditions.
- .3 Good workmanship shall be evident in all aspects of construction. Field balancing of the airfoils shall not be necessary.
- .2 Onboard Fan Control

- .1 The onboard fan controller shall be constructed using a variable frequency drive (VFD) that is pre-wired to the motor and factory-programmed to minimize the starting and braking torques for smooth and efficient operation. The onboard controller shall be prewired to the motor using a short run of flexible conduit with a dedicated ground conductor to minimize electromagnetic interference (EMI) and radio frequency interference (RFI). A 15-ft incoming power cord shall be pre-wired to the controller with one of the following plugs: NEMA L6-20P Twist-Lock Plug, NEMA L6-30P Twist-Lock Plug, NEMA L15-20P Twist Lock Plug, NEMA L16-20P Twist-Lock Plug.
- .2 As an option, the architect or owner may upgrade to the “harsh environment package,” which includes a seal for the weather-resistant onboard VFD enclosure and a motor with IP55 NEMA classification.
- .3 **Airfoil System**
  - .1 The fan shall be equipped with eight (8) Powerfoil airfoils of precision extruded aluminum alloy. The airfoils shall be connected by means of two (2) high strength locking bolts per airfoil. The airfoils shall be connected to the hub and interlocked with zinc plated steel retainers.
  - .2 The fan shall be equipped with eight (8) Powerfoil winglets on the ends of the airfoils and eight (8) AirFences™ positioned on the airfoils at the optimum location for performance. Both the winglet and AirFence shall be molded of polypropylene. The standard color of the winglet and AirFence shall be “Safety Yellow.”
- .4 **Motor**
  - .1 The fan motor shall be an AC induction type inverter rated at one of the following:
    - .1 1725 RPM, 200–240/400–480 VAC, 50/60 Hz, three-phase
    - .2 1725 RPM, 575–600 VAC, 50/60 Hz, three-phase
  - .2 The motor shall be totally enclosed, fan cooled (TEFC) with an IP44 NEMA classification. A NEMA 56C standard frame shall be provided for ease of service. The motor shall be manufactured with a double baked Class F insulation and be capable of continuous operation in 32 o F to 122 o F (0 o C to 50 o C) ambient conditions.
  - .3 The motor shall have a C-face attachment that shall enable technicians to detach the motor for easy field service. The C-face motor adapter shall be designed to work with the NitroSeal™ gearbox.
  - .4 As an option, the architect or owner may upgrade to the “harsh environment package,” which includes a motor with an IP55 NEMA classification. As part of the “harsh environment package,” the onboard VFD enclosure is sealed for weather-resistant operation.
- .5 **Gearbox**
  - .1 The fan gearbox shall be a NitroSeal™ Drive designed specifically for the Powerfoil X series. The gearbox shall include a high-efficiency, hermetically sealed, nitrogen-filled, offset helical gear reducer with two-stage gearing, a hollow output shaft, cast iron housing, double lip seals, high quality SKF Explorer Series bearings with crowned cages for optimal lubrication flow, and precision machined gearing to maintain backlash less than 11 arc-minutes over the life of the unit.

Lubrication shall be high-grade, low-foaming synthetic oil with extreme pressure additives and a wide temperature range.

- .2 The gearbox shall be equipped with a hollow shaft threaded to accept a 3/4" NPT fitting in which wiring, piping, etc., can be routed to below the fan. A standard junction box can be affixed to this hollow shaft to allow for installing optional features such as lights or cameras. The inclusion of the hollow shaft shall be specified at the time of order.

.6 Mounting Post

- .1 The fan shall be equipped with a mounting post that provides a structural connection between the fan assembly and extension tube. The mounting post shall be formed from A36 steel, contain no critical welds, and be powder coated for corrosion resistance and appearance.

.7 Mounting System

- .1 The fan mounting system shall be designed for quick and secure installation on a variety of structural supports. The mounting yoke shall be of ASTM A-36 steel, welded construction, at least 3/16" thick, and powder coated for appearance and corrosion resistance. No mounting hardware or parts substitutions, including cast aluminum, are acceptable.
- .2 All mounting bolts shall be SAE Grade 8 or equivalent.

.8 Hub

- .1 The fan hub shall be made of precision cut aluminum for high strength and light weight. The hub shall consist of two (2) aluminum plates, eight (8) aluminum spars and one (1) aluminum spacer fastened with a pin and collar rivet system.
- .2 The hub shall be secured to the output shaft of the gearbox by means of (10) high strength bolts. The hub shall incorporate five (5) safety retaining clips made of 1/4" (0.6 cm) thick steel that shall restrain the hub/airfoil assembly.

.9 Safety Cable

- .1 The fan shall be equipped with a safety cable that provides an additional means of securing the fan assembly to the building structure. The safety cable shall be 3/8" (1 cm) diameter and fabricated out of 7 x 19 galvanized steel cable. The end loops shall be secured with swaged Nicopress® sleeves, pre-loaded and tested to 3,200 lbf (13,345 N).
- .2 Field construction of safety cables is not permitted.

.10 Wall Controller

- .1 Regulatory Requirements: The fan speed control system shall be compliant with NFPA 70-2011—National Electric Code (NEC).
- .2 Sustainability Characteristics: The system shall be designed to automatically control the speed of fans from the locations of the wall controller and upper temperature sensor to maximize energy savings and user comfort. The system shall be designed specifically for high volume, low speed fans, and receives information from user-determined settings and temperature sensors.
- .3 Good workmanship shall be evident in all aspects of installation.
- .4 The wall control shall be a digital keypad device with an internal temperature sensor. It shall be wall-mounted centrally within the fan zone at head height using

- two (2) provided 6-32 x 7/8" pan head screws and four (4) provided 6-32 countersink.
- .5 The wall controller shall be enclosed in a cast zinc cover measuring 3.86" (9.8 cm) x 7.25" (18.4 mm) x 1" (2.5 cm) and be made of heavy-duty steel.
  - .6 The wall controller includes a Class II AC Adapter power cord.
  - .7 The wall controller only provides a speed reference for the fan. Start and stop functions are controlled by the auxiliary controller.
  - .8 The mounting location shall meet the requirements of OSHA standard 29 CFR 1910.303(g) for accessibility minimum clearances.
- .11 Upper Temperature Sensor
- .1 The upper temperature sensor shall be mounted in the upper portion of the fan zone either by using a provided I-Beam clamp, or by using four (4) provided mounting screws.
  - .2 The upper temperature sensor shall measure 1.9" (4.8 cm) x 4" (10.2 cm) x 1" (2.5 cm).
- .12 Auxiliary Controller
- .1 The fan shall be equipped with an auxiliary controller capable of providing 100% control of all fan functions. The auxiliary controller shall be a digital keypad device mounted within a cast zinc cover. The cover shall be capable of mounting to a standard switch box.
  - .2 The fan shall be equipped with touchpad controls and an LED display for controlling the fan's direction, operation, speed, and programming. Communication between the fan VFD and auxiliary controller is by a standard CAT5 (or higher) Ethernet cable. The auxiliary control comes standard with 150 ft of factory-assembled CAT5 Ethernet cable.
  - .3 The fan shall be equipped with a simple diagnostic program to identify faults in the system. Provisions shall be made for retrieving fan operation and diagnostic data (fault messages) through the auxiliary controller.
- .13 Fire Control Panel Integration
- .1 Includes a 10–30 VDC pilot relay for seamless fire control panel integration. The pilot relay can be wired Normally Open or Normally Closed in the field.
- .14 Guy wires
- .1 Included for installations with extension tubes 4 ft (1.2 m) or longer to limit the potential for lateral movement.

### **Part 3 Execution**

#### **3.1 PREPARATION**

- .1 Fan location shall have a typical bar joist or existing I-beam structure from which to mount the fan. Additional mounting options may be available.

- .2 The contractor shall provide structural engineering drawings for the mounting of the high-volume low-speed fans. Submit drawings stamped and signed by professional engineer registered or licensed in Province of Newfoundland and Labrador, Canada.
- .3 Fan location shall be free from obstacles such as lights, cables, or other building components.
- .4 Check fan location for proper electrical requirements. Consult installation guide for appropriate circuit requirements.
- .5 Each fan requires dedicated branch circuit protection.
- .6 Route power to within six (6) feet of the wall controller location. If additional distance is needed to power the wall controller, consult the alternative wiring method instructions in the Installation Guide.

### 3.2 INSTALLATION

- .1 The fan shall be installed by a factory-certified installer according to the manufacturer's Installation Guide, which includes acceptable structural dimensions and proper sizing and placement of angle iron for bar joist applications. Consult a structural engineer for installation methods outside the manufacturer's recommendation and a certification, in the form of a stamped print or letter, submitted prior to installation.
- .2 Minimum Distances
  - .1 Airfoils shall be at least 10 ft (3 m) above the floor.
  - .2 Installation area shall be free of obstructions such as lights, cables, sprinklers or other building structures with the airfoils at least 2 ft (0.61 m) clear of all obstructions.
  - .3 The structure the fan is attached to shall be capable of supporting a torque load up to 300 ft·lb (407 N·m) of torque
- .3 The fan shall not be located where it will be continuously subjected to wind gusts or in close proximity to the outputs of HVAC systems or radiant heaters.
- .4 In buildings equipped with sprinklers, including ESFR sprinklers, fan installation shall comply with all of the following:
  - .1 The maximum fan diameter shall be 24 ft (7.3 m).
  - .2 The HVLS fan shall be centered approximately between four adjacent sprinklers.
  - .3 The vertical clearance from the HVLS fan to the sprinkler deflector shall be a minimum of 3 ft (0.9 m).
  - .4 All HVLS fans shall be interlocked to shut down immediately upon receiving a waterflow signal from the alarm system in accordance with the requirements of NFPA 72 - National Fire Alarm and Signaling Code.
- .5 The wall control shall be installed by a factory-certified installer according to the Installation Guide.

- .6 The customer shall supply 2-conductor shielded cable (18-22AWG stranded) to connect the wall control components to the fan's variable frequency drive. The maximum distance between the wall controller and the upper temperature sensor shall be 1000 ft (305 m).
- .7 Installation areas must be free of obstructions such as lights, cables, sprinklers, or other building structures.
- .8 The components of the wall control shall not be mounted adjacent to or above radiant heaters, near HVAC ventilation intakes or exhausts, on poorly insulated exterior walls, in roof decking, or near radiant heat sources, and must be mounted so that they are exposed adequately to circulated air. Additional mounting guidelines can be found in the Installation Guide.

**END OF SECTION**

**Part 1 General**

**1.1 GENERAL**

- .1 This section covers items common to sections of Division 26. This section also supplements requirements of Division 1 and Division 23. Refer to Section 01 00 00 – Bid Depository Sections where applicable for bid depository.

**1.2 RELATED REQUIREMENTS**

- .1 Section 01 33 00 – Submittal Procedures.
- .2 Section 01 45 00 – Quality Control.
- .3 Section 01 61 00 – Common Product Requirements
- .4 Section 01 74 11 – Cleaning.
- .5 Section 01 78 00 – Closeout Submittals.

**1.3 REFERENCES**

- .1 Definitions:
  - .1 Electrical and electronic terms: unless otherwise specified or indicated, terms used in these specifications, and on drawings, are those defined by IEEE SP1122.
- .2 Reference Standards:
  - .1 CSA Group
    - .1 CSA C22.1, Canadian Electrical Code, Part 1 (23rd Edition), Safety Standard for Electrical Installations.
    - .2 CSA C22.2, General Requirements, Canadian Electrical Code, Part 2 (23rd Edition).
    - .3 CAN3-C235, Preferred Voltage Levels for AC Systems, 0 to 50,000 V.
  - .2 Institute of Electrical and Electronics (IEEE)/National Electrical Safety Code Product Line (NESC)
    - .1 IEEE SP1122, The Authoritative Dictionary of IEEE Standards Terms, 7th Edition.

**1.4 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for equipment and materials and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop drawings:
  - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Newfoundland and Labrador, Canada.



- .2 Submit wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure co-ordinated installation.
- .3 Identify on wiring diagrams circuit terminals and indicate internal wiring for each item of equipment and interconnection between each item of equipment.
- .4 Indicate of drawings clearances for operation, maintenance, and replacement of operating equipment devices.
- .4 Certificates:
  - .1 Provide CSA certified equipment and material.
  - .2 Where CSA certified equipment and material is not available, submit such equipment and material to Authority having Jurisdiction for approval before delivery to site.
  - .3 Submit test results of installed electrical systems.
  - .4 Permits and fees: in accordance with General Conditions of contract.
  - .5 Submit, upon completion of Work, load balance report as described in PART 3 - LOAD BALANCE.
  - .6 Submit certificate of acceptance from Authority having Jurisdiction upon completion of Work to Owner's Representative.
- .5 Manufacturer's Field Reports: submit to Owner's Representative manufacturer's written report, within seven (7) days of review, verifying compliance of Work and electrical system and instrumentation testing, as described in PART 3 - FIELD QUALITY CONTROL.

**1.5 CARE, OPERATION AND START-UP**

- .1 Instruct Owner's Representative and operating personnel in the operation, care and maintenance of systems, system equipment and components.
- .2 Operating instructions to include following:
  - .1 Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.
  - .2 Start up, proper adjustment, operating, lubrication, and shutdown procedures.
  - .3 Safety precautions.
  - .4 Procedures to be followed in event of equipment failure.
  - .5 Other items of instruction as recommended by manufacturer of each system or item of equipment.
- .3 Arrange and pay for services of manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance and calibrate components and instruct operating personnel.
- .4 Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant with all aspects of its care and operation.

**1.6 PERMITS, FEES AND INSPECTION**

- .1 Submit to Electrical Inspection Division and Supply Authority necessary number of drawings and specifications for examination and approval prior to commencement of work.
- .2 Pay associated fees.
- .3 Owner's Representative will provide drawings and specifications required by Electrical Inspection Division and Supply Authority at no cost.
- .4 Notify Owner's Representative of changes required by Electrical Inspection Division prior to making changes.
- .5 Furnish Certificates of Acceptance from Electrical Inspection Division or Authorities having Jurisdiction on completion of work to Owner's Representative.

**1.7 CO-ORDINATION**

- .1 Co-ordinate work with work of other divisions to avoid conflict.
- .2 Locate distribution systems, equipment, and materials to provide minimum interference and maximum usable space.
- .3 Locate all existing underground services and make all parties aware of their existence and location.
- .4 Where interference occurs, Owner's Representative must approve relocation of equipment and materials regardless of installation order.
- .5 Notwithstanding the review of shop drawings, this division may be required to relocate electrical equipment which interferes with the equipment of other trades, due to lack of co-ordination by this Division. The cost of this relocation shall be the responsibility of this Division. The Owner's Representative shall decide the extent of relocation required.

**1.8 CUTTING AND PATCHING**

- .1 Inform all other divisions in time, concerning required openings. Where this requirement is not met, bear the cost of all cutting. Openings of 200 mm or smaller shall be the responsibility of Division 26. Openings larger than 200 mm shall be the responsibility of Division 1. Obtain written approval of Structural Engineer before drilling any beams or floors.

**1.9 PROTECTION**

- .1 Protect exposed live equipment during construction for personnel safety.
- .2 Shield and mark all live parts "LIVE 120 VOLTS", or with appropriate voltage in English.
- .3 Arrange for installation of temporary doors for rooms containing electrical distribution equipment. Keep these doors locked except when under direct supervision of electrician.

**1.10 RECORD DRAWINGS**

- .1 Obtain and pay for three sets of white prints. As the job progresses, mark these prints to accurately indicate installed work. Have the white prints available for inspection at the site at all times and present for scrutiny at each job meeting.

- .2 Show on the record drawings the installed inverts of all services entering and leaving the building and the property. Dimension underground services at key points of every run in relation to the structure and building.
- .3 Indicate exact location of all services for future work. Show and dimension all work embedded in the structure.
- .4 Submit record drawings within 30 days prior to start of commissioning.

#### **1.11 INSPECTION OF WORK**

- .1 The Owner will make periodic visits to the site during construction to ascertain reasonable conformity to plans and specifications but will not execute quality control. The Contractor shall be responsible for the execution of his work in conformity with the construction documents and with the requirements of the inspection authority.

#### **1.12 SCHEDULING OF WORK**

- .1 Work shall be scheduled in phases as per other divisions of the architectural specifications.
- .2 Become familiar with the phasing requirements for the work and comply with these conditions.
- .3 No additional monies will be paid for contractor's requirement to comply with work phasing conditions.

#### **1.13 CLOSEOUT SUBMITTALS**

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for equipment and material for incorporation into manual.
  - .1 Provide for each system and principal item of equipment as specified in technical sections for use by operation and maintenance personnel.
  - .2 Operating instructions to include following:
    - .1 Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.
    - .2 Start up, proper adjustment, operating, lubrication, and shutdown procedures.
    - .3 Safety precautions.
    - .4 Procedures to be followed in event of equipment failure.
    - .5 Other items of instruction as recommended by manufacturer of each system or item of equipment.
  - .3 Print or engrave operating instructions and frame under glass or in approved laminated plastic.
  - .4 Post instructions where directed.
  - .5 For operating instructions exposed to weather, provide weather-resistant materials or weatherproof enclosures.
  - .6 Ensure operating instructions will not fade when exposed to sunlight and are secured to prevent easy removal or peeling.

**1.14 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle equipment and materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver equipment and materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store equipment and materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect equipment and materials from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged equipment and materials with new.

**Part 2 Products**

**2.1 DESIGN REQUIREMENTS**

- .1 Operating voltages: to CAN3-C235.
- .2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard.
  - .1 Equipment to operate in extreme operating conditions established in above standard without damage to equipment.
- .3 Language operating requirements: provide identification nameplates for control items in English.

**2.2 MATERIALS AND EQUIPMENT**

- .1 Provide material and equipment in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Material and equipment to be CSA certified. Where CSA certified material and equipment is not available, obtain special approval from authority having jurisdiction before delivery to site and submit such approval as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.
- .3 Factory assemble control panels and component assemblies.

**2.3 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS**

- .1 Supplier and installer responsibility is indicated in Motor Starter and Control List on electrical drawings and related mechanical responsibility is indicated on Mechanical Equipment Schedule on mechanical drawings, where applicable.

**2.4 WARNING SIGNS**

- .1 Warning Signs: in accordance with requirements of Electrical Inspection Department and Owner's Representative.
- .2 Porcelain enamel decal signs, minimum size 175 x 250 mm.

## 2.5 WIRING TERMINATIONS

- .1 Ensure lugs, terminals, screws used for termination of wiring are suitable for either copper or aluminum conductors.

## 2.6 EQUIPMENT IDENTIFICATION

- .1 Identify electrical equipment with nameplates and labels as follows:
  - .1 Nameplates: lamicoid 3 mm thick plastic engraving sheet, white face, black core, mechanically attached with self tapping screws.
  - .2 Sizes as follows:

### NAMEPLATE SIZES

Size 1	10 x 50 mm	1 line	3 mm high letters
Size 2	12 x 70 mm	1 line	5 mm high letters
Size 3	12 x 70 mm	2 lines	3 mm high letters
Size 4	20 x 90 mm	1 line	8 mm high letters
Size 5	20 x 90 mm	2 lines	5 mm high letters
Size 6	25 x 100 mm	1 line	12 mm high letters
Size 7	25 x 100 mm	2 lines	6 mm high letters

- .2 Labels: embossed plastic labels with 6 mm high letters unless specified otherwise.
- .3 Wording on nameplates and labels to be approved by Owner's Representative prior to manufacture.
- .4 Allow for minimum of twenty-five (25) letters per nameplate and label.
- .5 Nameplates for junction and pull boxes to indicate system and/or voltage characteristics.
- .6 Disconnects: indicate equipment being controlled and voltage.

## 2.7 WIRING IDENTIFICATION

- .1 Identify wiring with permanent indelible identifying markings, either numbered or coloured plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring.
- .2 Maintain phase sequence and colour coding throughout.
- .3 Colour coding: to CSA C22.1.
- .4 Use colour coded wires in communication cables, matched throughout system.

## 2.8 CONDUIT AND CABLE IDENTIFICATION

- .1 Colour code conduits, boxes and metallic sheathed cables.
- .2 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor, and at 15 m intervals.
- .3 Colours: 25 mm wide prime colour and 20 mm wide auxiliary colour.

Conduit System  
up to 250 V

Prime Colour  
Yellow

Auxiliary Colour

## **2.9 FINISHES**

- .1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.
  - .1 Paint outdoor electrical equipment "equipment green" finish to EEMAC 1Y-1.
  - .2 Paint indoor switchgear and distribution enclosures light gray to EEMAC 2Y-1.

## **Part 3 Execution**

### **3.1 EXAMINATION**

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for equipment and material installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect substrate in presence of Owner's Representative.
  - .2 Inform Owner's Representative of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Owner's Representative.

### **3.2 INSTALLATION**

- .1 Do complete installation in accordance with CSA C22.1 except where specified otherwise.

### **3.3 NAMEPLATES AND LABELS**

- .1 Ensure manufacturer's nameplates, CSA labels and identification nameplates are visible and legible after equipment is installed.

### **3.4 CONDUIT AND CABLE INSTALLATION**

- .1 Install conduit and sleeves prior to pouring of concrete.
  - .1 Sleeves through concrete: schedule 40 steel pipe, sized for free passage of conduit, and protruding 50 mm.
- .2 Install cables, conduits and fittings embedded or plastered over, close to building structure so furring can be kept to a minimum.

### **3.5 LOCATION OF OUTLETS**

- .1 Locate outlets in accordance with Section 26 05 32 – Outlet Boxes, Conduit Boxes and Conduit Fittings.
- .2 Do not install outlets back-to-back in wall; allow minimum 150 mm horizontal clearance between boxes.
- .3 Change location of outlets at no extra cost or credit, providing distance does not exceed 3000 mm, and information is given before installation.

### **3.6 MOUNTING HEIGHTS**

- .1 Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicated otherwise.
- .2 If mounting height of equipment is not specified or indicated, verify before proceeding with installation.
- .3 Install electrical equipment at following heights unless indicated otherwise.
  - .1 Panelboards: as required by Code or as indicated.

### **3.7 CO-ORDINATION OF PROTECTIVE DEVICES**

- .1 Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to required values and settings.

### **3.8 FIELD QUALITY CONTROL**

- .1 Load Balance:
  - .1 Measure phase current to panelboards with normal loads (lighting) operating at time of acceptance; adjust branch circuit connections as required to obtain best balance of current between phases and record changes.
  - .2 Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment.
  - .3 Provide upon completion of work, load balance report as directed in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS, phase and neutral currents on panelboards operating under normal load, as well as hour and date on which each load was measured, and voltage at time of test.
- .2 Conduct following tests in accordance with Section 01 45 00 - Quality Control.
  - .1 Power distribution system including phasing, voltage, grounding and load balancing.
  - .2 Circuits originating from branch distribution panels.
  - .3 Lighting.
  - .4 Motors, heaters and associated control equipment including sequenced operation of systems where applicable.
  - .5 Insulation resistance testing:
    - .1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.
    - .2 Check resistance to ground before energizing.
- .3 Carry out tests in presence of Owner's Representative.
- .4 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.
- .5 Manufacturer's Field Services:
  - .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.

- .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

### **3.9 SYSTEM STARTUP**

- .1 Instruct Owner's Representative and operating personnel in operation, care and maintenance of systems, system equipment and components.
- .2 Arrange and pay for services of manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance and calibrate components and instruct operating personnel.
- .3 Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant with aspects of its care and operation.

### **3.10 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

**END OF SECTION**



**Part 1            General**

**1.1                SECTION INCLUDES**

- .1            Materials and installation for wire and box connectors.

**1.2                RELATED REQUIREMENTS**

- .1            Section 26 50 00 – Common Work Results for Electrical.

**1.3                REFERENCES**

- .1            CSA International
  - .1            CAN/CSA-C22.2 No.18, Outlet Boxes, Conduit Boxes and Fittings.
  - .2            CAN/CSA-C22.2 No.65, Wire Connectors (Tri-National Standard with UL 486A-486B and NMX-J-543-ANCE-03).
- .2            Electrical and Electronic Manufacturers' Association of Canada (EEMAC)
  - .1            EEMAC 1Y-2, Bushing Stud Connectors and Aluminum Adapters (1200 Ampere Maximum Rating).
- .3            National Electrical Manufacturers Association (NEMA)

**Part 2            Products**

**2.1                MATERIALS**

- .1            Pressure type wire connectors to: CAN/CSA-C22.2 No.65, with current carrying parts of copper sized to fit copper conductors as required.
- .2            Fixture type splicing connectors to: CAN/CSA-C22.2 No.65, with current carrying parts of copper and copper alloy sized to fit copper conductors 10 AWG or less.
- .3            Bushing stud connectors: to EEMAC 1Y-2 to consist of:
  - .1            Connector body and stud clamp for stranded copper conductors.
  - .2            Clamp for copper bar.
  - .3            Stud clamp bolts.
  - .4            Bolts for copper bar.
  - .5            Sized for conductors and bars as indicated.
- .4            Clamps or connectors for armoured cable, TECK cable aluminum sheathed cable, mineral insulated cable, flexible conduit, non-metallic sheathed cable as required to: CAN/CSA-C22.2 No.18.

**Part 3 Execution**

**3.1 INSTALLATION**

- .1 Remove insulation carefully from ends of conductors and:
  - .1 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CAN/CSA-C22.2 No.65.
  - .2 Install fixture type connectors and tighten to CAN/CSA-C22.2 No.65. Replace insulating cap.
  - .3 Install bushing stud connectors in accordance with EEMAC 1Y-2.

**END OF SECTION**

## **Part 1 General**

### **1.1 RELATED REQUIREMENTS**

- .1 Section 26 05 20 – Wire and Box Connectors (0-1000V).
- .2 Refer to drawings for wiring type required under different applications.

### **1.2 REFERENCES**

- .1 Canadian Standards Association (CSA)
  - .1 CSA C22.2 No.0.3, Test Methods for Electrical Wires and Cables.
  - .2 CAN/CSA-C22.2 No.131, Type TECK 90 Cable.

## **Part 2 Products**

### **2.1 BUILDING WIRES**

- .1 Conductors: stranded for 10 AWG and larger. Minimum size: 12 AWG.
- .2 Copper conductors: size as indicated, with 600V insulation of cross-linked thermosetting polyethylene material rated RW90 XLPE and RWU90 XLPE, as indicated. Provide RWU90 XLPE rated cable for underground wiring related to new service entrance feeders and site lighting circuits. RWU90 XLPE not required under interior floor slabs.
- .3 Copper conductors: size as indicated, with thermoplastic insulation type TWH rated at 600 V, typically used for insulated ground wires.
- .4 Neutral supported cable: 1, 2 and 3 phase insulated conductors of copper or aluminum and one neutral conductor of copper or aluminum steel reinforced, size as indicated. Type: NS90 Insulation: Type NSF-2 flame retardant rated 600 V, typically used for overhead lines.

### **2.2 TECK 90 CABLE**

- .1 Cable: in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Conductors:
  - .1 Grounding conductor: copper.
  - .2 Circuit conductors: copper, size as indicated.
- .3 Insulation:
  - .1 Cross-linked polyethylene XLPE.
  - .2 Rating: 600V.
- .4 Inner jacket: polyvinyl chloride material.
- .5 Armour: interlocking, compliant to applicable Building Code classified for this project.
- .6 Overall covering: thermoplastic polyvinyl chloride, compliant to applicable Building Code classification for this project.

- .7 Fastenings:
  - .1 One-hole steel straps to secure surface cables 50 mm and smaller. Two-hole steel straps for cables larger than 50 mm.
  - .2 Channel type supports for two or more cables at 1500 mm centers.
  - .3 Threaded rods: 6 mm diameter to support suspended channels.
- .8 Connectors:
  - .1 Watertight and/or type approved for TECK cable.

### **2.3 ARMOURED CABLES (AC-90)**

- .1 Conductors: insulated, copper, size as indicated.
- .2 Type: AC90.
- .3 Armour: interlocking type fabricated from aluminum strip.
- .4 Type: ACWU90 jacket over armour and compliant to applicable Building Code classification for this project for wet locations.
- .5 Connectors: anti-short connectors, complete with double split rings.

## **Part 3 Execution**

### **3.1 FIELD QUALITY CONTROL**

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Perform tests using method appropriate to site conditions and to approval of Owner's Representative and local authority having jurisdiction over installation.
- .3 Perform tests before energizing electrical system.
- .4 No splices permitted in panelboard feeders in new construction. Splices in re-work or renovation projects only with pre-approval by Owner's Representative.

### **3.2 GENERAL CABLE INSTALLATION**

- .1 Terminate cables in accordance with Section 26 05 20 - Wire and Box Connectors (0-1000 V).
- .2 Cable Colour Coding: to Section 26 05 00 - Common Work Results for Electrical.
- .3 Conductor length for parallel feeders to be identical.
- .4 Lace or clip groups of feeder cables at distribution centres, pull boxes, and termination points.
- .5 Wiring in walls: typically drop or loop vertically from above to better facilitate future renovations. Generally wiring from below and horizontal wiring in walls to be avoided unless indicated.
- .6 Branch circuit wiring for surge suppression receptacles and permanently wired computer and electronic equipment to be 2-wire circuits only, i.e. common neutrals not permitted.

- .7 Provide numbered wire collars for control wiring. Numbers to correspond to control shop drawing legend. Obtain wiring diagram for control wiring.

### **3.3 INSTALLATION OF BUILDING WIRES**

- .1 Install wiring as follows:
  - .1 In conduit systems in accordance with Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.
  - .2 In surface and lighting fixture raceways in accordance with Section 26 50 00 - Lighting.

### **3.4 INSTALLATION OF TECK90 CABLE (0-1000V)**

- .1 Group cables wherever possible on channels.
- .2 Install cable concealed, securely supported by straps and hangers.

### **3.5 INSTALLATION OF ARMoured CABLES (AC-90)**

- .1 Group cables wherever possible on channels.
- .2 Use permitted only for work in movable portions and vertical power drops to lighting fixtures.

**END OF SECTION**

**Part 1           General (Not Applicable)**

**Part 2           Products**

**2.1             SUPPORT CHANNELS**

- .1       U shape, size 41 x 41 mm, 2.5 mm thick, surface mounted, suspended or set in poured concrete walls and ceilings as required.

**Part 3           Execution**

**3.1             INSTALLATION**

- .1       Secure equipment to tile and plaster surfaces with lead anchors or nylon shields.
- .2       Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.
- .3       Fasten exposed conduit or cables to building construction or support system using straps.
  - .1       One-hole steel straps to secure surface conduits and cables 50 mm and smaller.
  - .2       Two-hole steel straps for conduits and cables larger than 50 mm.
  - .3       Beam clamps to secure conduit to exposed steel work.
  - .4       Strap AC90 at box location plus every 1500 mm.
- .4       Suspended support systems.
  - .1       Support individual cable or conduit runs with 6 mm diameter threaded rods and spring clips.
  - .2       Support 2 or more cables or conduits on channels supported by 6 mm diameter threaded rod hangers where direct fastening to building construction is impractical.
- .5       For surface mounting of two or more conduits use channels at 1.5 m on centre spacing.
- .6       Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.
- .7       Do not use wire lashing, wood blocking, plastic strap or perforated strap to support or secure raceways or cables.
- .8       Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Owner's Representative.
- .9       Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

**END OF SECTION**

**Part 1           General**

**1.1               RELATED REQUIREMENTS**

- .1       Section 01 33 00 – Submittal Procedure.
- .2       Section 26 05 00 – Common Work Results for Electrical.

**1.2               REFERENCES**

- .1       Canadian Standards Association (CSA International)
  - .1       CSA C22.1, Canadian Electrical Code, Part 1, 23rd Edition.

**Part 2           Products**

**2.1               JUNCTION AND PULL BOXES**

- .1       Construction: welded steel enclosure.
- .2       Covers Flush Mounted: 25 mm minimum extension all around.
- .3       Covers Surface Mounted: screw-on flat covers for surface mounting.

**Part 3           Execution**

**3.1               JUNCTION AND PULL BOXES INSTALLATION**

- .1       Install pull boxes in inconspicuous but accessible locations.
- .2       Only main junction and pull boxes are indicated. Install additional pull boxes as not to exceed 30 m of conduit between pull boxes.

**3.2               IDENTIFICATION**

- .1       Equipment Identification: to Section 26 05 00 - Common Work Results for Electrical.
- .2       Identification Labels: size 2 indicating system name, voltage and phase.

**END OF SECTION**

**Part 1           General**

**1.1           RELATED REQUIREMENTS**

- .1   Section 26 05 00 – Common Work Results for Electrical.
- .2   Section 26 05 29 – Hangers and Supports for Electrical Systems.
- .3   Section 26 05 34 – Conduits, Conduit Fastenings and Fittings.

**1.2           REFERENCES**

- .1   Canadian Standards Association (CSA International)
  - .1   CSA C22.1, Canadian Electrical Code, Part 1, 23rd Edition.

**Part 2           Products**

**2.1           OUTLET AND CONDUIT BOXES GENERAL**

- .1   Size boxes in accordance with CSA C22.1.
- .2   102 mm square or larger outlet boxes as required.
- .3   Gang boxes where wiring devices are grouped.
- .4   Blank cover plates for boxes without wiring devices.
- .5   Combination boxes with barriers where outlets for more than one system are grouped.

**2.2           CONDUIT BOXES**

- .1   Cast FS or FD aluminum boxes with factory-threaded hubs and mounting feet for surface wiring of devices.

**2.3           FITTINGS - GENERAL**

- .1   Bushing and connectors with nylon insulated throats.
- .2   Knock-out fillers to prevent entry of debris.
- .3   Conduit outlet bodies for conduit up to 35 mm and pull boxes for larger conduits.
- .4   Double locknuts and insulated bushings on sheet metal boxes.
- .5   Double split rings for AC90 terminations.

**Part 3           Execution**

**3.1           INSTALLATION**

- .1   Support boxes independently of connecting conduits.
- .2   Fill boxes with paper, sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of work.



- .3 For flush installations mount outlets flush with finished wall using plaster rings to permit wall finish to come within 6 mm of opening.
- .4 Provide correct size of openings in boxes for conduit, mineral insulated and armoured cable connections. Do not install reducing washers.
- .5 Vacuum clean interior of outlet boxes before installation of wiring devices.
- .6 Identify systems for outlet boxes as required.

**END OF SECTION**

## **Part 1        General**

### **1.1            REFERENCES**

- .1 Canadian Standards Association (CSA International)
  - .1 CAN/CSA C22.2 No. 18, Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware, A National Standard of Canada.
  - .2 CSA C22.2 No. 83, Electrical Metallic Tubing.

## **Part 2        Products**

### **2.1            CONDUITS**

- .1 Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with couplings.

### **2.2            CONDUIT FASTENINGS**

- .1 One-hole steel straps to secure surface conduits 50 mm and smaller.
  - .1 Two-hole steel straps for conduits larger than 50 mm.
- .2 Beam clamps to secure conduits to exposed steel work.
- .3 Channel type supports for two or more conduits at 1.5 m on centre.
- .4 Threaded rods, 6 mm diameter, to support suspended channels.

### **2.3            CONDUIT FITTINGS**

- .1 Fittings: manufactured for use with conduit specified. Coating: same as conduit.
- .2 Ensure factory "ells" where 90 degrees bends for 25 mm and larger conduits.
- .3 Watertight connectors and couplings for EMT.
  - .1 Set-screws are not acceptable.

### **2.4            FISH CORD**

- .1 Polypropylene.

## **Part 3        Execution**

### **3.1            MANUFACTURER'S INSTRUCTIONS**

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.

### **3.2 INSTALLATION**

- .1 Install all conduit, conduit fittings and accessories in accordance with the latest edition of the Canadian Electrical Code in a manner that does not alter, change or violate any part of the installed system components or the CSA/UL certification of these components.
- .2 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.
- .3 Conceal conduits except in mechanical and electrical service rooms and in unfinished areas.
- .4 Surface mount conduits except in finished areas or as indicated.
- .5 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment in damp, wet or corrosive locations.
- .6 Use AC90 for vertical power supply drops to light fixtures.
- .7 Minimum conduit size for lighting and power circuits: 19 mm. 12 mm conduit is acceptable for switch leg drops only where one two-wire circuit and ground is required.
- .8 Bend conduit cold:
  - .1 Replace conduit if kinked or flattened more than 1/10th of its original diameter.
- .9 Mechanically bend steel conduit over 19 mm diameter.
- .10 Install fish cord in empty conduits.
- .11 Remove and replace blocked conduit sections.
  - .1 Do not use liquids to clean out conduits.
- .12 Dry conduits out before installing wire.

### **3.3 SURFACE CONDUITS**

- .1 Run parallel or perpendicular to building lines.
- .2 Locate conduits behind infrared or gas fired heaters with 1.5 m clearance.
- .3 Run conduits in flanged portion of structural steel.
- .4 Group conduits wherever possible on suspended channels.
- .5 Do not pass conduits through structural members except as indicated.
- .6 Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers.

### **3.4 CONCEALED CONDUITS**

- .1 Run parallel or perpendicular to building lines.
- .2 Do not install horizontal runs in masonry walls.

**END OF SECTION**

**PART 1**      **GENERAL**

**1.1**            **RELATED SECTIONS**

- .1            Section 01 33 00 - Submittal Procedures.
  
- Section 26 05 00 - Common Work Results – Electrical.

**PART 2**      **PRODUCTS**

**2.1**            **BREAKERS GENERAL**

- .1            Bolt-on moulded case circuit breaker: quick- make, quick-break type, for manual and automatic operation with temperature compensation for 40°C ambient.
  
- .2            Common-trip breakers: with single handle for multi-pole applications.
  
- .3            Magnetic instantaneous trip elements in circuit breakers to operate only when value of current reaches setting. Trip settings on breakers with adjustable trips to range from 3-8 times current rating.
  
- .4            Circuit breakers with interchangeable trips as indicated.
  
- .5            Circuit breakers to have minimum of 10,000 A symmetrical rms interrupting capacity rating.

**2.2**            **THERMAL MAGNETIC BREAKERS DESIGN A**

- .1            Moulded case circuit breaker to operate automatically by means of thermal and magnetic tripping devices to provide inverse time current tripping and instantaneous tripping for short circuit protection.

**2.3**            **FUSED THERMAL MAGNETIC BREAKERS DESIGN B**

- .1            Fused thermal magnetic breakers with current limiting fuses internally mounted. Time current limiting characteristics of fuses coordinated with time current tripping characteristics of circuit breaker. Coordination to result in interruption by breaker of fault-level currents up to interrupting capacity of breaker. Fuses individually removable and interlocked with breaker. Removal of fuse cover, blowing of a fuse or removal of a fuse, to trip breaker.

**2.4**            **SOLID STATE TRIP BREAKERS DESIGN C**

- .1            Moulded case circuit breaker to operate by means of a solid-state trip unit with associated current monitors and self-powered shunt trip to provide inverse time current trip under overload condition, and long time short time, instantaneous tripping for phase and ground fault short circuit protection.

**2.5 ENCLOSURE**

- .1 Mounted in NEMA 1 type enclosure, sprinkler proof as indicated.

**PART 3 EXECUTION**

**3.1 INSTALLATION**

- .1 Install circuit breakers as indicated.

**END OF SECTION**

**Part 1           General**

**1.1           RELATED REQUIREMENTS**

- .1   Section 01 33 00 – Submittal Procedures.
- .2   Section 26 05 00 – Common Work Results for Electrical.

**1.2           REFERENCES**

- .1   CSA Group
  - .1   CAN/CSA-C22.2 No.4, Enclosed and Dead-Front Switches (Tri-National Standard, with ANCE NMX-J-162-2004 and UL 98).

**1.3           ACTION AND INFORMATIONAL SUBMITTALS**

- .1   Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2   Product Data:
  - .1   Submit manufacturer's instructions, printed product literature and data sheets for disconnect switches - fused and non-fused and include product characteristics, performance criteria, physical size, finish and limitations.

**Part 2           Products**

**2.1           DISCONNECT SWITCHES**

- .1   Non-fusible, disconnect switch in CSA enclosure 1 to CAN/CSA-C22.2 No.4 size as indicated.
- .2   Provision for padlocking in on-off switch position by 3 locks.
- .3   Mechanically interlocked door to prevent opening when handle in ON position.
- .4   Quick-make, quick-break action.
- .5   ON-OFF switch position indication on switch enclosure cover.

**2.2           EQUIPMENT IDENTIFICATION**

- .1   Provide equipment identification in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2   Indicate name of load controlled on size 4 nameplate.

**Part 3           Execution**

**3.1           INSTALLATION**

- .1   Install disconnect switches as indicated.

**END OF SECTION**

**Part 1            General**

**1.1                RELATED REQUIREMENTS**

- .1        Section 01 33 00 – Submittal Procedures.
- .2        Section 01 45 00 – Quality Control.
- .3        Section 01 61 00 – Common Product Requirements.

**1.2                REFERENCES**

- .1        American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE)
  - .1        ANSI/IEEE C62.41, Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits.
- .2        ASTM International Inc.
  - .1        ASTM F1137-00, Standard Specification for Phosphate/Oil and Phosphate/Organic Corrosion Protective Coatings for Fasteners.
- .3        Canadian Standards Association (CSA International)
- .4        ICES-005-07, Radio Frequency Lighting Devices.
- .5        Underwriters' Laboratories of Canada (ULC)

**1.3                ACTION AND INFORMATIONAL SUBMITTALS**

- .1        Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2        Product Data:
  - .1        Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
  - .2        Provide complete photometric data prepared by independent testing laboratory for luminaires where specified, for review by Owner's Representative.
  - .3        Photometric data to include: VCP Table where applicable, spacing criterion and luminaire coefficient of utilization (CU) tables.
- .3        Quality assurance submittals: provide following in accordance with Section 01 45 00 - Quality Control.
  - .1        Manufacturer's instructions: provide manufacturer's written installation instructions and special handling criteria, installation sequence, cleaning procedures and re-lamping schedule.

**1.4                DELIVERY, STORAGE AND HANDLING**

- .1        Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.

- .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .3 Divert unused metal materials from landfill to metal recycling facility.
- .4 Disposal and recycling of fluorescent lamps as per local regulations.
- .5 Disposal of old PCB filled ballasts.

## **1.5 ACCEPTABLE PRODUCTS**

- .1 Luminaires described in the Lighting Fixture Schedule identify quality, performance criteria and other parameters, as indicated for this project. Named fixtures are acceptable with modifications and accessories, as indicated.
- .2 Fixtures from other manufacturers may be acceptable provided:
  - .1 Appearance and lighting performance are similar.
  - .2 Quality is equal or better.
  - .3 LED driver criteria remain the same.
  - .4 The fixture is provided with modifications and accessories to provide a complete product in keeping with the intent of the project.
  - .5 Approval in writing is obtained from the Owner's Representative to the supplier/manufacturer 5 days prior to tender closing date.
- .3 Acceptable manufacturers: Eaton, Lithonia, Philips and Stanpro.

## **Part 2 Products**

### **2.1 LED DRIVER**

- .1 LED driver shall be installed in an electrical enclosure.
- .2 Wiring inside enclosure shall comply with 600V/105 degrees rating or higher.
- .3 LED driver shall comply with UL standard UL1012.
- .4 LED driver shall have Class A sound rating.
- .5 LED driver shall be UL certified for use in a dry or damp location.
- .6 LED driver shall tolerate sustained open circuit and short circuit output conditions without damage.
- .7 LED driver shall comply with the requirements of the FCC rules and regulations, Title 47 CFR Part 15 Non-Consumer (Class A)

### **2.2 LIGHT EMITTING DIODE (LED) FIXTURES**

- .1 Luminaires shall be controlled by photocells or automatic profile dimming and motion response override as required by the design.
- .2 Outdoor luminaires shall have provisions for house side shield to prevent glare to uphill neighbours.
- .3 Luminaire shall have door frame and lens with LED arrays.



- .4 The light distribution pattern pattern of the luminaires shall be suitable for a S/H ratio of approximately 1.8.
- .5 The lighting systems shall consist of the type and manufacturer as shown on the drawings or approved equivalent. If other than fixture shown is submitted, complete illumination calculations are required to show equivalency.

### **2.3 FINISHES**

- .1 Light fixture finish and construction to meet ULC listing[s] and CSA certification[s] related to intended installation.

### **2.4 LUMINAIRES**

- .1 As indicated in luminaire schedules.

## **Part 3 Execution**

### **3.1 INSTALLATION**

- .1 Locate and install luminaires as indicated.

### **3.2 WIRING**

- .1 Connect luminaires to lighting circuits:
  - .1 Install flexible conduit for vertical supply drop to luminaires as indicated.
  - .2 Horizontal wiring using flexible conduit not permitted.

### **3.3 LUMINAIRE SUPPORTS**

- .1 For suspended ceiling installations support luminaires from ceiling grid in accordance with local inspection requirements.

### **3.4 LUMINAIRE ALIGNMENT**

- .1 Align luminaires mounted in continuous rows to form straight uninterrupted line.
- .2 Align luminaires mounted individually parallel or perpendicular to building grid lines.

### **3.5 FIELD QUALITY CONTROL**

- .1 Perform tests in accordance with Section 26 05 00 – Common Work Results for Electrical.

**END OF SECTION**