



Public Works and Government Services Canada

Requisition No.
EZ899-211233/A

PWGSC Project No. R.108854.001
MCTS Renovation
Canadian Coast Guard
Institute of Ocean Sciences, Sidney, BC

for

DFO

ISSUED FOR TENDER JULY 2020

Issued for Tender

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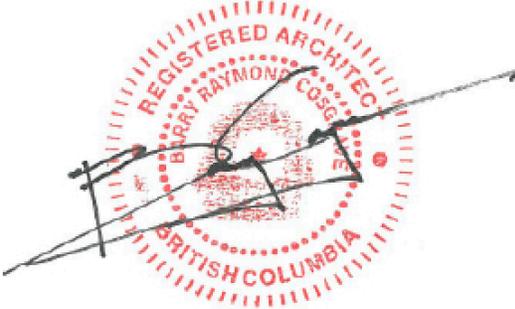
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SPECIFICATION

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DRAWINGS (bound separately)

Architectural

A1.00	COVER SHEET
A2.00	PLANS

Mechanical

M0.01	COVER SHEET, LEGEND AND DRAWING LIST
M1.00	MECHANICAL HVAC & FIRE PROTECTION DEMOLITION AND NEW

Electrical

E0.01	COVER SHEET, LEGEND, GENERAL NOTES AND DRAWING LIST
E1.00	ELECTRICAL FLOOR PLAN – DEMOLITION AND NEW
E1.10	ELECTRICAL SINGLE LINE DIAGRAM AND ROUTING PLAN
E2.00	ELECTRICAL DETAILS

Part 1 General

1.1 WORK COVERED BY CONTRACT DOCUMENTS

- .1 Work of this Contract consists of renovations to the MCTS office, IOS, Sidney B.C.

1.2 DESCRIPTION OF WORK

- .1 The work of this contract consists of the following:
- .1 Removal of existing demountable partitions.
 - .2 Restoration of floor, wall and ceiling finishes damaged by this removal.
 - .3 Installation of new electrical and mechanical services, and connection to existing services.
 - .4 Preparation for the installation of two new workstations.
 - .1 Supply and installation of workstations is not included in the work of this contract.

1.3 CONTRACT DOCUMENTS

- .1 The Contract documents, drawings and specifications are intended to complement each other, and to provide for and include everything necessary for the completion of the work.
- .2 Drawings are, in general, diagrammatic and are intended to indicate the scope and general arrangement of the work.
- .3 Contractor to maintain a complete set of contract documents on site.

1.4 DIVISION OF SPECIFICATIONS

- .1 The specifications are subdivided in accordance with the current 6-digit National Master Specifications System.
- .2 A division may consist of the work of more than 1 subcontractor. Responsibility for determining which subcontractor provides the labour, material, equipment and services required to complete the work rests solely with the Contractor.
- .3 In the event of discrepancies or conflicts when interpreting the drawings and specifications, the specifications govern.

1.5 HOURS OF WORK

- .1 Construction work will occur during normal working hours.
 - .1 Normal working hours are Monday to Friday, 07:30 to 16:00 hours.

1.6 SITE MEETINGS

- .1 Site meetings between the PWGSC Departmental Representative and the Contractor will be arranged on a bi weekly basis to review project progress and upcoming work.

- .2 Contractor to arrange project meetings and to be responsible for arranging times, location, and recording and distributing meeting minutes.

1.7 COST BREAKDOWN

- .1 Before submitting the first progress claim, submit a breakdown of the Contract lump sum prices in detail as directed by the Departmental Representative and aggregating Contract price. Provide in conjunction with payment schedule indicating anticipated monthly billings for the duration of the project.

1.8 CONTRACTORS USE OF PREMISES

- .1 Co-ordinate use of premises under direction of Departmental Representative.
- .2 Contractor to maintain barriers and repair any existing barriers altered or damaged by construction.
- .3 Ensure construction site is safe, secure and properly separated from areas accessible to the public. Maintain public and personnel access to buildings in the vicinity of the construction area.
- .4 Contractor is responsible for maintaining a clean worksite and for securing all materials against wind.
- .5 At all times during construction, ensure that critical systems remain fully functional, including but not limited to the following
 - .1 Life Safety Systems.
 - .2 Fire protection.
- .6 Minimize service disruptions. Coordinate any required service shutdowns with the Departmental Representative.
 - .1 All shutdowns to occur outside occupied/operational hours.
 - .2 Shutdowns are allowed only with the permission of the Departmental Representative. All requests must be submitted in writing.
- .7 At completion of operations, the condition of existing work is to be equal to or better than that which existed before new work started.

1.9 OWNER OCCUPANCY.

- .1 Owner will occupy premises during entire construction period for execution of normal operations.
- .2 Cooperate with Owner in scheduling operations to minimize conflict and to facilitate Owner usage.
- .3 Maintain fire and life safety systems and public access to exits during all stages of the Work.

1.10 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.

1.11 EXISTING SERVICES

- .1 Notify, Departmental Representative and utility companies of intended interruption of services and obtain required permission.
- .2 Where Work involves breaking into or connecting to existing services, give Departmental Representative 48 hours' notice for necessary interruption of mechanical or electrical service throughout course of work. Minimize duration of interruptions. Carry out work at times as directed by governing authorities with minimum disturbance to tenant operations.
- .3 Submit schedule to and obtain approval from Departmental Representative for any shut-down or closure of active service or facility including power and communications services. Adhere to approved schedule and provide notice to affected parties.
- .4 Provide temporary services as directed, to maintain critical building and tenant systems.
- .5 Where unknown services are encountered, immediately advise Departmental Representative and confirm findings in writing.
- .6 Protect, relocate or maintain existing active services. When inactive services are encountered, cap off in manner approved by authorities having jurisdiction.
- .7 Record locations of maintained, re-routed and abandoned service lines.
- .8 Construct barriers in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.

1.12 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 Plan of Construction Operations (PCO).
 - .12 Other documents as required as submittals in individual specification sections.

1.13 AS-BUILT DOCUMENTS

- .1 The Departmental Representative will provide 2 sets of drawings, and 2 sets of specifications, for "as-built" purposes.

- .2 As work progresses, maintain accurate records to show all deviations from the Contract documents. Note on as-built specifications, drawings and shop drawings as changes occur.
- .3 Refer to Section 01 78 10 Closeout Procedures.

1.14 ADDITIONAL DRAWINGS

- .1 The Departmental Representative may furnish additional drawings for clarification. These additional drawings have the same meaning and intent as if they were included with plans referred to in the Contract documents.
- .2 Upon request, Departmental Representative may furnish up to a maximum of 10 sets of Contract documents for use by the Contractor at no additional cost. Should more than 10 sets of documents be required the Departmental Representative will provide them at additional cost.

1.15 FAMILIARIZATION WITH SITE

- .1 Before submitting tender, visit site – as indicated in tender documents and become familiar with all conditions likely to affect the cost of the work.

1.16 SUBMISSION OF TENDER

- .1 Submission of a tender is deemed to be confirmation of the fact that the Tenderer has analyzed the Contract documents and inspected the site, and is fully conversant with all conditions.

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 SCHEDULES REQUIRED

- .1 Construction Schedule.

1.2 SCHEDULE FORMAT

- .1 Prepare schedule in form of a horizontal bar chart. (Gantt)
- .2 Provide a separate bar for each major operation.
- .3 Provide horizontal time scale identifying first Working Day of each week.
- .4 Identification of listings.
- .5 By specific task.
- .6 Identify work by phase
- .7 Include all milestones and identify critical paths.

1.3 SCHEDULE SUBMISSION.

- .1 Submit initial schedule within seven working days after award of Contract.
- .2 Submit schedules in electronic format, forward through e-mail - .pdf files.
- .3 Departmental Representative will review schedule and return review copy within three days after receipt.
- .4 Resubmit finalized schedule within three days after return of review copy.
- .5 Submit revised progress schedule with each application for payment.
- .6 Distribute copies of revised schedule to:
 - .1 Subcontractors.
 - .2 Other concerned parties.
- .7 Instruct recipients to report to Contractor within five working days, any problems anticipated by timetable shown in schedule.

1.4 SCHEDULING

- .1 Show complete sequence of construction by activity, identifying Work of separate stages and final completion of the entire project within the time period required by the Contract documents. Indicate the early and late start, early and late finish, float dates, and duration. Indicate the following:
 - .1 Submission of Shop Drawings, product data, MSDS sheets and samples.
 - .2 Indicate estimated percentage of completion for each item of Work at each submission.
 - .3 Include dates for commencement and completion of each portion of the project.

- .4 Indicate the anticipated date of substantial completion.
- .5 Indicate final completion date within the time period required by the contract documents.
- .6 Indicate projected percentage of completion of each item as of first day of the week.
- .7 Indicate progress of each activity to date of submission schedule.
- .8 Indicate changes occurring since previous submission of schedule:
 - .1 Major changes in scope.
 - .2 Activities modified since previous submission.
 - .3 Revised projections of progress and completion.
 - .4 Other identifiable changes.

1.5 PROGRESS REPORTS

- .1 Maintain an accurate record of the Construction work. Submit progress report when requested by the Departmental Representative and with each Request for Progress Payment.
- .2 Include in reports, the dates of commencement and percentage of work completed for different aspects of the work.

1.6 STAFFING AND OVERTIME

- .1 Cease work at any particular point and transfer workers to other designated points, when so directed, should the Departmental Representative judge it necessary to expedite the Work.
- .2 Should the Work fail to progress according to the approved progress schedule, work such additional time (including weekends and holidays), employ additional workers, or both, as may be required to bring the Work back on schedule, at no additional cost to Contract.

1.7 CHANGES IN THE SCHEDULE

- .1 Whenever proposing a change in the construction schedule, submit proposed revised schedule to the Departmental Representative, together with such analyses thereof as are required to clearly indicate the purpose and anticipated results of such changes.
- .2 If, in the opinion of the Departmental Representative, any proposed change in construction scheduled is inadequate to secure completion of the Work within the specified time, or is otherwise not in accordance with the specifications, or if the Work is not being adequately or properly prosecuted in any respect, the Departmental Representative reserves the right to require a revised schedule together with such analyses thereof as are required to indicate the anticipated results of such revision.
- .3 Claims for additional compensation or extension of Contract Time on account of such requirements will not be considered.

END OF SECTION

Part 1 General

1.1 ADMINISTRATIVE

- .1 Submit to Departmental Representative submittals listed for review. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.
- .2 Do not proceed with Work affected by submittal until review is complete.
- .3 Present shop drawings, product data, samples and mock-ups in SI Metric units.
- .4 Where items or information is not produced in SI Metric units converted values are acceptable.
- .5 Review submittals prior to submission to Departmental Representative. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and co-ordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and considered rejected.
- .6 Notify Departmental Representative, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
- .7 Verify field measurements and affected adjacent Work are co-ordinated.
- .8 Contractor's responsibility for errors and omissions in submission is not relieved by Departmental Representative's review of submittals.
- .9 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Departmental Representative review.
- .10 Keep one reviewed copy of each submission on site.

1.2 HEALTH AND SAFETY PLAN

- .1 Submit site specific Health and Safety Plan, MSDS and WHMIS documents requested in Section 01 35 30 - Health and Safety Requirements-

1.3 MATERIAL SOURCE SEPARATION PLAN

- .1 Submit site specific Material Source Separation Plan as detailed in Section 01 74 21 Construction Waste and Disposal

1.4 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 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.
- .3 Allow 5 days for Departmental Representative's review of each submission.
- .4 Adjustments made on shop drawings by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.
- .5 Make changes in shop drawings as Departmental Representative may require, consistent with Contract Documents. When resubmitting, notify Departmental Representative in writing of revisions other than those requested.
- .6 Accompany submissions with electronic transmittal, containing:
 - .1 Date.
 - .2 Project title and number.
 - .3 Contractor's name and address.
 - .4 Indicate the specification section and paragraph number that applies to the shop drawing that is being submitted.
 - .1 Ensure that each shop drawing clearly refers to the requirements of the stated specification section.
 - .5 Identification and quantity of each shop drawing, product data and sample.
 - .6 Other pertinent data.
- .7 Submissions include:
 - .1 Date and revision dates.
 - .2 Project title, number and applicable specification section.
 - .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 Engineers Stamp if required by specific specification section.
 - .6 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.
- .8 After Departmental Representative's review, distribute copies.
- .9 Submit electronic copy of shop drawings for each requirement requested in specification Sections and as Departmental Representative may reasonably request.
- .10 Submit electronic copies of any test reports for requirements requested in specification Sections and as requested by Departmental Representative.
- .1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.
 - .2 Testing must have been within 3 years of date of contract award for project.
- .11 Submit electronic copies of manufacturer's instructions for requirements requested in specification Sections and as requested by Departmental Representative.
- .1 Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.
- .12 Submit electronic copies of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Departmental Representative.
- .13 Delete information not applicable to project.
- .14 Supplement standard information to provide details applicable to project.
- .15 If upon review by Departmental Representative no errors or omissions are discovered or if only minor corrections are made, copies will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.
- .16 The review of shop drawings by Public Works and Government Services Canada (PWGSC) is for sole purpose of ascertaining conformance with general concept.
- .1 This review shall not mean that PWGSC approves detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting requirements of construction and Contract Documents.
 - .2 Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of sub-trades.

1.5 SAMPLES

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

1.6 PHOTOGRAPHIC DOCUMENTATION

- .1 Submit electronic copy of digital photography in jpg format, standard resolution as directed by Departmental Representative.
- .2 Project identification: name and number of project and date of exposure indicated.
- .3 Number of viewpoints: 4 locations.
 - .1 Viewpoints and their location as determined by Departmental Representative.

1.7 CERTIFICATES AND TRANSCRIPTS

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

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

1 GENERAL

PWGSC Update on Asbestos Use

Effective April 1, 2016, all Public Works and Government Services of Canada (PWGSC) contracts for new construction and major rehabilitation will prohibit use of asbestos-containing materials.

COVID 19

All contractors shall follow Canadian Construction Association COVID-19 - Standardized Protocols for All Canadian Construction Sites.

1.1 REFERENCES

- .1 Government of Canada.
 - .1 Canada Labour Code - Part II (as amended)
 - .2 Canada Occupational Health and Safety Regulations. (as amended)
- .2 National Building Code of Canada (NBC): (as amended)
 - .1 Part 8, Safety Measures at Construction and Demolition Sites.
- .3 The Canadian Electrical Code (as amended)
- .4 Canadian Standards Association (CSA) as amended:
 - .1 CSA Z797-2018 Code of Practice for Access Scaffold.
 - .2 CSA S269.1-2016 Falsework for Construction Purposes.
 - .3 CSA S350-M1980 (R2003) Code of Practice for Safety in Demolition of Structures.
 - .4 CSA Z1006-10 Management of Work in Confined Spaces.
 - .5 CSA Z462-18 Workplace Electrical Safety Standard
- .5 National Fire Code of Canada 2015 (as amended)
 - .1 Part 5 – Hazardous Processes and Operations and Division B as applicable and required.
- .6 American National Standards Institute (ANSI): (as amended)
 - .1 ANSI/ASSP A10.3-2013, Operations – Safety Requirements for Powder-Actuated Fastening Systems.

- .7 Province of British Columbia:
 - .1 Workers Compensation Act Part 3-Occupational Health and Safety. (as amended)
 - .2 Occupational Health and Safety Regulation (as amended)

1.2 RELATED SECTIONS

- .1 Refer to the following current NMS sections as required:
 - .1 Section 01 11 00 – Summary of Work.
 - .2 Section 01 35 35 - Fire Safety Requirements.

1.3 WORKERS' COMPENSATION BOARD COVERAGE

- .1 Comply fully with the Workers' Compensation Act, regulations and orders made pursuant thereto, and any amendments up to the completion of the work.
- .2 Maintain Workers' Compensation Board coverage during the term of the Contract, until and including the date that the Certificate of Final Completion is issued.

1.4 COMPLIANCE WITH REGULATIONS

- .1 PWGSC may terminate the Contract without liability to PWGSC where the Contractor, in the opinion of PWGSC, refuses to comply with a requirement of the Workers' Compensation Act or the Occupational Health and Safety Regulations.
- .2 It is the Contractor's responsibility to ensure that all workers are qualified, competent and certified to perform the work as required by the Workers' Compensation Act or the Occupational Health and Safety Regulations.

1.5 SUBMITTALS

- .1 Submit to Departmental Representative submittals listed for review in accordance with Section 01 33 00 Submittal Procedures.
- .2 Work affected by submittal shall not proceed until review is complete.
- .3 Submit the following:
 - .1 Organizations Health and Safety Plan.
 - .2 Site Specific Safety Plan or Health and Safety Plan (SSSP or HASP)
 - .3 Copies of reports or directions issued by Federal and Provincial health and safety inspectors.

- .4 Copies of incident and accident reports.
- .5 Complete set of Material Safety Data Sheets (SDS), and all other documentation required by Workplace Hazardous Materials Information System (WHMIS) requirements.
- .6 Emergency Response Procedures.
- .4 The Departmental Representative will review the Contractor's Site Specific Safety Plan or Health and Safety Plan (SSSP/HASP) and emergency response procedures, and provide comments to the Contractor within 5 days after receipt of the plan. Revise the plan as appropriate and resubmit to Departmental Representative.
- .5 Medical surveillance: where prescribed by legislation, regulation or safety program, submit certification of medical surveillance for site personnel prior to commencement of work, and submit additional certifications for any new site personnel to Departmental Representative.
- .6 Submission of the Site Specific Safety Plan or Health and Safety Plan, and any revised version, to the Departmental Representative is for information and reference purposes only. It shall not:
 - .1 Be construed to imply approval by the Departmental Representative.
 - .2 Be interpreted as a warranty of being complete, accurate and legislatively compliant.
 - .3 Relieve the Contractor of his legal obligations for the provision of health and safety on the project.

1.6 RESPONSIBILITY

- .1 Assume responsibility as the Prime Contractor for work under this contract.
- .2 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.
- .3 Comply with and enforce compliance by employees with safety requirements of Contract documents, applicable Federal, Provincial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

1.7 HEALTH AND SAFETY COORDINATOR

- .1 Assign a competent and qualified Health and Safety Coordinator who shall:
 - .1 Be responsible for completing all health and safety training and ensuring that personnel that do not successfully complete the required training are not permitted to enter the site to perform work.
 - .2 Be responsible for implementing, daily enforcing, and monitoring the Site Specific Safety Plan (SSSP) or Health and Safety Plan (HASP)
 - .3 Be on site during execution of work.
 - .4 Have minimum two (2) years' site-related working experience
 - .5 Have working knowledge of the applicable occupational safety and health regulations.

1.8 GENERAL CONDITIONS

- .1 Provide safety barricades and lights around work site as required to provide a safe working environment for workers and protection for pedestrian and vehicular traffic.
- .2 Ensure that non-authorized persons are not allowed to circulate in designated construction areas of the work site.
 - .1 Provide appropriate means by use of barricades, fences, warning signs, traffic control personnel, and temporary lighting as required.
 - .2 Secure site at night time or provide security guard as deemed necessary to protect site against entry.

1.9 PROJECT/SITE CONDITIONS

- .1 Work at site will involve contact with:
 - .1 Multi-employer work site.
 - .2 Federal employees and general public.
 - .3 Energized electrical services.
 - .4 Working from heights.
 - .5 Hazards - PSPC Preliminary Hazard Assessment included as an Appendix to Specifications

1.10 UTILITY CLEARANCES

- .1 The Contractor is solely responsible for all utility detection and clearances prior to starting the work.
- .2 The Contractor will not rely solely upon the Reference Drawings or other information provided for Utility locations.

1.11 REGULATORY REQUIREMENTS

- .1 Comply with specified codes, acts, bylaws, standards and regulations to ensure safe operations at site.
- .2 In event of conflict between any provision of the above authorities, the most stringent provision will apply. Should a dispute arise in determining the most stringent requirement, the Departmental Representative will advise on the course of action to be followed.

1.12 WORK PERMITS

- .1 Obtain specialty permit(s) related to project before start of work.

1.13 FILING OF NOTICE

- .1 The General Contractor is to file Notice of Project with Provincial authorities prior to commencement of work. (All construction projects require a Notice of Work)
- .2 Provide copies of all notices to the Departmental Representative.

1.14 SITE SPECIFIC HEALTH AND SAFETY PLAN

- .1 Conduct a site-specific hazard assessment based on review of Contract documents, required work, and project site. Identify any known and potential health risks and safety hazards.
- .2 Prepare and comply with the Site Specific Safety Plan (SSSP) or Health and Safety Plan (HASP) based on the required hazard assessment, including, but not limited to, the following:
 - .1 Primary requirements:
 - .1 Contractor's safety policy.
 - .2 Identification of applicable compliance obligations.
 - .3 Definition of responsibilities for project safety/organization chart for project.

- .4 General safety rules for project.
- .5 Job-specific safe work, procedures.
- .6 Inspection policy and procedures.
- .7 Incident reporting and investigation policy and procedures.
- .8 Occupational Health and Safety Committee/Representative procedures.
- .9 Occupational Health and Safety meetings.
- .10 Occupational Health and Safety communications and record keeping procedures.
- .11 COVID 19 Protocols and Procedures.
- .2 Summary of health risks and safety hazards resulting from analysis of hazard assessment, with respect to site tasks and operations which must be performed as part of the work.
- .3 List hazardous materials to be brought on site as required by work. SDS required for all products.
- .4 Indicate Engineering and administrative control measures to be implemented at the site for managing identified risks and hazards.
- .5 Identify personal protective equipment (PPE) to be used by workers.
- .6 Identify personnel and alternates responsible for site safety and health.
- .7 Identify personnel training requirements and training plan, including site orientation for new workers.
- .3 Develop the plan in collaboration with all subcontractors. Ensure that work/activities of subcontractors are included in the hazard assessment and are reflected in the plan.
- .4 Revise and update Site Specific Safety Plan (SSSP) and/or Health and Safety Plan (HASP) as required, and re-submit to the Departmental Representative.
- .5 Departmental Representative's review: the review of Site Specific Safety Plan and/or Health and Safety Plan by Public Works and Government Services Canada (PWGSC) shall not relieve the Contractor of responsibility for errors or omissions in final Site Specific Safety Plan and/or Health and Safety Plan of responsibility for meeting all requirements of construction and Contract documents and legislated requirements.

1.15 EMERGENCY PROCEDURES

- .1 List standard operating procedures and measures to be taken in emergency situations. Include an emergency response and emergency evacuation plan and emergency contacts (i.e.names/telephone numbers) of:
 - .1 Designated personnel from own company.
 - .2 Regulatory agencies applicable to work and as per legislated regulations.
 - .3 Local emergency resources.
 - .4 Departmental Representative.
 - .5 A route map with written directions to the nearest hospital or medical clinic.
- .2 Include the following provisions in the emergency procedures:
 - .1 Notify workers and the first-aid attendant, of the nature and location of the emergency.
 - .2 Evacuate all workers safely.
 - .3 Check and confirm the safe evacuation of all workers.
 - .4 Notify the fire department or other emergency responders.
 - .5 Notify adjacent workplaces or residences which may be affected if the risk extends beyond the workplace.
 - .6 Notify Departmental Representative.
- .3 Provide written rescue/evacuation procedures as required for, but not limited to:
 - .1 Work at high angles.
 - .2 Work in confined spaces or where there is a risk of entrapment.
 - .3 Work with hazardous substances.
 - .4 Underground work.
 - .5 Work on, over, under and adjacent to water.
 - .6 Workplaces where there are persons who require physical assistance to be moved.
- .4 Design and mark emergency exit routes to provide quick and unimpeded exit.

- .5 Revise and update emergency procedures as required, and re-submit to the Departmental Representative.
- .6 Contractors must not rely solely upon 911 for emergency rescue in a confined space, working at heights, etc.

1.16 HAZARDOUS PRODUCTS

- .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS 2015) regarding use, handling, storage and disposal of hazardous materials, and regarding labelling and provision of Safety Data Sheets (SDS) acceptable to the Departmental Representative and in accordance with the Canada Labour Code.
- .2 Where use of hazardous and toxic products cannot be avoided:
 - .1 Advise Departmental Representative beforehand of the product(s) intended for use. Submit applicable SDS and WHMIS 2015 documents as per Section 01 33 00 Submittal Procedures.
 - .2 In conjunction with Departmental Representative schedule to carry out work during "off hours" when tenants have left the building.
 - .3 Provide adequate means of ventilation in accordance with Section 01 51 00.
 - .4 The contractor shall ensure that the product is applied as per manufacturers recommendations.
 - .5 The contractor shall ensure that only pre-approved products are bought onto the work site in an adequate quantity to complete the work.

1.17 ASBESTOS HAZARD

- .1 Carry out any activities involving asbestos in accordance with current applicable Federal and Provincial Regulations.
- .2 Removal and handling of asbestos will be in accordance with current applicable Provincial / Federal Regulations.

1.18 PCB REMOVALS

- .1 Mercury-containing fluorescent tubes and ballasts which contain polychlorinated biphenyls (PCBs) are classified as hazardous waste.
- .2 Remove, handle, transport and dispose of as indicated in Division 2 specifications.

1.19 REMOVAL OF LEAD-CONTAINING PAINT

- .1 All paint containing TCLP lead concentrations above 5 ppm are classified as hazardous.
- .2 Carry out demolition and/or remediation activities involving lead-containing paints in accordance with current applicable Provincial / Territorial Regulations.
- .3 Work with lead-containing paint shall be completed as per Provincial and Federal regulations.
- .4 Dry Scraping/Sanding of any materials containing lead is strictly prohibited.
- .5 The use of Methylene Chloride based paint removal products is strictly prohibited.

1.20 ELECTRICAL SAFETY REQUIREMENTS (Reference: Worksafe BC OHS Regulation Part 19 – Electrical Safety)

- .1 Comply with authorities and ensure that, when installing new facilities or modifying existing facilities, all electrical personnel are completely familiar with existing and new electrical circuits and equipment and their operation.
 - .1 Before undertaking any work, coordinate arc flash protection, required energizing and de-energizing of new and existing circuits with Departmental Representative.
 - .2 Maintain electrical safety procedures and take necessary precautions to ensure safety of all personnel working under this Contract, as well as safety of other personnel on site.

1.21 ELECTRICAL LOCKOUT

- .1 Develop, implement and enforce use of established procedures to provide electrical lockout and to ensure the health and safety of workers for every event where work must be done on any electrical circuit or facility.
- .2 Prepare the lockout procedures in writing, listing step-by-step processes to be followed by workers, including how to prepare and issue the request/authorization form. Have procedures available for review upon request by the Departmental Representative.
- .3 Keep the documents and lockout tags at the site and list in a log book for the full duration of the Contract. Upon request, make such data available for viewing by Departmental Representative or by any authorized safety representative.

1.22 OVERLOADING

- .1 Ensure no part of work is subjected to a load which will endanger its safety or will cause permanent deformation.

1.23 FALSEWORK

- .1 Design and construct falsework in accordance with CSA S269.1-1975 (R2003) (as amended)

1.24 SCAFFOLDING

- .1 Design, construct and maintain scaffolding in a rigid, secure and safe manner, in accordance with CSA Z797-2009 (as amended) and B.C. Occupational Health and Safety Regulations. (as amended)

1.25 CONFINED SPACES

- .1 Carry out work in compliance with current Provincial / Territorial regulations.

1.26 POWDER-ACTUATED DEVICES

- .1 Use powder-actuated devices in accordance with ANSI A10.3 (as amended) only after receipt of written permission from the Departmental Representative.

1.27 FIRE SAFETY AND HOT WORK

- .1 Obtain Departmental Representative's authorization before any welding, cutting or any other hot work operations can be carried out on site.
- .2 Hot work includes cutting/melting with use of torch, flame heating roofing kettles, or other open flame devices and grinding with equipment which produces sparks.
- .3 Hot Work permits are a mandatory requirement for any hot work activities.

1.28 FIRE SAFETY REQUIREMENTS

- .1 Store oily/paint-soaked rags, waste products, empty containers and materials subject to spontaneous combustion in ULC approved, sealed containers and remove from site on a daily basis.
- .2 Handle, store, use and dispose of flammable and combustible materials in accordance with the National Fire Code of Canada. (as amended)
- .3 Portable gas and diesel fuel tanks are not permitted on most federal work sites. Approval from the Departmental Representative is required prior to any gas or diesel tank being brought onto the work site.

1.29 FIRE PROTECTION AND ALARM SYSTEM

- .1 Fire protection and alarm systems shall not be:
 - .1 Obstructed.
 - .2 Shut off.
 - .3 Left inactive at the end of a working day or shift.
- .2 Do not use fire hydrants, standpipes and hose systems for purposes other than firefighting.
- .3 Be responsible/liable for costs incurred from the fire department, the building owner and the tenants, resulting from false alarms.

1.30 UNFORESEEN HAZARDS

- .1 Should any unforeseen or peculiar safety-related factor, hazard or condition become evident during performance of the work, immediately stop work and immediately advise the Departmental Representative verbally and in writing.

1.31 POSTED DOCUMENTS

- .1 Post legible versions of the following documents on site:
 - .1 Site Specific Safety Plan (SSSP) or Health and Safety Plan (HASP)
 - .2 Sequence of work.
 - .3 Emergency procedures.
 - .4 Site drawing showing project layout, locations of the first-aid station, evacuation route and marshalling station, and the emergency transportation provisions.
 - .5 Notice of Project.
 - .6 Floor plans or site plans.
 - .7 Notice as to where a copy of the Workers' Compensation Act and Regulations are available on the work site for review by employees and workers.
 - .8 Workplace Hazardous Materials Information System (WHMIS 2015) documents.
 - .9 Material Safety Data Sheets (SDS).

- .10 List of names of Joint Health and Safety Committee members, or Health and Safety Representative, as applicable.
- .11 All Hazardous Material and Substance Reports including Lab Analysis
- .2 Post all Material Safety Data Sheets (MSDS) on site, in a common area, visible to all workers and in locations accessible to tenants when work of this Contract includes construction activities adjacent to occupied areas.
- .3 Postings should be protected from the weather, and visible from the street or the exterior of the principal construction site shelter provided for workers and equipment, or as approved by the Departmental Representative.

1.32 MEETINGS

- .1 Attend health and safety pre-construction meeting and all subsequent meetings called by the Departmental Representative.

1.33 CORRECTION OF NON-COMPLIANCE

- .1 Immediately address health and safety non-compliance issues identified by the Departmental Representative.
- .2 Provide Departmental Representative with written report of action taken to correct non-compliance with health and safety issues identified.
- .3 The Departmental Representative may issue a "stop work order" if noncompliance of health and safety regulations is not corrected immediately or within posted time. The General Contractor/subcontractors will be responsible for any costs arising from such a "stop work order".

2 PRODUCTS

- .1 Not used.

3 EXECUTION

- .1 Not used.

END OF SECTION

Part 1 General

1.1 CONSTRUCTION FIRE SAFETY

- .1 The Contractor shall provide construction fire safety in accordance with the National Fire Code of Canada.

1.2 REPORTING FIRES

- .1 The Contractor shall inform the Departmental Representative of all fire incidents at the construction site, regardless of size.
- .2 Know location of nearest fire alarm pull station and telephone, including emergency phone number.
- .3 Report immediately fire incidents to Fire Department as follows:
 - .1 Activate nearest fire alarm pull station.
 - .2 Telephone, by calling **911**.
 - .3 Inform site commissioner
- .4 Person activating fire alarm pull station will remain at the front entrance to direct Fire Department to scene of fire.
- .5 When reporting fire by telephone, give location of fire, name or number of building and be prepared to verify location

1.3 FIRE SAFETY PLAN

- .1 Submit a fire safety plan for the construction site prior to commencement of construction work. The fire safety plan shall conform to the National Fire Code of Canada.
- .2 The fire safety plan shall be submitted to the Departmental Representative for review by local fire department. Any comments by local fire department shall be implemented by the Contractor.
- .3 The fire safety plan shall be limited to the area of construction only. Contractor is not responsible for amending fire safety plans in existing buildings.
- .4 Post the fire safety plan at the entrance to the construction site or near the construction site's health and safety board.
- .5 The fire safety plan shall conform to the National Fire Code of Canada, and shall contain, at minimum:
 - .1 Emergency procedures to be used in case of fire, including
 - .1 Sounding the fire alarm;
 - .2 Notifying the fire department;
 - .3 Instructing occupants on procedures to be followed when the fire alarm sounds;
 - .4 Evacuating occupants, including special provisions for persons requiring assistance; and
 - .5 Confining, controlling and extinguishing fires.

- .2 The appointment and organization of designated supervisory staff to carry out fire safety duties.
- .3 The training of supervisory staff and other occupants in their responsibilities for fire safety.
- .4 Documents including diagrams, showing the type, location and operation of building fire emergency systems.
- .5 The holding of fire drills (where applicable).
- .6 The control of fire hazards in the building.
- .7 The inspection and maintenance of building facilities provided for the safety of occupants.

1.4 FIRE WARNING SYSTEM

- .1 A fire warning shall be provided to notify construction personnel of a fire emergency in the construction area.
- .2 The system used shall be capable of being heard throughout the construction site.

1.5 EXTERIOR FIRE PROTECTION SYSTEMS

- .1 Do not use Fire hydrants, standpipes or hose systems for other than fire-fighting purposes unless authorized by the Supervisor, Surface and Mobile.

1.6 FIRE PROTECTION SYSTEM IMPAIRMENT

- .1 Notify the Departmental Representative and the North Saanich Fire Chief and site commissioner 48 hours prior to shutting down any active fire protection system, including water supply, fire suppression, fire detection and life safety systems.
- .2 Where a fire protection system that provides fire alarm monitoring is impaired in an existing building, a fire watch **shall be** implemented.
- .3 Implement all fire protection system impairments in accordance with the National Fire Code of Canada. Fire Orders will be provided at the Pre-Commencement Meeting.

1.7 FIRE EXTINGUISHERS

- .1 In addition to other requirements of this specification, supply fire extinguishers, as scaled by the North Saanich Fire Chief, necessary to protect work in progress and contractor's physical plant on site.
- .2 Fire extinguishers may be required in the following areas as directed by the North Saanich Fire Chief
 - .1 Adjacent to hot works;
 - .2 In areas where combustibles are stored;
 - .3 Near or on any internal combustion engines;
 - .4 Adjacent to areas where flammable liquids or gases are stored or handled;
 - .5 Adjacent to temporary oil fired or gas fired equipment; and
 - .6 Adjacent to bitumen heating equipment.

- .3 Extinguishers shall be sized as 4-A:40-B:C (20 lbs) unless otherwise directed by the North Saanich Fire Chief.
- .4 Extinguishers shall be of the dry chemical type unless otherwise required by the hazard being protected.
- .5 The Contractor may assume the quantity of extinguishers based on a maximum travel distance between extinguishers of 75 feet.

1.8 ACCESS FOR FIRE FIGHTING

- .1 Access for firefighting shall be provided in accordance with the National Fire Code of Canada.

1.9 SMOKING PRECAUTIONS

- .1 Smoking is prohibited in all buildings. Observe posted smoking restrictions on entire site. Smoking only in designated areas. Contractor to provide designated area for job.

1.10 RUBBISH AND WASTE MATERIALS

- .1 Keep rubbish and waste materials at minimum quantities.
- .2 Burning of rubbish is prohibited.
- .3 Remove rubbish from work site at end of work day or shift or as directed.
- .4 Storage:
 - .1 Store oily waste in approved receptacles to ensure maximum cleanliness and safety.
 - .2 Deposit greasy or oily rags and materials subject to spontaneous combustion in approved receptacles and remove specified.

1.11 FLAMMABLE AND COMBUSTIBLE LIQUIDS

- .1 Handle, store and use of flammable and combustible liquids in accordance with the National Fire Code of Canada.
- .2 Keep flammable and combustible liquids such as gasoline, kerosene and naphtha for ready use in quantities not exceeding 45 litres provided they are stored in approved safety cans bearing Underwriters' Laboratory of Canada or Factory Mutual seal of approval. Obtain written authorization from Port Hardy Fire Chief for storage of quantities of flammable and combustible liquids exceeding 45 litres.
- .3 Do not transfer flammable or combustible liquids inside buildings.
- .4 Do not transfer flammable or combustible liquids in vicinity of open flames or any type of heat-producing devices.
- .5 Do not use flammable liquids having flash point below 38 degrees C such as naphtha or gasoline as solvents or cleaning agents.
- .6 Store flammable and combustible waste liquids, for disposal, in approved containers located in safe ventilated area. Keep quantities to a minimum and notify District Fire Chief when disposal is required.

1.12 HOT WORKS

- .1 Notify Departmental Representative 48 hours prior to hot works. Fill in site hot works approval form and authorizing signature from Departmental Representative.
- .2 The Contractor shall implement a hot works program in accordance with the National Fire Code of Canada and NFPA 51 Standard for Fire Prevention during Welding, Cutting and Other Hot Work.
- .3 Area of hot works:
 - .1 Hot works shall be carried out in an area free of combustible and flammable content.
 - .1 All flammable and combustible materials within 15m of the hot works shall be protected in accordance with the National Fire Code of Canada;
 - .2 A fire watch shall be provided during the hot work and for a period of not less than 60 minutes afterwards.
 - .2 Where there is a possibility of sparks leaking onto combustible materials in areas adjacent to the areas where the hot work is carried out.
 - .1 Openings in walls, floors or ceilings shall be covered or closed to prevent the passage of sparks to such adjacent areas, or
- .4 Protection of flammable and combustible materials.
 - .1 Any combustible or flammable material, dust or residue shall be
 - .1 Removed from the area where hot works is carried out; or
 - .2 Protected from ignition by non-combustible materials.
- .5 Fire extinguisher
 - .1 A fire extinguisher shall be provided within 3 m of all hot works. Minimum size shall be 20lbs.

1.13 HAZARDOUS SUBSTANCES

- .1 Work entailing use of toxic or hazardous materials, chemicals and/or explosives, or otherwise creating hazard to life, safety or health, shall be in accordance with National Fire Code of Canada.
- .2 Provide ventilation where flammable liquids, such as lacquers or urethanes are used. Eliminate all sources of ignition. Inform the North Saanich Fire Chief prior to and at completion of such work.

1.14 QUESTIONS AND/OR CLARIFICATION

- .1 Direct questions or clarification on Fire Safety in addition to above requirements to the Departmental Representative.

1.15 FIRE INSPECTION

- .1 Co-ordinate site inspections by the Fire Chief through 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 REQUIREMENTS

- .1 Section 01 33 00 – Submittal Procedures
- .2 Section 01 74 11 – Cleaning.
- .3 Section 02 41 99 – Selective Demolition.

1.2 REFERENCES

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

1.3 SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 Submit WHMIS MSDS in accordance with Section 01 35 30 - Health and Safety Requirements.
- .2 Project Specific Environmental Protection Plan:
 - .1 Plan must include comprehensive overview of known or potential environmental issues to be addressed during construction.
 - .2 Address topics at level of detail commensurate with environmental issue and required construction tasks.
 - .3 Names of persons responsible for ensuring adherence to Environmental Protection Plan.
 - .4 Names and qualifications of persons responsible for manifesting any hazardous waste to be removed from site.

1.4 CONSTRUCTION EQUIPMENT

- .1 All equipment to be in good working order, free of leaks that would contaminate the site.
- .2 All equipment brought to site is to be clean and well maintained. Do not add fuel, oils or coolants to machinery on site. Provide properly placed drip pans under all fuel, oil and coolant filled machinery when machinery is left on site overnight and on weekends to contain leaks and drips.

1.5 FIRES

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

1.6 POLLUTION CONTROL

- .1 Maintain pollution control features installed under this Contract.
- .2 Control emissions from equipment and plant in accordance with local authorities' emission requirements.

- .3 Prevent extraneous materials from contaminating air and waterways beyond application area.
- .4 Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads.

1.7 HAZARDOUS MATERIALS HANDLING AND STORAGE

- .1 Hazardous materials including, but not limited to fuels, bitumen, cement, paints, solvent, cleaners, dust suppressants, used fuel and oil filters, and other construction materials shall be stored and handled to minimize loss and allow contaminant and recovery in the event of a spill.
- .2 Designate areas for the transfer and temporary storage of hazardous materials and wastes. The areas shall be clearly labelled and appropriately controlled. The designated areas shall be used by the contractor as a transfer and temporary storage area for potentially hazardous materials and wastes.
- .3 Maintain proper WHMIS labels and MSDS for all hazardous materials used and stored on site.
- .4 Report spills of hazardous materials immediately to the Departmental Representative.

1.8 SPECIAL WASTE

- .1 Special wastes generated in the course of the construction activities shall be disposed of in compliance with the British Columbia Hazardous Waste Regulations. As defined by these regulations, special waste includes but is not limited to waste asbestos, oils, grease, lubricants, solvents, batteries, PCB's, paints, and used spill clean-up materials.
- .2 When handling, storing and removing Special Waste, the Contractor shall maintain the following records: Inventories of types and quantities of Special Wastes generated, stored or removed; manifests identifying special waste haulers and disposal destinations; and, disposal certification documents.
 - .1 Submit documentation in accordance with Section 01 78 00 Closeout Procedures.

1.9 NOTIFICATION

- .1 Departmental Representative will notify Contractor in writing of observed noncompliance with Federal, Provincial or Municipal environmental laws or regulations, permits, and other elements of Contractor's Environmental Protection plan.
- .2 Contractor: after receipt of such notice, inform Departmental Representative of proposed corrective action and take such action.
 - .1 Take action only after receipt of written approval by Departmental Representative.
- .3 Departmental Representative may issue stop order of work until satisfactory corrective action has been taken.
- .4 No time extensions granted or equitable adjustments allowed to Contractor for such suspensions.

PART 2 Products

2.1 NOT USED

- .1 Not Used.

PART 3 Execution

3.1 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Ensure public waterways, storm and sanitary sewers remain free of waste and volatile materials disposal.
- .3 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .4 Waste Management: separate waste materials for in accordance with Section 01 74 21- Construction/Demolition Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 REFERENCES AND CODES

- .1 Perform Work in accordance with National Building Code of Canada (NBC) 2015 including amendments up to tender closing date and other codes of provincial or local application provided that in case of conflict or discrepancy, more stringent requirements apply.
- .2 Comply with applicable local bylaws rules and regulations enforced at the location concerned.
- .3 Provide inspection authorities having jurisdiction with plans and information required for issue of acceptance certificates.
- .4 Pay fees and obtain certificates and permits required.
- .5 Furnish inspection certificates in evidence that the work installed conforms to the requirements of the authority having jurisdiction.
- .6 Conform to the Canada Labour Code II, Canada Occupational Safety and Health regulations.
- .7 FCC, Fire Commissioner of Canada.
 - .1 Standard No. 301, "Construction Operations, June 1982.
- .8 WCB, Worker's Compensation Act, B.C., Reg. 185/99.
- .9 Meet or exceed requirements of:
 - .1 Contract documents.
 - .2 Specified standards, codes and referenced documents.

1.2 BUILDING SMOKING ENVIRONMENT

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

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

Part 1 General

1.1 INSPECTION

- .1 Allow Departmental Representative access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.
- .2 Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by Departmental Representative, Consultants 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.

1.2 PROCEDURES

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

1.3 REJECTED WORK

- .1 Remove defective Work which has been rejected by Departmental Representative as failing to conform to Contract Documents. Defective work may be as a result of poor workmanship, use of defective products, or damage. Replace work whether already incorporated into Work or not. 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 Work that is defective or not performed in accordance with Contract Documents, the Owner will deduct from Contract Price difference in value between Work performed and that called for by Contract Documents.
- .4 In case of dispute, decisions as to standard or quality of work rests solely with the Departmental Representative.

1.4 INDEPENDENT INSPECTION AGENCIES

- .1 Independent Inspection/Testing Agencies are to be engaged by the contractor to inspect portions of the work, as indicated in individual specification sections.
- .2 Contractor is to allow for the costs of these inspections.
- .3 Provide equipment required for executing inspection and testing by appointed agencies.

- .4 Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.
- .5 If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by Departmental Representative at no cost to Departmental Representative. Pay costs for retesting and re-inspection.

1.5 TESTS AND MIX DESIGNS

- .1 Furnish test results and mix designs as requested.

1.6 EQUIPMENT AND SYSTEMS

- .1 Submit adjustment and balancing reports for mechanical, electrical and building equipment systems.
- .2 Refer to individual specification sections for definitive requirements.

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

1.2 WATER SUPPLY

- .1 Departmental Representative will provide continuous supply of potable water for construction use.
- .2 Exercise conservation. Turn off water when not in use.
- .3 Provide all equipment and temporary hoses to bring water supply to site, at no additional cost to the contract.

1.3 TEMPORARY POWER AND LIGHT

- .1 Electrical power is available for construction purposes at no cost.
- .2 Departmental Representative will determine delivery points and quantitative limits. Departmental Representative written permission is required before any connection is made. Connect to existing power supply in accordance with Canadian Electrical Code.
 - .1 Provide detailed written isolation and re-energization plan. MCTS, DFO and Departmental Representative to be consulted when producing this plan.
- .3 Provide all equipment and temporary lines to bring these services to the work, at no additional cost to the contract.
- .4 Exercise conservation whenever using temporary electrical power supply.

1.4 FIRE PROTECTION

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

Part 2 Products

2.1 NOT USED

Part 3 EXECUTION

- .1 NOT USED

END OF SECTION

Part 1 General

1.1 INSTALLATION AND REMOVAL

- .1 Provide construction facilities in order to execute work expeditiously.
- .2 Remove from site all such work after use.

1.2 SCAFFOLDING

- .1 Scaffolding in accordance with CAN/CSA-S269.2.
- .2 Provide and maintain scaffolding, ladders, shoring and platforms necessary for the performance of the work.
- .3 Provide scaffolding and support structures as detailed in individual specification sections.

1.3 SITE STORAGE/LOADING

- .1 Confine work and operations of employees to areas as directed by Departmental Representative unless otherwise identified in Contract Documents. Do not unreasonably encumber premises with products.
- .2 Do not load or permit to load any part of Work with weight or force that will endanger Work.

1.4 CONSTRUCTION PARKING

- .1 Parking is permitted on site in areas directed by Departmental Representative.
- .2 Existing roads may be used for access to project site. Maintain construction parking area clean and free of construction-related debris, spillage and soiling.
- .3 Make good damage resulting from Contractor use of parking areas and roads, at no additional cost to the Contract.

1.5 EQUIPMENT, TOOL AND MATERIALS STORAGE

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

1.6 CONSTRUCTION SIGNAGE

- .1 No project identification signage allowed.
- .2 No other signs or advertisements, other than warning signs, are permitted on site.
- .3 Signs and notices for safety and instruction in both official languages Graphic symbols to CAN/CSA-Z321.

- .4 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.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 Not Used

END OF SECTION

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 and BARRIERS

- .1 Provide hoarding as necessary to enclose activities and around specified material storage area. Alter and modify as required to accommodate work.

1.3 DUST TIGHT SCREENS

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

1.4 ACCESS TO SITE

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

1.5 FIRE ROUTES

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

1.6 PROTECTION FOR OFF-SITE AND PUBLIC PROPERTY

- .1 Protect surrounding private and public property from damage during performance of Work.
- .2 Be responsible for damage incurred.
- .3 Be responsible for damage incurred due to lack of or improper protection.

END OF SECTION

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 STORAGE, HANDLING AND PROTECTION

- .1 Handle and store products in manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions when applicable.
- .2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work.
- .3 Store products subject to damage from weather in weatherproof enclosures.
- .4 Store cementitious products clear of earth or concrete floors, and away from walls.
- .5 Keep sand, when used for grout or mortar materials, clean and dry. Store sand on wooden platforms and cover with waterproof tarpaulins during inclement weather.
- .6 Store sheet materials, lumber on flat, solid supports and keep clear of ground. Slope to shed moisture.
- .7 Store and mix paints in heated and ventilated room. Remove oily rags and other combustible debris from site daily. Take every precaution necessary to prevent spontaneous combustion.
- .8 Remove and replace damaged products at own expense and to satisfaction of Departmental Representative.

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

1.3 TRANSPORTATION

- .1 Pay costs of transportation of products required in performance of Work.
- .2 Transportation cost of products supplied by Owner will be paid for by Departmental Representative. Unload, handle and store such products.
- .1 Contractor to make arrangements to receive all deliveries. Departmental Representative will not be responsible for receiving contractor deliveries.

1.4 MANUFACTURER'S INSTRUCTIONS

- .1 Unless otherwise indicated in specifications, install or erect products in accordance with manufacturer's instructions. Do not rely on labels or enclosures provided with products. Obtain written instructions directly from manufacturers.
- .2 Notify Departmental Representative in writing, of conflicts between specifications and manufacturer's instructions. 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.

1.5 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.
- .2 Do not employ anyone unskilled in their required duties.
- .3 Decisions as to the standard or fitness of Quality of Work in cases of dispute rest solely with Departmental Representative, whose decision is final.

1.6 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.

1.7 CONCEALMENT

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

1.8 REMEDIAL WORK

- .1 Perform remedial work required to repair or replace parts or portions of Work identified as defective or unacceptable. Co-ordinate adjacent affected Work as required.

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

1.9 LOCATION OF FIXTURES

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

1.10 FASTENINGS

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

1.11 FASTENINGS - EQUIPMENT

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

1.12 PROTECTION OF WORK IN PROGRESS

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

1.13 EXISTING UTILITIES

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

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 WASTE MANAGEMENT AND DISPOSAL

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

1.2 PROJECT CLEANLINESS

- .1 Maintain Work in tidy condition, free from accumulation of waste products and debris.
- .2 Maintain public areas adjacent to the worksite in a tidy condition.
- .3 Remove waste materials from site at daily and as directed by the Departmental Representative.
- .4 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .5 Provide on-site dump containers for collection of waste materials and debris.
- .6 Dispose of waste materials and debris.
 - .1 Dispose of hazardous waste materials in accordance with applicable federal and provincial acts, regulations, and guidelines.
 - .2 Send hazardous wastes to authorized hazardous waste disposal or treatment facilities.
 - .3 Remove hazardous materials away from public areas as they are exposed.
- .7 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.
- .8 Clean interior areas prior to start of finishing work, and maintain areas free of dust and other contaminants during finishing operations.

1.3 DAILY CLEANING

- .1 Conduct cleaning and disposal operations daily. Comply with local ordinances and anti-pollution laws.
- .2 Remove waste products and debris other than that caused by others, leave Work area clean.
- .3 Maintain cleanliness of adjacent areas during the demolition phase.

1.4 FINAL CLEANING

- .1 When all of the Work has been 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.
- .5 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.
- .6 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.
- .7 Sweep and wash clean paved areas.
- .8 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 SECTION INCLUDES

- .1 Waste goals.
- .2 Waste management plan.
- .3 Waste management plan implementation.
- .4 Disposal of waste.

1.2 DEFINITIONS

- .1 Clean Waste: Untreated and unpainted; not contaminated with oils, solvents, sealants or similar materials.
- .2 Construction and Demolition Waste: Solid wastes typically including but not limited to, building materials, packaging, trash, debris, and rubble resulting from construction, re-modelling, repair and demolition operations.
- .3 Hazardous: Exhibiting the characteristics of hazardous substances including, but not limited to, ignitability, corrosiveness, toxicity or reactivity.
- .4 Non-hazardous: Exhibiting none of the characteristics of hazardous substances, including, but not limited to, ignitability, corrosiveness, toxicity, or reactivity.
- .5 Non-toxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.
- .6 Recyclable: The ability of a product or material to be recovered at the end of its life cycle and re-manufactured into a new product for reuse by others.
- .7 Recycle: To remove a waste material from the Project site to another site for re-manufacture into a new product for reuse by others.
- .8 Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.
- .9 Return: To give back reusable items or unused products to vendors for credit.
- .10 Reuse: To reuse a construction waste material in some manner on the Project site.
- .11 Salvage: To remove a waste material from the Project site to another site for resale or reuse by others.
- .12 Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.
- .13 Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.
- .14 Toxic: Poisonous to humans either immediately or after a long period of exposure.
- .15 Trash: Any product or material unable to be reused, returned, recycled, or salvaged.
- .16 Volatile Organic Compounds (VOC): Chemical compounds common in and emitted by many building products over time through outgassing:

- .1 Solvents in paints and other coatings,
 - .2 Wood preservatives; strippers and household cleaners,
 - .3 Adhesives in particle board, fibreboard, and some plywood; and foam insulation,
 - .4 When released, VOC's can contribute to the formation of smog and can cause respiratory tract problems, headaches, eye irritations, nausea, damage to the liver, kidneys, and central nervous system, and possibly cancer.
- .17 Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

1.3 WASTE MANAGEMENT GOALS

- .1 Owner has established that this Project shall generate the least amount of waste possible and that processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors shall be employed. The owners goal is to divert 75% of waste materials from the landfill.
- .2 Owner recognizes that waste in any project is inevitable, but indicates that as much of the waste materials as economically feasible shall be reused, salvaged, or recycled.
- .3 Waste disposal in landfills shall be minimized.

1.4 MATERIAL SOURCE SEPARATION PLAN

- .1 Before project start-up, prepare Materials Source Separation Program. Provide separate containers for re-usable and/or recyclable materials of following:
 - .1 Construction waste: including but not limited to following types.
 - .1 Uncontaminated packaging (wood, metal banding, cardboard, paper, plastic wrappings, polystyrene).
 - .2 Wood pallets (recycle or return to shipper).
 - .3 Batt insulation.
 - .4 Metals (pipe, conduit, ducting, wiring, miscellaneous cuttings)
 - .5 Wood (uncontaminated).
 - .6 Gypsum board (uncontaminated).
 - .7 Paint, solvent, oil.
 - .8 Other materials as indicated in technical sections.
 - .2 Administration/worker waste (uncontaminated): including but not limited to following types.
 - .1 Paper, cardboard.
 - .2 Plastic containers and lids marked types 1 through 6.
 - .3 Glass and aluminum drink containers (recycle or return to vendor).
- .2 Implement MSSP for waste generated on project in compliance with approved methods and as approved by Departmental Representative.
- .3 Locate containers in locations, to facilitate deposit of materials without hindering daily operations.
- .4 Locate separated materials in areas which minimize material damage.

1.5 STORAGE, HANDLING AND PROTECTION

- .1 Store, materials to be reused, recycled and salvaged.
- .2 All materials for recycling must be source separated into separate bins to be accepted by the local processing authority.
- .3 Separate non-salvageable materials from salvaged items. Transport and deliver non-salvageable items to licensed disposal facility.
- .4 Protect surface drainage, storm sewers, sanitary sewers, and utility services from damage and blockage.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 PREPARATION

- .1 Handle waste materials not reused, salvaged, or recycled in accordance with appropriate regulations and codes.

3.2 USE OF SITE AND FACILITIES

- .1 Execute work with least possible interference or disturbance to normal use of premises.

3.3 WASTE MANAGEMENT IMPLEMENTATION

- .1 Manager: Contractor to designate an on-site party responsible for instructing workers and overseeing the results of the Waste Management Plan the Project.
- .2 Instruction: Contractor shall provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the Project.
- .3 Separation facilities: Contractor shall lay out and label a specific area to facilitate separation of materials for potential recycling, salvage, reuse, and return. Recycling and waste bin areas are to be kept neat and clean and clearly marked in order to avoid contamination of materials.
- .4 Hazardous wastes: Hazardous wastes shall be separated, stored, and disposed of according to local regulations.

3.4 DISPOSAL OF WASTE

- .1 Burying of rubbish and waste materials is prohibited.
- .2 Disposal of waste into waterways, storm, or sanitary sewers is prohibited.

3.5 CLEANING

- .1 Remove tools and waste materials on completion of work, and leave work area in clean and orderly condition.
- .2 Clean-up work area as work progresses.
- .3 Source separate materials to be reused/recycled into specified sort areas.

END OF SECTION

Part 1 General

1.1 ADMINISTRATIVE REQUIREMENTS

- .1 Acceptance of Work Procedures:
 - .1 Contractor's Inspection: Contractor and all subcontractors to conduct inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents.
 - .1 Notify Departmental Representative in writing of satisfactory completion of inspection and submit verification that corrections have been made.
 - .2 Request Departmental Representative's inspection.
 - .2 Departmental Representative's Inspection:
 - .1 Departmental Representative and Contractor to inspect Work and identify defects and deficiencies.
 - .2 Contractor to correct Work as directed.
 - .3 Completion Tasks: submit written certificates in English that tasks have been performed as follows:
 - .1 Work: completed and inspected for compliance with Contract Documents.
 - .2 Defects: corrected and deficiencies completed.
 - .3 Certificates required by authorities having jurisdiction have been submitted.
 - .4 Operation of systems have been demonstrated to the owner's personnel
 - .5 Work is complete and ready for final inspection.
 - .4 Declaration of Substantial Performance: When Departmental Representative considers deficiencies and defects corrected and requirements of Contract substantially performed, make application for Certificate of Substantial Performance.
 - .5 Commencement of warranty period: Date of Departmental Representatives acceptance of substantial performance to be the date for commencement for warranty period.
 - .6 Payment of Holdback: after issuance of Substantial Performance of work, submit application for payment of holdback amount in accordance with contractual agreement.
 - .7 Final Inspection:
 - .1 When completion tasks are done, request final inspection of Work by Departmental Representative.
 - .2 If work is deemed incomplete by Departmental Representative, complete outstanding items and request re-inspection.

- .8 Final Payment
 - .1 When Departmental Representative considers final deficiencies and defects corrected and requirements of contract met, make application for final payment.
 - .2 When work deemed incomplete by Departmental Representative complete outstanding items and request re-inspection.

1.2 FINAL CLEANING

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

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

Part 1

General

1.1 SECTION INCLUDES

- .1 Closeout submittals.
- .2 Operation and maintenance manual format.
- .3 Contents each volume.
- .4 Recording actual site conditions.
- .5 Record (as-built) documents and samples.
- .6 Record documents.
- .7 Final survey.
- .8 Warranties and bonds.

1.2 RELATED SECTIONS

- .1 Section 01 33 00 - Submittal Procedures.

1.3 CLOSEOUT SUBMITTALS

- .1 Prepare instructions and data using personnel experienced in maintenance and operation of described products.
- .2 Copy will be returned with Consultant's comments.
- .3 Revise content of documents as required prior to final submittal.
- .4 Two weeks prior to Substantial Performance of the Work, submit to the Consultant, two final copies and one electronic copy (PDF) of operating and maintenance manuals in Canadian English.
 - .1 One copy of the manual to be provided in digital form on CD rom, in Canadian English.
- .5 Ensure spare parts, maintenance materials and special tools provided are new, undamaged or defective, and of same quality and manufacture as products provided in Work.
- .6 If requested, furnish evidence as to type, source and quality of products provided.
- .7 Defective products will be rejected, regardless of previous inspections. Replace products at own expense.
- .8 Pay costs of transportation.

1.4 OPERATION AND MAINTENANCE MANUAL FORMAT

- .1 Organize data in the form of an instructional manual.
- .2 Binders: vinyl, hard covered, 3 'D' ring, loose leaf 219 x 279 mm with spine and face pockets.
- .3 When multiple binders are used, correlate data into related consistent groupings. Identify contents of each binder on spine.

- .4 Cover: Identify each binder with type or printed title "MAINTENANCE MANUAL"; list title of project and identify subject matter of contents.
- .5 Arrange content by systems, under Section numbers and sequence of Table of Contents.
- .6 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.
- .7 Text: Manufacturer's printed data, or typewritten data.
- .8 Drawings: provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
- .9 Coordinate with commissioning specification to include all related close out documentation, warranty and test reports.

1.5 CONTENTS - EACH VOLUME

- .1 Table of Contents: provide title of project;
 - .1 date of submission;
 - .2 names, addresses, and telephone numbers of Consultant and Contractor with name of responsible parties; and
 - .3 schedule of products and systems, indexed to content of volume.
- .2 For each product or system, 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 clearly identify specific products and component parts, and data applicable to installation; delete inapplicable information. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.
- .4 Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.

1.6 RECORDING ACTUAL SITE CONDITIONS

- .1 Record information on set of black line opaque drawings, and within the Project Manual, provided by Owner.
- .2 Annotate with coloured felt tip marking pens, maintaining separate colours for each major system, for recording changed information.
- .3 Record information concurrently with construction progress. Do not conceal Work of the Project until required information is accurately recorded.
- .4 Contract drawings and shop drawings: legibly mark each item to record actual construction, including:
 - .1 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.
 - .2 Field changes of dimension and detail.
 - .3 Changes made by change orders.
 - .4 Details not on original Contract Drawings.
 - .5 References to related shop drawings and modifications.

- .5 Specifications: legibly 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 inspection certifications, field test records, required by individual specifications sections.

1.7 RECORD DOCUMENTS AND SAMPLES

- .1 In addition to requirements in General Conditions, maintain at the site for Departmental Representative, one record copy of:
 - .1 Contract Drawings.
 - .2 Specifications.
 - .3 Addenda.
 - .4 Change Orders and other modifications to the Contract.
 - .5 Reviewed shop drawings, product data, and samples.
 - .6 Field test records.
 - .7 Inspection certificates.
 - .8 Manufacturer's certificates.
- .2 Store record documents and samples in apart from documents used for construction. Provide files, racks, and secure storage.
- .3 Label record documents and file in accordance with section number listings in List of Contents of the Project Manual. Label each document "RECORD DOCUMENTS" in neat, large, printed letters.
- .4 Maintain record documents in clean, dry and legible condition. Do not use record documents for construction purposes.
- .5 Keep record documents and samples available for inspection by Consultant.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 British Columbia Building Code 2018.
 - .1 Part 8, Safety Measures at Construction and Demolition Sites.
- .2 Canadian Standards Association (CSA International)
 - .1 CSA S350-M1980(R2003), Code of Practice for Safety in Demolition of Structures.

1.2 ALTERATION PROJECT PROCEDURES

- .1 Materials: As specified in Product sections; match existing Products and work for patching and extending work.
- .2 Employ skilled and experienced installer to perform alteration work.
- .3 Close openings in exterior surfaces to protect existing work from weather and extremes of temperature and humidity.
- .4 Remove, cut, and patch Work in a manner to minimize damage and to provide means of restoring Products and finishes to original condition.
- .5 Refinish existing visible surfaces to remain in renovated rooms and spaces, to renewed condition for each material, with a neat transition to adjacent finishes.
- .6 Where new Work abuts or aligns with existing, provide a smooth and even transition. Patch Work to match existing adjacent Work in texture and appearance.
- .7 When finished surfaces are cut so that a smooth transition with new Work is not possible, terminate existing surface along a straight line at a natural line of division and submit recommendation to Departmental Representative for review.
- .8 Where a change of plane of 6 mm or more occurs, submit recommendation for providing a smooth transition; to Departmental Representative for review.
- .9 Patch or replace portions of existing surfaces which are damaged, lifted, discoloured, or showing other imperfections.
- .10 Finish surfaces as specified in individual Product sections.

1.3 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-Demolition Meeting: Conduct a pre-demolition meeting at Project site to confirm extent demolition Work.
- .2 Coordination:
 - .1 Be responsible for reviewing full extent of contract documents including demolition and new Work indicated on drawings and as specified to determine extent of demolition, selective cutting and removal of material, assemblies, finishes or portions thereof as necessary to accomplish new Work results.
 - .2 Coordinate selective demolition work so that work of this Section adheres to aesthetic criteria established by the Drawings and specified dimensions with all

elements in planes as drawn, maintaining their relationships with all other building elements.

.3 Coordination for shutoff, capping, and continuation of utility services.

.3 Scheduling:

.1 Schedule Work to precede new construction.

.2 Describe demolition removal procedures and schedule.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Pre-demolition Photographs and Video: Submit photographs indicating existing conditions of adjoining construction and site improvements prior to starting Work. Include finish surfaces that may be misconstrued as damage caused by selective demolition operations.

1.5 CLOSEOUT SUBMITTALS

.1 Section 01 78 10: Submission procedures.

.2 Record Documentation: Accurately record actual locations of capped utilities, subsurface obstructions.

1.6 SITE CONDITIONS

.1 Site Environmental Requirements.

.1 Ensure that selective demolition work does not adversely affect adjacent watercourses, groundwater and wildlife, or contribute to excess air and noise pollution.

.2 Do not dispose of waste of volatile materials including but not limited to, mineral spirits, oil, petroleum based lubricants, or toxic cleaning solutions into watercourses, storm or sanitary sewers.

.1 Ensure proper disposal procedures are maintained throughout the project.

.3 Do not pump water containing suspended materials into watercourses, storm or sanitary sewers or onto adjacent properties.

.4 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authorities.

1.7 REGULATORY REQUIREMENTS

.1 Conform to applicable code for demolition work, dust control, products requiring electrical disconnection and reconnection.

.2 Obtain required permits from authorities.

.3 Do not close or obstruct egress width to any building or site exit.

.4 Do not disable or disrupt building fire or life safety systems without three (3) days prior written notice to the Departmental Representative.

1.8 PROJECT CONDITIONS

- .1 Conduct demolition to minimize interference with adjacent building areas.
- .2 Cease operations immediately if structure appears to be in danger and notify Departmental Representative. Do not resume operations until directed.

Part 2 Products

2.1 MATERIALS

- .1 Not Used.

Part 3 Execution

3.1 PREPARATION

- .1 Provide, erect, and maintain temporary barriers where required to prevent spread of dust to areas not being renovated.
- .2 Protect existing materials, equipment, furnishings, finishes, assemblies designated to remain. In event of damage to such items, immediately replace or make repairs to approval of Departmental Representative and at no cost to Tenant.
- .3 Mark location and termination of utilities.

3.2 REMOVAL OF HAZARDOUS WASTES

- .1 If material resembling spray or trowel-applied asbestos or other designated substance listed as hazardous that has not already been identified is encountered, stop work, take preventative measures, and notify the Departmental Representative immediately.
 - .1 Proceed only after receipt of written instructions have been received from the Departmental Representative.

3.3 DEMOLITION

- .1 Demolish in an orderly and careful manner. Protect surrounding finishes from damage.
- .2 Remove indicated wall panels and doorway.
- .3 Perform Work in accordance with Provincial Occupational Health and Safety Requirements, Part 8 of the BCBC 2012 and CSA S350. Demolish existing elements and services as indicated in drawings. Remove parts of existing building to permit new construction.
- .4 Disconnect, remove, cap, identify designated utilities within demolition areas.
- .5 Demolish in an orderly and careful manner. Protect surrounding finishes from damage.
- .6 Where existing materials are to be re-used in Work, use special care in removal, handling, storage and re-installation to assure proper function in completed work.
- .7 Remove demolished materials from site except where specifically noted otherwise. Do not burn or bury materials on site.

- .8 Remove materials as Work progresses. Upon completion of Work, leave areas in clean condition.

3.4 SALVAGE:

- .1 Remove demountable wall panels, door and door jambs and turn over to the Departmental Representative.

3.5 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
 - .2 Remove debris, trim surfaces and leave work site clean, upon completion of Work.
 - .3 Use cleaning solutions and procedures which are not harmful to health, are not injurious to plants, and do not endanger wildlife, adjacent water courses or ground water.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

3.6 PROTECTION

- .1 Restore areas and existing works outside areas of demolition to conditions that existed prior to beginning of Work.
- .2 Repair damage to adjacent materials or property caused by selective site demolition.
- .3 Patch and repair walls, floor and ceilings damaged during demolition with material matching adjacent walls, prepare ready for new finishes.
- .4 Patch and repair mechanical equipment and electrical fixtures damaged or exposed during demolition to match adjacent finished surfaces.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 02 41 19 – Selective Demolition.

1.2 SITE CONDITIONS

- .1 No specific Hazardous Materials have been identified in the area of the work.
- .2 Contractor to allow for testing of any materials suspected to contain Hazardous Materials, in the contract price.
- .3 If Hazardous Materials are discovered, removal and disposal will be priced by the contractor and, once accepted, will be dealt with as a change to the contract.
- .4 All work is to be completed in accordance with all applicable guidelines and statutes within the WorkSafeBC Regulation.

1.3 SUBMITTALS

- .1 All work is to be completed in accordance with all applicable guidelines and statutes within the WorkSafeBC Regulation.
- .2 If Hazardous Materials are discovered:
 - .1 The contractor will provide the Departmental Representative with submittals including work procedures, exposure control plans, permits, notices and provincial Notice of Project.
 - .2 The contractor will provide the Departmental Representative with waste disposal documentation for all hazardous material disposal. (waste manifests and/or intent to dispose certification).
 - .3 These tasks to be priced and once accepted will be dealt with as a change to the contract.

Part 2 Products

2.1 MATERIALS

- .1 Not Used.

Part 3 Execution

3.1 GENERAL DEMOLITION

- .1 If required, Contractor to engage an Environmental Consultant to advise on safe work procedures to be followed when remediating hazardous materials.
- .2 The work is to be performed during hours determined by the Departmental Representative. All work is to be scheduled to allow the Environmental Consultant to perform inspections and air monitoring as required while on site.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM C423-02a, Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
 - .2 ASTM E580/E580M-14 Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions.
 - .3 ASTM C635/C635M-13a, Standard Specifications for the Manufacture, Performance and Testing of Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings.
 - .4 ASTM E1264-98, Standard Classification for Acoustical Ceiling Products.
 - .5 ASTM E1477-98a(2003), Standard Test Method for Luminous Reflectance Factor of Acoustical Materials by Use of Integrating-Sphere Reflectometers.
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .3 Underwriter's Laboratories of Canada (ULC)
 - .1 CAN/ULC-S102-2003, Surface Burning Characteristics of Building Materials and Assemblies.

1.2 DELIVERY, STORAGE AND HANDLING

- .1 Protect on site stored or installed absorptive material from moisture damage.
- .2 Store extra materials required for maintenance, where directed by DCC Representative.
- .3 Waste Management and Disposal:
 - .1 Separate waste materials for recycling in accordance with Section 01 74 21 - Construction /Demolition Waste Management and Disposal.
 - .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

1.3 SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 Submittal Procedures
- .2 Submit delegated design shop drawings stamped and signed by professional engineer registered or licensed in the Province of British Columbia, Canada.
- .3 Indicate components and installation methods to conform to specified seismic design and construction requirements of Contract Documents and in general accordance with ASTM E580/E580M.

- .4 Include supporting details, treatment of cross runners, main runners, and wall closures at terminal ends, suspension wire, lateral force bracing, light fixtures and services within the ceiling, seismic isolation joints and partition bracing.

1.4 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Submit final certificate from design professional responsible for delegated detail design of ceiling indicating conformity with accepted shop drawings.

1.5 ENVIRONMENTAL REQUIREMENTS

- .1 Permit wet work to dry before beginning to install.
- .2 Maintain uniform minimum temperature of 15 degrees C and humidity of 20% before and during installation.
- .3 Store materials in work area 48 hours prior to installation.

1.6 DESIGN CRITERIA

- .1 Design requirements:
 - .1 Intermediate duty system to ASTM C 635/ASTM C635M.
 - .2 Maximum deflection: 1/360th of span to ASTM C 635/ASTM C635M deflection test.
- .2 Seismic design requirements:
 - .1 Design acoustical ceiling installation to resist effects of earthquake motions under seismic design conditions specified in National Building Code of Canada.
 - .2 Provide components as necessary to implement design.

Part 2 Products

2.1 MATERIALS

- .1 Acoustic units for suspended ceiling system: to ASTM E1264.
 - .1 Acoustic units to match existing units as closely as possible
- .2 Acoustical Suspension:
 - .1 Any acoustical suspension components required to match existing as closely as possible.

Part 3 Execution

3.1 REPAIR

- .1 Repair or replace damaged acoustical suspension and panels as required after removal of demountable wall panels.

- .2 Replace with materials that match existing as closely as possible.

3.2 CLEANING

- .1 Do cleaning in accordance with Section 01 74 11 - Cleaning.

END OF SECTION

Part 1

General

1.1 RELATED SECTIONS

- .1 Section 02 41 19 – Selective Demolition

1.2 SECTION INCLUDES

- .1 Tile carpeting
- .2 Rubber base

1.3 REFERENCES

- .1 CAN/CGSB-4.129-93(R1997), Carpets for Commercial Use.
- .2 ASTM D2859-06(2011) - Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials.
- .3 ASTM E84-12c - Standard Test Method for Surface Burning Characteristics of Building Materials.
- .4 ASTM E1155-14 – Standard Test Method for Determining FF (Floor Flatness) and FL (Floor Levelness) numbers.
- .5 CAN/ULC-S102-10 - Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
- .6 CRI Carpet Installation Standard – 2011
- .7 ASTM F1861-08 (2012) e1 Standard Specification for Resilient Wall Base.

1.4 SUBMITTALS FOR INFORMATION

- .1 Section 01 33 00 for submission procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for each carpet tile and include product characteristics, performance criteria, physical size, finish and limitations.

1.5 CLOSEOUT SUBMITTALS

- .1 Section 01 78 00: Closeout Submittals.
- .2 Operation and Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.

1.6 QUALITY ASSURANCE

- .1 Regulatory Requirements: Conform to NBC 2010 for flame/smoke rating.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store materials protected from exposure to harmful weather conditions and at temperature conditions recommended by manufacturer.
 - .3 Store and protect carpet tile and adhesive in original containers or wrapping with manufacturer's seals and labels intact.
 - .4 Store carpet and adhesive at minimum ambient temperature of 21 degrees C and relative humidity of maximum 65% for minimum of 72 hours before installation.
 - .5 Prevent damage to materials during handling and storage. Keep materials under cover and free from dampness.
 - .6 Safety: comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials.
 - .7 Replace defective or damaged materials with new.

1.8 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal, and with Waste Reduction Workplan.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

1.9 SITE CONDITIONS

- .1 Ambient Conditions:
 - .1 Moisture: ensure substrate is within moisture limits and alkalinity limits recommended by manufacturer.
 - .2 Temperature: maintain ambient temperature of not less than 21 degrees C from 72 hours before installation to at least 24 hours after completion of work.
 - .3 Relative humidity: maintain between 10% and 65% for 72 hours before, during and 48 hours after installation.
 - .4 Install carpet after space is enclosed and weatherproof, wet-work in space is completed and nominally dry, work above ceilings is complete.

Part 2 Products

2.1 MATERIALS - CARPET

- .1 Carpet: to CAN/CGSB-4.129 and as follows
 - .1 To match existing carpet tile as closely as possible.

2.2 MATERIALS – BASE

- .1 To match existing rubber base as closely as possible.

Part 3 Execution

3.1 EXAMINATION

- .1 Verify that surfaces are smooth and flat with maximum variation of 6 mm in 3 m and are ready to receive work.
- .2 Verify concrete floors are dry to a maximum moisture content of 7 percent, and exhibit negative alkalinity, carbonization, or dusting.

3.2 PREPARATION

- .1 Prepare areas of the floor that require carpet tile repair or replacement to receive the replacement flooring.
 - .1 Fill holes and level areas as required.
- .2 Remove or treat old adhesives to prevent residual, old flooring adhesives from bleeding through to new flooring and/or interfering with the bonding of new adhesives.
- .3 Ensure wall to receive base is smooth, level, free from waves and other defects, and ready for base installation.
- .4 Vacuum clean substrate.

3.3 INSTALLATION

- .1 Install carpet tile accessories and adhesive in accordance with manufacturer's written instructions.
- .2 Co-ordinate tile carpeting work with work of other trades, for proper time and sequence to avoid construction delays.
- .3 Install carpet tile after finishing work is completed but before furniture is installed.
- .4 Snugly join carpet tiles in completed installation; do not trap yarn between carpet tiles.
- .5 Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.
- .6 Ensure finished installation presents smooth wearing surface free from conspicuous seams, burring and other faults.
- .7 Fully adhere carpet tile to substrate.
- .8 Install carpet tiles smooth and free from bubbles, puckers, and other defects.

3.4 INSTALLATION – BASE

- .1 Repair or replace rubber base as required after demolition.
- .2 Install base in full bed of adhesive using full spread notched trowel. Cut and fit base neatly at corners, to tight fitting tolerances.
- .3 Install base straight and level to maximum variation of 1:1000.
- .4 Scribe base neatly and accurately to frames, cabinets and other interrupting surfaces.
- .5 Keep joints tight and well fitted.

3.5 CLEANING

- .1 Section 01 74 11: Cleaning installed work.
- .2 Remove excess adhesive without damage, from floor, base, and wall surfaces.
- .3 Clean and vacuum carpet surfaces.

3.6 PROTECTION OF FINISHED WORK

- .1 Protect installed products and components from damage during construction.
- .2 Prohibit traffic on carpet for period of 24 hours minimum after installation and until adhesive is cured.
- .3 Install carpet protection to satisfaction of Departmental Representative. Do not permit traffic over unprotected floor surface.
- .4 Repair damage to adjacent materials caused by tile carpeting installation.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Health Canada / Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .2 Master Painters Institute (MPI)
 - .1 MPI Architectural Painting Specifications Manual, 2004.
- .3 National Fire Code of Canada – 1995
- .4 Green Seal Environmental Standards
 - .1 Standard GC-03-97, Anti-Corrosive Paints.
 - .2 Standard GS-11-93, Architectural Paints.
 - .3 Standard GS-36-00, Commercial Adhesives
- .5 South Coast Air Quality Management District (SCAQMD), California State
 - .1 SCAQMD Rule 1113-04, Architectural Coatings.
 - .2 SCAQMD Rule 1168-05, Adhesives and Sealants Applications.

1.2 DELIVERY, STORAGE AND HANDLING

- .1 In accordance with Section 01 61 00 Common Product Requirements.

1.3 WASTE MANAGEMENT AND DISPOSAL:

- .1 Separate waste materials for recycling in accordance with Section 01 74 21– Construction/Demolition Waste Management and Disposal.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Unused coating materials must be disposed of at official hazardous material collections site as approved by Departmental Representative.

1.4 SITE CONDITIONS

- .1 Surface and Environmental Conditions:
 - .1 Apply paint finish in areas where dust is no longer being generated by related construction operations or when wind or ventilation conditions are such that airborne particles will not affect quality of finished surface.
 - .2 Apply paint to adequately prepared surfaces and to surfaces within moisture limits.
 - .3 Apply paint when previous coat of paint is dry or adequately cured.
- .2 Additional interior application requirements:
 - .1 Apply paint finishes when temperature at location of installation can be satisfactorily maintained within manufacturer's recommendations.

Part 2 Products

2.1 MATERIALS

- .1 Paint materials listed in the MPI Approved Products List (APL) are acceptable for use on this project.
- .2 Provide paint materials for paint systems from single manufacturer.
- .3 Conform to latest MPI requirements for painting work including preparation and priming.
- .4 Materials (primers, paints, coatings, varnishes, stains, lacquers, fillers, thinners, solvents, etc.) in accordance with MPI Architectural Painting Specification Manual "Approved Product" listing.
- .5 Paint materials to conform to the requirements of:
 - .1 Green Seal Environmental Standards.
 - .1 Standard GS-11-93, Architectural Paints.
 - .2 South Coast Air Quality Management District (SCAQMD), California State
 - .1 SCAQMD Rule 1113-04, Architectural Coatings.

2.2 COLOURS

- .1 Colours to match that of existing paint finishes as closely as possible.

2.3 GLOSS/SHEEN RATINGS

- .1 Paint gloss is defined as sheen rating of applied paint, in accordance with following values:

	Gloss @ 60 degrees	Sheen @ 85 degrees
Gloss Level 1 - Matte Finish (flat)	Max. 5	Max. 10
Gloss Level 2 - Velvet-Like Finish	Max.10	10 to 35
Gloss Level 3 - Eggshell Finish	10 to 25	10 to 35
Gloss Level 4 - Satin-Like Finish	20 to 35	min. 35
Gloss Level 5 - Traditional Semi-Gloss Finish	35 to 70	
Gloss Level 6 - Traditional Gloss	70 to 85	
Gloss Level 7 - High Gloss Finish	More than 85	

2.4 PAINTING SYSTEMS

- .1 Plaster and gypsum board: gypsum wallboard, drywall, "sheet rock type material", and textured finishes:
 - .1 INT 9.2A - Latex –gloss level 3 finish (over latex sealer).

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 data sheet.

3.2 GENERAL

- .1 Perform preparation and operations for interior painting in accordance with MPI Architectural Painting Specifications Manual except where specified otherwise.
- .2 Apply paint materials in accordance with paint manufacturer's written application instructions.

3.3 EXAMINATION

- .1 Investigate existing substrates for problems related to proper and complete preparation of surfaces to be painted. Report to Departmental Representative damages, defects, unsatisfactory or unfavourable conditions before proceeding with work.

3.4 PREPARATION

- .1 Protection:
 - .1 Protect existing building surfaces and adjacent structures from paint spatters, markings and other damage by suitable non-staining covers or masking. If damaged, clean and restore surfaces as directed by Departmental Representative.
 - .2 Protect items that are permanently attached such as Fire Labels on doors and frames.
 - .3 Protect factory finished products and equipment.
 - .4 Protect building occupants and general public in and about the building.
- .2 Surface preparation: clean and prepare surfaces in accordance with MPI Architectural Painting Specification Manual requirements. Refer to MPI Manual in regard to specific requirements.
- .3 Sand and dust between coats as required to provide adequate adhesion for next coat and to remove defects visible from a distance up to 1000 mm.

3.5 APPLICATION

- .1 Conform to manufacturer's application instructions unless specified otherwise.
- .2 Where painting is required to cover damage or unpainted areas, paint entire wall panel up to the nearest corner or outside edge.
- .3 Brush and Roller Application:
 - .1 Apply paint in uniform layer using brush and/or roller type suitable for application.
 - .2 Work paint into cracks, crevices and corners.

- .3 Paint surfaces and corners not accessible to brush using spray, daubers and/or sheepskins. Paint surfaces and corners not accessible to roller using brush, daubers or sheepskins.
- .4 Brush and/or roll out runs and sags, and over-lap marks. Rolled surfaces free of roller tracking and heavy stipple.
- .5 Remove runs, sags and brush marks from finished work and repaint.
- .4 Use dipping, sheepskins or daubers only when no other method is practical in places of difficult access.
- .5 Apply coats of paint continuous film of uniform thickness. Repaint thin spots or bare areas before next coat of paint is applied.
- .6 Allow surfaces to dry and properly cure after cleaning and between subsequent coats for minimum time period as recommended by manufacturer.
- .7 Sand and dust between coats to remove visible defects.

3.6 SITE TOLERANCES

- .1 Walls: no defects visible from a distance of 1000 mm at 90 degrees to surface.
- .2 Ceilings: no defects visible from floor at 45 degrees to surface when viewed using final lighting source.
- .3 Final coat to exhibit uniformity of colour and uniformity of sheen across full surface area.

3.7 CLEANING

- .1 Do cleaning in accordance with Section 01 74 11 - Cleaning.

END OF SECTION

PART 1 - GENERAL

- 1.1 Summary .1 Section includes common work results for Divisions 22, 23 and 25.
- 1.2 Related Sections .1 These common works apply for Divisions 22, 23 and 25. Should there be any conflict between any requirement of this Section and the General Conditions, Supplements and Amendments, the more stringent shall apply.
- .2 This Section of the Specification forms part of the Contract Documents and is to be read, interpreted and coordinated with all other parts.
- 1.3 Definitions .1 Provide means supply and install.
- .2 Work means material and labour.
- .3 Departmental Representative refers to owner's representative.
- .4 The specification sections are titled and divided under the headings of General, Products and Execution and under clause headings. These titles and headings are for general organization only and shall in no way limit or restrict the specification requirements.
- 1.4 General Scope .1 Provide the work indicated in the Contract Documents and as required to provide complete, tested and fully operational systems including all work not normally indicated but necessary for a complete and operational installation.
- .2 The Contractor is expected to be experienced and competent and knowledgeable about the trades and applicable codes, ordinances and industry standards and shall perform the work accordingly, on schedule and fully coordinated with all other trades.
- .3 Except where precisely indicated, the Contract Documents are diagrammatic and generally indicating the scope of work, general arrangement, and establishing minimum quality and performance requirements. Where there are conflicting requirements the Contractor shall allow for and provide the better quality and/or greater quantity unless the conflicting requirements are interpreted otherwise in writing by the Departmental Representative.

- .4 The Contract Documents for this Division are an integral part of the complete Contract Documents for the project and will be interpreted in conjunction with all other Divisions.

1.5 Codes, Regulations and Standards

- .1 Mechanical work shall conform to the following codes, regulations and standards, and all other codes in effect at the time of award of Contract, and any others having jurisdiction. The revision of each code and standard and their amendments which are adopted by the Authority Having Jurisdiction shall apply unless otherwise specified in the Contract Documents, adhere to the code bylaw that is the most stringent:
 - .1 Bylaws
 - .1 Local Building Bylaws.
 - .2 National Fire Codes
 - .1 NFPA 10 Portable Fire Extinguishers.
 - .3 National Research Council of Canada
 - .1 NRCC 23174 National Building Code of Canada, most current.
 - .2 NRCC 23178 National Building Code of Canada, Supplement.
 - .3 NRCC 23175 National Fire Code of Canada.
 - .4 Province of British Columbia
 - .1 BC Building and Plumbing Code (2018).
 - .2 BC Fire Code (2018).
 - .3 BC Industrial Health & Safety Regulations, WorkSafeBC.
 - .5 SMACNA Publications
 - .1 HVAC Duct Construction Standards.
 - .2 Guidelines for seismic restraints of mechanical systems.
- .2 All specification references to the Building Code refer to the BC Building Code or National Building Code, which ever is the most stringent shall take precedence.

1.6 Drawings and Measurements

- .1 Drawings are generally diagrammatic and are intended to indicate the scope and general arrangement of work. They are not detailed installation drawings.
- .2 Do not scale the drawings.
- .3 Obtain accurate dimensions from the Architectural and Structural Drawings.

- .4 Consult the Architectural drawings for exact locations of fixtures and equipment. Obtain this information from the Departmental Representative where not obtainable from the drawings.
- .5 Field measure as required to size and locate services and equipment.

1.7 Price Breakdown

- .1 Within ten [10] days of award of the Contract provide to the Departmental Representative a price breakdown in the following categories as applicable. This information is for the Departmental Representative's use in evaluating progress claims. All work shall be included and the component prices shall add up to the total Contract price.
- .2 Prices for the Proposed Changes shall be submitted broken down sufficiently for the Departmental Representative's review and shall show mark-ups.
- .3 Submit any further breakdown as determined by the Departmental Representative as necessary to allow assessment of Progress Claims or Proposed Changes.
- .4 Price breakdown categories:
 - .1 Start-Up
 - .2 Site Work:
 - .1 Material
 - .2 Labour
 - .3 Ductwork
 - .1 Material
 - .2 Labour
 - .4 Air Handling Equipment
 - .1 Material
 - .5 Ductwork Insulation
 - .6 Controls:
 - .1 Material
 - .2 Labour
 - .7 Commissioning, Testing, Balancing
 - .8 Contract Close Out (Record Drawings, Maintenance Manuals, Submissions).
 - .9 Total Mechanical Contract Price.

1.8 Warranty

- .1 Use of installed equipment during construction shall not shorten or alter the warranty period as specified in the General Conditions.

- .2 Take note of and submit written information for any extended warranties specified.

1.9 Workmanship

- .1 Workmanship shall be in accordance with well-established practice and with standards accepted and recognized by the Departmental Representative and the Trade.
- .2 The Departmental Representative may reject any work not conforming to the Contract Documents or to accepted standards of performance, quietness of operation, finish or appearance.
- .3 Employ only tradesmen with valid Provincial Trade Qualification Certificates. Tradesmen shall perform only work permitted by their certificates. Certificates shall be available for review by the Departmental Representative.

1.10 Accessibility

- .1 All work shall be readily accessible for adjustment, operation and maintenance. Supply access doors where required in building surfaces for installation by building trades.

1.11 Submittals

- .1 Shop Drawings:
 - .1 Process:
 - .1 Shop drawings/product data shall be submitted as elsewhere specified.
 - .2 Shop drawings/product data shall be reviewed, signed and processed as described in the General Conditions and as further described by the Mechanical Contractors Association of British Columbia.
 - .2 Content:
 - .1 Shop drawings submitted title sheet.
 - .2 Data shall be specific and technical.
 - .3 Identify each piece of equipment.
 - .4 Information shall include all scheduled data.
 - .5 Advertising literature will be rejected.
 - .6 The project shall be identified on each document.
 - .7 Information shall be given in SI units consistent with the system of units in the Contract Documents.
 - .8 The shop drawings/product data shall include:
 - .1 Dimensioned construction drawings with plans and sections showing size, arrangement and necessary

- clearances, with all equipment weights and mounting point loads.
 - .2 Mounting arrangements.
 - .3 Capacity and performance characteristics indicated on performance curves for fans and pumps.
 - .4 Sound Power Data, where requested.
 - .5 Motor efficiencies on motors 1 HP and larger.
 - .6 List of the manufacturers and figure numbers for all valves, traps and strainers.
 - .7 Detailed drawings of bases, supports and anchor bolts.
 - .8 Control explanation and internal wiring diagrams for packaged equipment.
 - .9 Control system drawings.
 - .10 A written description of control sequences relating to the schematic diagrams.
- .9 Clearly indicate selected options and accessories. Cross out any items that do not apply. Add any additional specified features such as finishes, high temperature seals, etc.
- .3 Format:
- .1 Black line print 216 mm x 280 mm [8-1/2" x 11"] or 280 mm x 430 mm [11" x 17"].
 - .2 Larger drawings may be submitted on reproducible sepia with space for stamps and signatures - master set plus one working copy.
 - .3 An assembly of related components, e.g. grilles, registers and diffusers or radiation with sheet metal cabinets, etc. between covers with the contents [identified by model number] listed on the front cover with item identification numbers.
 - .4 A brochure for plumbing fixtures between covers with the contents named with model numbers listed on the front cover with item identification numbers
- .4 Coordination: Where mechanical equipment requires electrical connections, power or other services, the shop drawings shall also be circulated through the Electrical Contractor prior to submission to the Departmental Representative.
- .5 Keep one (1) copy of shop drawings and product data, on site, available for reference

- .6 Review or non-review of shop drawings does not alter the requirements of the equipment and materials provided to conform to the specification.
- .2 Closeout Submittals:
 - .1 Operating and Maintenance Manuals:
 - .1 Provide maintenance data for incorporation into Operational and Maintenance manual.
 - .2 Employ the Balancing Agency to prepare the manuals.
 - .3 Allow sufficient time to provide the final reviewed manuals to the Departmental Representative before Substantial Performance.
 - .4 Provide one draft digital pdf copy of the manuals to the Departmental Representative for review. PDF files shall have searchable text within PDF reader software. Make all required changes and resubmit to the Departmental Representative. Repeat until accepted. Then submit the following, identical to the accepted copy, to the Departmental Representative:
 - .1 Three (3) hard copies - organized in binders, refer to below.
 - .2 Two (2) PDF electronic copies (minimum of 600 DPI scanning quality) of full binder contents on flash drive.
 - .5 Obtain a receipt and send a copy to the Departmental Representative. Allow ten days for the first submittal review by the Departmental Representative and seven days for each subsequent review.
 - .6 If the manuals are not accepted and submitted to the Departmental Representative by the time of Substantial Performance, submit at Substantial Performance a draft copy to the Departmental Representative with clear indication that it is a draft copy, not a final copy, for interim use by the Departmental Representative. When the final copies are submitted to the Departmental Representative, retrieve the draft copy and modify it to match the other final copies.
 - .7 The binders shall be 3-ring binder. The maximum overall thickness of the filled binder shall be 100 mm [4"]. Provide multiple binders for each manual as required.

- .8 Each binder shall have large clear lettering in a clear label insert on the front cover indicating the name of the project and “OPERATING AND MAINTENANCE MANUAL - MECHANICAL”.
- .9 Provide an index and tab each section.
- .10 The manual shall include:
 - .1 Air balance report.
 - .2 Commissioning report.
 - .3 Copy of any required approvals, certifications and acceptance by Authorities Having Jurisdiction.
 - .4 All shop drawings.
 - .5 List of local source of supply.
 - .6 Manufacturer’s operating and maintenance literature and wiring and control diagrams.
- .2 Site Records:
 - .1 Keep a set of contract prints on site for the sole purpose of keeping an up-to-date record marked in red of the installation of the mechanical work where they vary from the drawings.
 - .2 Changes for all mechanical work and piped site service trades, including sketches for Change Orders and Site Instructions shall be kept on this set of drawings.
 - .3 For all buried new services and all existing services exposed by the work indicate the inverts and dimensioned locations at all connections and changes in direction.
 - .4 Services shall not be buried or concealed until the Record Drawings are up-to-date for the services.
 - .5 All inaccessible concealed services shall be accurately located.
 - .6 Minor changes in the routing of services within a space which are readily observable and obvious after all construction is complete, need not be recorded.
 - .7 Identify each drawing in lower right hand corner in letters at least 10 mm high as follows: - "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" and under this add the Contractor’s name, an authorized signature and the date.
 - .8 Submit the prints for review by the Departmental Representative. Make any additional changes identified by the Departmental Representative including returning to the site if necessary to make measurements and/or to confirm installation locations and details. Resubmit to the Departmental Representative.

- .3 Record Drawings:
 - .1 Prior to start of Testing, Adjusting and Balancing for HVAC, finalize production of As-Built Drawings.
 - .2 Upon completion of the Departmental Representative's review, submit final Record Drawings to the Departmental Representative. Final record drawings shall include revised CAD files prepared by a qualified draftsman to the same standards as the original drawings.

1.12 Dimensions
And Units

- .1 The Contract Documents are generally in metric units and in places are followed by non-metric equivalents in square brackets.
- .2 Generally the conversions for the equivalents are not exact but close enough that both are sufficiently accurate to be used.
- .3 Many sizes or capacities shown are an indication of a nominal size, not an exact dimension, and these are as generally understood by the trade.
- .4 Pipe sizes are nominal pipe sizes. Neither the metric size in mm or the often used Imperial sizes in inches are either equal to the inside or outside diameter of the pipe; they are used as follows to be equivalent to the NPS sizes (Nominal Pipe Size):
 - .1 NPS 1/2, 12 mm, 1/2".
 - .2 NPS 3/4, 20 mm, 3/4".
 - .3 NPS 1, 25 mm, 1".
 - .4 NPS 1-1/4, 30 mm, 1-1/4".
 - .5 NPS 1-1/2, 40 mm, 1-1/2".
 - .6 NPS 2, 50 mm, 2".
 - .7 NPS 2-1/2, 65 mm, 2-1/2".
 - .8 NPS 3, 75 mm, 3".
 - .9 NPS 4, 100 mm, 4".
- .5 Duct sizes are intended to be the actual size shown. However, some duct products are premanufactured in standard sizes or a sheet metal shop may be set up to work in standard sizes (generally Imperial based sizes) in which case a size shown in metric shall be soft converted to the Imperial inch size which is slightly larger e.g.:
 - .1 300 mm shall be 12".
 - .2 600 mm shall be 24".
 - .3 1200 mm shall be 48".
- .6 Sheet metal thickness is shown in gauges (ga) only as it is not generally referred to in its metric or Imperial thickness.

- .7 Equipment dimensions are nominal sizes but are close to actual size. A 600 x 600 diffuser shall be close to 600 x 600 mm in overall dimension but where it is in a T-bar grid ceiling it shall be sized to lay in the grid whether it is a metric grid at 600 mm centres or an Imperial grid at 609 mm centres. A 600 x 600 mm surface mounted diffuser will be larger overall than 600 x 600 mm depending on the flange width.

PART 2 - PRODUCTS

2.1 Maintenance

- .1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Obtain signed receipt from the Departmental Representative” when spare parts are handed over.
- .3 Provide the following spare parts:
 - .1 Provide two (2) sets of filter media (for each filter) or filter bank installed - one for installation and one for hand over to the Departmental Representative” as a spare.

2.2 Asbestos

- .1 All material/products provided shall be free of asbestos.
- .2 If any existing asbestos containing material not identified in the Contract Documents is discovered and it will be disturbed or affected by the work of the Contract or if it poses a health concern, do no further work involving risk due to the asbestos until the Departmental Representative has been notified and until all notifications, arrangements and approvals with the Authorities Having Jurisdiction are in place.
- .3 All work related to existing asbestos shall be handled and/or removed in accordance with the requirements of Ministry of Environment, WorkSafeBC and any other Authorities Having Jurisdiction.
- .4 All work performed on systems with asbestos containing material must be reported in advance to WorkSafeBC.
- .5 If instructions concerning asbestos are specified elsewhere in the Contract Documents then the most stringent specified requirements shall be followed.

2.3 Access Doors

- .1 Provide in accordance with Section 08 31 00 - Access Doors and Panels.

- 2.4 Miscellaneous Metal
- .1 Be responsible for all miscellaneous steel work relative to the mechanical work of the Specifications, including but not limited to:
 - .1 Support of equipment.
 - .2 Hanging, supporting, anchoring, guiding and related work as it applies to piping, ductwork and mechanical equipment.
 - .3 Earthquake restraint devices.
 - .2 All exterior miscellaneous steel shall be hot-dipped galvanized.
 - .3 All steelwork not galvanized shall be prime and undercoat painted ready for finish under Painting Division. On galvanized materials that are subsequently welded apply galvicon. Refer to drawings for details.

PART 3 - EXECUTION

- 3.1 Coordination
- .1 Examine all Contract Drawings to verify space and headroom limitations for the required work. Coordinate the work with all trades and modify without changing the design intent to facilitate a satisfactory installation. Make no changes to the design intent involving extra cost to the Departmental Representative”, without the Departmental Representative's prior written approval.
 - .2 The drawings indicate the general location and route to be followed by the piping and ductwork. Where details are not shown on the drawings or are only shown diagrammatically, the pipes and ductwork shall be installed in such a way as to conserve headroom and interfere as little as possible with the free use of space through which they pass. Service lines shall run parallel to building lines. All ducts and pipes in the ceiling shall be kept as tight as possible to beams or other limiting members at high level. All pipes and ducts shall be coordinated in elevation to ensure that they are concealed unless indicated otherwise.
 - .3 Work out jointly all interference problems on the site and coordinate all work before fabricating or installing any material or equipment. No consideration of payment will be made for additional work due to fabricating or installing materials before a coordination issue was identified and resolved. Where necessary produce interference drawings showing exact locations of mechanical equipment within service areas, shafts and the ceiling space. Ensure that all materials and equipment fit into the allotted spaces and that all equipment can be properly serviced and replaced, if and when required. Advise the Departmental Representative of space problems before fabricating or installing any

material or equipment. Demonstrate to the Departmental Representative on completion of the work that all equipment installed can be properly, safely serviced and replaced, if and when required.

3.2 Concealment

- .1 Conceal all tubing, piping, ductwork and conduit in partitions, walls, crawlspaces, and ceiling spaces, unless otherwise noted.
- .2 Do not install tubing, piping and conduit in outside walls or roof construction unless specifically directed, in which case, make provision to ensure that the building insulation is between them and the outside face of the building.

3.3 Protection of Work

- .1 Protect equipment and materials, stored or installed, from the weather, moisture, dust and physical damage.
- .2 Mask machined surfaces. Secure temporary covers over equipment openings and open ends of piping, ductwork and conduits, as required to keep them clean.
- .3 Rusting, pitting or physical damage will be cause for rejecting equipment.
- .4 Make good damaged or marred factory finish.
- .5 Air systems must have air filters installed before fans are operated. Air filters must be clean at Substantial Completion.

3.4 Equipment Installation

- .1 Provide unions and flanges to permit equipment maintenance, disassembly or removal, to minimize disturbance to piping and duct systems and to avoid interfering with building structure or other equipment.
- .2 Provide means of access for servicing equipment including permanently lubricated bearings.
- .3 Pipe equipment drains to floor drains.
- .4 Align equipment, rectangular cleanouts and similar items with building lines wherever possible.
- .5 Ensure that equipment does not transmit noise or vibration to other parts of the building as a result of poor installation practices.

3.5 Cutting, Patching And Coring

- .1 Lay out all cutting, patching and coring required to accommodate the

mechanical services. Coordinate with other Divisions. The performance of actual cutting, patching, digging, canning and coring is specified under other Divisions. Be responsible for correct location and sizing of all openings required under the mechanical work, including pipe sleeves and duct openings. Allow oversized openings for fire dampers and for pipe penetrations where continuous insulation is specified.

- .2 Verify the location of existing service runs and structural components within existing concrete floors and walls prior to core drilling and/or cutting. The Contractor is responsible to repair existing services and structural components damaged as a result of core drilling and cutting.
- .3 Openings through structural members of the building shall not be made without the approval of the Departmental Representative.

3.6 Firestop Materials

- .1 Firestopping and Smoke Seal Systems: Install assembly capable of maintaining an effective barrier against flame, smoke and gases in compliance with requirements of ULC CAN4-S115-M85, or ULI 1479 and ASTM 814, and not to exceed opening sizes for which they are intended.
- .2 Fire resistance rating of installed firestopping assembly shall be not less than the fire resistance rating of surrounding floor and wall assembly.

3.7 Service Penetrations In Rated Fire Separations

- .1 All piping, tubing, ducts, wiring, conduits, etc. passing through rated fire separations shall be smoke and fire proofed with ULC approved materials in accordance with CAN4-S115 and ASTM E814 standards and which meet the requirements of the Building Code in effect. This includes new and existing services passing through existing rated separations and new and existing services passing through new rated separations or existing separations whose rating is being upgraded.
- .2 Fire resistance rating of installed firestopping assemblies shall not be less than fire resistance rating of the surrounding assembly.
- .3 All smoke and fire stopping shall be installed by a qualified Contractor who shall submit a letter certifying that all work is complete and in accordance with this specification.
- .4 Install fire stopping and smoke seal material and components in accordance with ULC certification and manufacturer's instructions in formed, sleeved or cored penetrations.

- .5 Submit shop drawings for each type of pipe and separation type combination showing the approved materials and installation data

3.8 Service Penetrations
Of Non-Rated Separations

- .1 All piping, tubing, ducts, wiring, conduits, etc. passing through non-rated fire separations and non-rated walls and floors shall be tightly fitted and sealed on both sides of the separation with silicon sealant to resist the passage of smoke and/or transmission of sound.

3.9 Duct and Pipe
Mounted Control
Equipment

- .1 The following automatic control equipment will be supplied by the controls trade but installed by the appropriate trade sections of mechanical work:
 - .1 Automatic control dampers.

3.10 Start-Up

- .1 Before starting the plant, provide confirmation in writing to the Departmental Representative that the plant is ready for start-up and the following conditions have been met. These include:
 - .1 All safety controls are installed and fully operational.
 - .2 Permanent electrical connections have been made to all equipment.

3.11 Cleaning and
Final Adjustment

- .1 Clean mechanical systems daily.
- .2 Balance and adjust all systems and each piece of equipment to operate efficiently.

3.12 Painting Repairs
And Restoration

- .1 Apply a coat of rust inhibiting primer to all exposed, bare steel provided under the mechanical work. Clean and prepare the surfaces first in accordance with the paint manufacturer's recommendations.
- .2 Apply the primer before or immediately after installation where the steel will be exposed to moisture.
- .3 Make good any damage to factory finishes on equipment supplied under the mechanical work.
- .4 Any finish painting of the equipment and materials provided under the mechanical work is by Painting Division (except where specifically

indicated otherwise). Coordinate with Painting Division including identifying the various mechanical services for painting.

- .5 Colours for equipment and materials in finished areas and outdoors shall be as directed by the Architect.

3.13 Demonstration and Instruction to Departmental Representative”

- .1 Provide certified personnel to demonstrate plant operation and to instruct operating staff on operation of mechanical equipment. Provide maintenance specialist personnel to instruct operating staff on maintenance and adjustment of mechanical equipment and any changes or modification in equipment made under terms of guarantee.
- .2 The demonstration shall include:
 - .1 Operation and sequencing of all automatic control dampers.
 - .2 Operation and maintenance requirements of all equipment and systems under each mode of operation including:
 - .1 Air conditioning units.
- .3 Provide instruction during regular work hours prior to acceptance and turnover to operating staff for regular operation.
- .4 Use Operating and Maintenance manuals for instruction purposes.
- .5 Submit the proposed instructional agenda for approval.
- .6 Finalize demonstration and instructions by obtaining a signed statement from the Departmental Representative” that the demonstration and instructions have been given satisfactorily.

END OF SECTION

PART 1 - GENERAL

- 1.1 Summary
- .1 TAB is used throughout this Section to describe the process, methods and requirements of testing, adjusting and balancing for HVAC.
 - .2 TAB means to test, adjust and balance to perform in accordance with requirements of Contract Documents and to do other work as specified in this section
- 1.2 Related Sections
- .1 This Section of the Specification forms part of the Contract Documents and is to be read, interpreted and coordinated with all other parts.
- 1.3 Qualifications of Tab Personnel
- .1 Submit names of personnel to perform TAB to the Departmental Representative within 90 days after award of the Contract.
 - .2 Provide documentation confirming qualifications, successful experience.
- 1.4 Purpose of Tab
- .1 Test to verify proper and safe operation, determine actual point of performance, evaluate qualitative and quantitative performance of equipment, systems and controls at design, average and low loads using actual or simulated loads.
 - .2 Adjust and regulate equipment and systems to meet specified performance requirements and to achieve specified interaction with other related systems under normal and emergency loads and operating conditions.
 - .3 Balance systems and equipment to regulate flow rates to match load requirements over full operating ranges.
- 1.5 Exceptions
- .1 TAB of systems and equipment regulated by Codes, Standards to satisfaction of Authority Having Jurisdiction.
- 1.6 Tests
- .1 Scope of Tests:
 - .1 The pressure testing of piping systems shall be the responsibility of the installing trade. The tests are specified under the appropriate specification section.
 - .2 The pressure/leakage testing of air handling systems shall be the responsibility of the installing trade. The tests are specified under the appropriate specification section.

- .3 The testing of fire dampers shall be the responsibility of the Balancing Agency responsible for balancing. The tests are specified in this section of the specification.
- .4 The performance testing of equipment shall be the responsibility of the supplying trade. For certain larger, or complex or specialized equipment the start-up and/or testing shall be performed by a manufacturer's qualified representative. The tests are specified under the appropriate specification section
- .2 General Requirements:
 - .1 Give written minimum 48 hour notice of date for tests to Departmental Representative and to any Authorities Having Jurisdiction.
 - .2 Do not externally insulate or conceal work until tested and reviewed.
 - .3 Make good and retest as required until test is successful.
 - .4 Prior to tests, isolate all equipment or other parts which are not designed to withstand test pressures.
 - .5 Tests shall be to applicable codes, to the requirements of Authorities Having Jurisdiction and in accordance with recognized industry standards.
 - .6 Obtain and provide certificates of approval where applicable from Authorities Having Jurisdiction.

1.7 Balancing - Air Systems

- .1 Adjust duct and terminal balance dampers, adjustable air turning devices and adjust or change drive sheaves to balance supply, return and exhaust air systems to provide the design air quantities (within +10%/-5%) at each outlet and inlet and to maintain the design relationship between the supply, return and exhaust air system quantities.
- .2 Adjust air terminals to optimize the air distribution pattern while minimizing drafts and noise.
- .3 Permanently mark the final balance position on all balance dampers and adjustable air turning devices.
- .4 Submit a report to the Departmental Representative indicating final fan speed, motor operating amperages, system static pressure, filter static pressure and final air quantities obtained.
- .5 Pre-load filters using blanket material to midway between clean and dirty static pressure drop at system balance.

1.8 Commissioning
And Demonstration

- .1 Be responsible for the performance and commissioning of all equipment supplied under the HVAC Sections of Mechanical Division. Commissioning is the process of advancing the installation from the stage of static completion to full working order in accordance with the Contract Documents and design intent. It is the activation of the completed installation.
- .2 The commissioning shall be executed in accordance with the intent of ASHRAE Standard 1 "Guideline for Commissioning of HVAC Systems" and comply with CSA Z320-11 requirements, which ever is the most stringent.
- .3 In consultation with the General Contractor, ensure that sufficient time is allowed and fully identified on the construction schedule for the proper commissioning of all mechanical systems.
- .4 Submit a schedule for the commissioning phase of the work. This schedule shall show:
 - .1 Equipment start-up schedule.
 - .2 Submission dates for the various documents required prior to substantial completion.
 - .3 Timing of the various phases of the commissioning, testing, balancing and demonstration process.
- .5 Commissioning is concluded when air systems have been balanced and the installation is in full working order and acceptable for use. The work will include the following:
 - .1 Balancing of the air systems as specified in this section.
 - .2 Set up air diffusers, registers and grilles for optimum distribution/comfort.
 - .3 Set up constant fans.
 - .4 Adjust vibration isolators and earthquake restraints for optimum performance.
 - .5 Verification and certification of the sealing of all HVAC penetrations through fire separations (rated & non-rated) and sound separations.
 - .6 Verification that all coil drain pans operate.
 - .7 Set up all automatic control dampers and automatic temperature control devices.
 - .8 Set up and test all alarm and protective devices.
- .6 At the conclusion of commissioning, demonstrate the operation of the systems to the Departmental Representative and then to the Departmental Representative's Operating Staff.

- .7 The verification process shall include the demonstration of the following:
 - .1 The ease of access that has been provided throughout for motors, drives, fusible link fire dampers, control dampers and damper operators.
 - .2 Location of and opening and closing of all access panels.
 - .3 Operation of all automatic control dampers and automatic temperature control devices.
 - .4 Operation of all alarm and protective devices.
 - .5 Operability of randomly selected fire dampers.
 - .6 Noise level from typical mixing boxes and air valves under extreme operating conditions.
 - .7 Operation of all equipment and systems under each mode of operating, and failure, including:
 - .1 Air conditioning units.
 - .2 Condensing units
 - .8 At the completion of the commissioning, testing, balancing and demonstration submit the following to the Departmental Representative:
 - .1 A letter certifying that all work specified under this Contract is complete, clean and operational in accordance with the specification and drawings.
 - .2 Completed copies of all commissioning check lists plus copies of start-up reports from specialty contractors and vendors.
 - .3 Record Drawings, as specified.
 - .4 A list of all alarm and protective devices tested, with the final operating settings

PART 2 - PRODUCTS

- .1 Not Applicable.

PART 3 - EXECUTION

- .1 Not Applicable.

END OF SECTION

PART 1 - GENERAL

- 1.1 Summary .1 Section includes materials, requirements and installation for thermal insulation for ductwork and accessories in a commercial type application.
- 1.2 Related Sections .1 This Section of the Specification forms part of the Contract Documents and is to be read, interpreted and coordinated with all other parts.
- 1.3 Submittals .1 Shop Drawings:
.1 Submit shop drawings for insulation and accessories.
.2 Closeout Submittals:
.1 Provide maintenance data for incorporation into Operation and Maintenance manual.
- 1.4 Definitions .1 "CONCEALED" describes insulated mechanical services above suspended ceilings, in trenches, chases, furred spaces and shafts.
.2 "EXPOSED" - will mean not concealed.
- 1.5 Quality Assurance .1 Installer: Journeyman insulation applicators, skilled in this trade, shall perform the work.
.2 The latest edition of the "BC Insulation Contractors Association (BCICA) Quality Standards Manual", shall apply except where exceeded in this specification.
- 1.6 Asbestos .1 All material/products provided shall be free of asbestos.
.2 If existing asbestos is discovered which will be affected by the work of the Contract, immediately notify the Engineer.
.3 All work related to existing asbestos shall be handled and/or removed in accordance with the requirements of Ministry of Environment, WorkSafeBC (Workers' Compensation Board of British Columbia) and any other Authorities Having Jurisdiction.
.4 All work performed on systems with asbestos containing material must be reported in advance to WorkSafeBC.

PART 2 - PRODUCTS

2.1 Fire and Smoke Rating

- .1 In accordance with BC Building Code, NFPA 90A and CAN/ULC-S102.
 - .1 Maximum flame spread rating: 25.
 - .2 Maximum smoke developed rating: 50.

2.2 Insulation

- .1 External Insulation - Flexible:
 - .1 Maximum thermal conductivity per 25 mm [1"]: 0.040 W/m-°C at 24°C [0.27 Btu-in/(hr-ft2-°F) at 75°F].
- .2 External Insulation - Rigid:
 - .1 Maximum thermal conductivity per 25 mm [1"]: 0.033 W/m-°C at 24°C [0.23 Btu-in/(hr-ft2-°F) at 75°F].

2.3 Accessories

- .1 Insulation Adhesive.
- .2 Vapour Barrier Tape: foil self-adhesive tape.
- .3 Vapour Barrier Adhesive
- .4 Insulation Finish Coating.
- .5 Weather Coating - vapour barrier.
- .6 Reinforcing Membrane: Glass fibre-reinforcing membrane.
- .7 Fabric Adhesive.
- .8 Aluminum Jacket for exterior installation.

2.4 Jackets

- .1 Aluminum:
 - .1 To ASTM B209.
 - .2 Thickness: 22 ga.
 - .3 Finish: Corrugated or smooth.
 - .4 Joining: longitudinal and circumferential slip joints with 50 mm [2"] laps.
 - .5 Fittings: die-shaped fitting covers with factory-attached protective liner.
 - .6 Metal jacket banding and mechanical seals: stainless steel, 20 mm [3/4"] wide, 0.5 mm thick at 300 mm [12"] spacing.

2.5 Scope of Insulation

.1 Scope 1: External Insulation – Flexible.

		Thickness	
		mm	[ins]
.1	All cooling and heating supply ducts; where the temperature difference between the space within which the duct is located and the design air temperature in the duct, is less than or equal to 22.2°C [40°F].	40	[1.5]
.2	All cooling and heating supply ducts; where the temperature difference between the space within which the duct is located and the design air temperature in the duct, is greater than 22.2°C [40°F].	50	[2]

Note: If ductwork is exposed use external rigid insulation.

.2 Scope 2: External Insulation - Rigid.

		Thickness	
		mm	[ins]
.1	Refer to External Insulation, Flexible - if insulation is exposed use external rigid insulation of the thickness indicated.		

PART 3 - EXECUTION

3.1 Pre-Installation Requirements

- .1 Apply external insulation to ductwork after successful pressure tests have been made.
2. Apply insulation and accessories so that the finished product is smooth and neat and with longitudinal seams concealed from view.
3. Apply insulation, accessories and finishes in accordance with the manufacturer's recommendations.
- .4 Insulation and vapour barrier shall be continuous through all non-rated separations.

.5 Surfaces clean, dry, free from foreign material.

3.2 Installation

.1 Do not externally insulate any ductwork that is specified to be internally insulated (unless noted otherwise).

.2 Application of External Insulation – Flexible

- .1 Adhere insulation with insulation adhesive applied in 150 mm [6"] wide strips on 300 mm [12"] centres.
- .2 On rectangular ductwork and plenums, over 610 mm [24"] in width, spot weld pins 6 mm [1/4"] longer than the insulation thickness, one per 0.1 sq. m [1.0 sq ft] minimum. Impale the insulation over the pins, and hold in place using metal or nylon clips (washers). Alternatively, use welded pins with integral head washers welded in place through the insulation.
- .3 Adhere foil faced vapour barrier tape over all butt joints, raw edges, holding washers and other points of penetration of the vapour barrier jacket on all exposed hot and cold ducts and concealed cold ducts.

3.3 Ductwork Insulation

Finishes

.1 "Concealed" insulation will require no further finish except in damp locations where it shall have a vapour barrier continuously sealed.

.2 "Exposed" insulation inside the building shall be finished as follows:

.1 Where insulation is external provide rigid insulation.

.3 "Exposed" insulation inside the building shall be finished as follows:

.1 Apply two coats of white insulation coating.

.4 "Exposed" outdoor insulation - aluminum jacket.

.1 Provide a total enclosure with aluminum jacket.

.2 The jacket shall be totally vapour and water sealed and seams located to shed water.

.3 Install with accessories and procedures as recommended by the manufacturer.

END OF SECTION

PART 1 - GENERAL

- 1.1 Summary .1 Section includes materials, requirements and installation of low-pressure metallic ductwork, joints and accessories where working static pressure does not exceed 500 Pa [2" w.g.].
- 1.2 Related Sections .1 This Section of the Specification forms part of the Contract Documents and is to be read, interpreted and coordinated with all other parts.
- 1.3 Submittals .1 Closeout Submittals:
.1 Provide maintenance data for incorporation into Operation and Maintenance manual.

PART 2 - PRODUCTS

- 2.1 Ducts - Galvanized Steel
- .1 All ductwork shall be constructed and sealed to withstand without damage or permanent deformation at least 150% of the working static pressure.
- .2 Construct rectangular ducts in accordance with Section I of the SMACNA Duct Standards. Of the tables and figures, use only Tables 1-5, 1-10, 1-11, 1-12, 1-13 and Figs. 1-4 through 1-18.
- .3 Construct round ducts in accordance with Section III of the SMACNA Duct Standards. Of the tables and figures, use only Table 3-2 and Figs. 3-1 and 3-2, but excluding beaded crimp joints and snaplock seams.
- .4 Construct flat oval ducts in accordance with Section III of the SMACNA Duct Standards. Of the tables and figures, use only Table 3-4 and Fig. 3-6. Joints and seams shall be similar to those indicated for round ducts. Flat oval duct to be used for positive pressure application only.
- .5 500 Pa [2" w.g.] working static pressure on:
.1 All exhaust air ductwork, except where otherwise specified.
.2 All outdoor air ductwork, except as otherwise specified.
- 2.2 Fittings
- .1 Construct rectangular duct fittings in accordance with Section II of the SMACNA Duct Standards. Of the figures, use only Figs. 2-1 to 2-11 and Figs. 2-16 to 2-18.
- .2 Construct round and flat oval duct fittings in accordance with Section III of the SMACNA Duct Standards. Of the figures and tables, use only Table 3-1 and Figs. 3-3 through 3-6.

- .3 Sheet metal gauge of fittings and elbows shall be not less than the thickness of that specified for longitudinal seam straight duct of the equivalent size.
- .4 Square throated - radius heel elbows shall not to be used.
- .5 Adjustable elbows are not permitted.
- .6 Radiused elbows:
 - .1 Rectangular: Centreline radius of a rectangular duct elbow at least equal to 1.5 times the duct width, measured in the direction of the radius. If it is not possible to install a full radius elbow, use a square elbow with multi-blade turning vanes.
 - .2 Round: Centreline radius of 1.0 times duct diameter.
- .7 Mitred elbows, rectangular: Construct with single wall turning vanes.
- .8 Branches:
 - .1 Rectangular main and branch: 45 degrees entry on branch.
 - .2 Round main and branch: enter main duct at 45 degrees with conical connection.
 - .3 Provide volume control damper in branch duct near connection to main duct.
 - .4 Main duct branches: with splitter damper.
- .9 Transitions: In accordance with Fig. 2-9 of the SMACNA Duct Standards:
 - .1 Maximum taper of diverging transitions shall be 20°.
 - .2 Maximum taper of converging transitions shall be 30°.
 - .3 Maximum divergence upstream of equipment shall be 30°.
 - .4 Maximum convergence downstream of equipment shall be 45°.
 - .5 Maximum divergence of evase from centrifugal fan scroll outlet shall be 7°.
- .10 Offsets: Full radiused elbows.

2.3 Firestopping

- .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.

2.4 Hangers and Supports

- .1 Support ductwork to SMACNA using:
 - .1 Galvanized steel straps.
 - .2 Cadmium plated threaded rods.
 - .3 Flat bar or angle hangers.
- .2 Attachments to the structure shall be compatible with the structure and selected for the load of the ductwork.

- .3 Install ductwork hangers in accordance with Section IV of the SMACNA Duct Standards. Of the tables and figures, use only Tables 4-1 through 4-3 and Figs. 4-1 through 4-9.
- .4 Support duct risers at their base and at each floor and at not greater than 3.7 m [12 ft] intervals.

2.5 Wire Mesh Screens

- .1 Provide wire mesh screens in all air intake openings where noted on the drawings.
- .2 Screens shall be constructed from 16 ga aluminum wire.
- .3 Screen mesh shall be 12 mm [1/2"] grid.
- .4 Mount screens in 20 ga folded aluminum frames.

2.6 Sealant

- .1 SMACNA Seal Classification B for ductwork 500 Pa [2" w.g.] and under working static pressure.
- .2 Class B: longitudinal seams, transverse joints and connections made airtight with sealant.
- .3 Oil resistant, water borne, polymer type flame resistant duct sealant. Temperature range of -30°C to 93°C

PART 3 - EXECUTION

3.1 General

- .1 The project drawings are diagrammatic. Effort has been made to indicate offsets and transitions, but not all are necessarily shown. Changes may be required to ductwork to avoid interference with structure and other services. Determine all required adjustments prior to fabrication and provided the adjustments without additional cost to the Contract.
- .2 Working static pressure means the maximum pressure that could be created by the equipment when operating at the speed required to achieve the specified performance, by the closure (including closure due to failure) of any specified devices in the ductwork.
- .3 Ductwork means ducts and plenums.
- .4 Where a duct is to be internally insulated, size the duct so as to provide the free area duct dimensions shown on the drawings.

- .5 Plenum sizes are the sheet metal plenum dimension.
- .6 Where ducts penetrate roofs, install sleeves and roof curb c/w flashing and counterflashing. Pack sleeves in roof with fibreglass insulation and provide sheet metal below to hold it in place.
- .7 Flash and counterflash ducts through roofs and exterior walls.
- .8 Arrange openings for ductwork through floors and walls to accommodate insulation, packing, sleeves, and fire dampers as appropriate.
- .9 Arrange for 100 mm [4"] high watertight curbs around all ductwork penetrations of floor slabs except inside duct shafts.
- .10 During construction, protect ductwork openings from the entry of dirt, dust and debris with suitable covers.
- .11 Install proprietary manufactured flanged duct joints in accordance with manufacturer's instructions.
- .12 Where ductwork is required to pass through open web steel joists, coordinate with the joist fabricator before fabricating ductwork.

3.2 Ductwork Installation

- .1 Square throated - radius heel elbows shall not to be used.
- .2 Where a duct contains a fire or smoke damper, construct the duct so that the free area of the duct is maintained through the fire or smoke damper unless otherwise indicated.
- .3 Install tie rods to limit the maximum unsupported vane length to 914 mm [36"]. Refer to Fig. 2-4 of the SMACNA Duct Standards.
- .4 Cross-break or bead all metal ductwork panels unless otherwise noted.
- .5 Arrange ductwork so that equipment can be easily serviced and removed.
- .6 Ductwork passing through non-rated fire separations, sound insulated walls and through walls and floors which are not fire separations shall be tightly fitted and sealed on both sides of the separation with silicon sealant to prevent passage of smoke and/or transmission of sound (ULC approved fire stop sealant is not a requirement). Where ducts are externally insulated provide a 24 ga thick galvanized steel band tightly fitted around the insulation and then caulk from band to wall or floor.
- .7 Install breakaway joints in ductwork on sides of fire separation.
- .8 To avoid a conflict with structure or other services a duct may be reduced up to 10% in cross-sectional area for up to 2 meters [6'-8"] in length. Also, to assist installation any duct may be changed in dimension by up to

50 mm [2"] with a corresponding change in the other dimension to maintain the cross-sectional area. Notify the Departmental Representative of the change. Any other changes in duct dimensions must first be reviewed and accepted by the Departmental Representative.

3.3 Sealing

- .1 Apply sealant to outside of joint to manufacturer's recommendations.
- .2 Where accessible, apply sealer to inside of joints on ductwork under positive pressure.
- .3 Apply sealer to outside of joints on ductwork under negative pressure.
- .4 Duct tape is not a permitted sealing method

3.4 Ductwork Cleaning

- .1 It is the intent that the ductwork system shall be clean. No dirt, debris or dust shall be evident in a visual examination.
- .2 Protect ductwork from fabrication to the completion of the project to keep it clean. Any dust, dirt or debris in the systems shall be removed.
- .3 If in the opinion of the Departmental Representative the systems are not clean, provide cleaning as required including, if necessary, retaining a Cleaning Agency to do the work.
- .4 Cleaning shall be to the satisfaction of the Departmental Representative.
- .5 Submit a letter signed by a principal of the ductwork installing company certifying that all ductwork systems are clean.

END OF SECTION

PART 1 - GENERAL

- 1.1 Summary .1 Section includes materials, requirements and installation for balancing dampers for mechanical forced air ventilation and air conditioning systems.
- 1.2 Related Sections .1 This Section of the Specification forms part of the Contract Documents and is to be read, interpreted and coordinated with all other parts.
- 1.3 Submittals .1 Closeout Submittals:
.1 Provide maintenance data for incorporation into Operation and Maintenance manual.

PART 2 - PRODUCTS

- 2.1 General .1 Manufacture to SMACNA standards.
- 2.2 Single Blade Dampers .1 Fabricate from same material as duct but one sheet metal thickness heavier 16 ga, with V-groove stiffened.
.2 Size and configuration to recommendations of SMACNA, except maximum height 300 mm [12"] on rectangular ducts.
.3 Locking quadrant with shaft extension to accommodate insulation thickness.
.4 Inside and outside end bearings. Nylon on dampers up to 300 mm [12"] high, oilite bronze on dampers over 300 mm [12"] high or diameter.
.5 Channel frame of same material as adjacent duct, complete with angle stop.
- 2.3 Multi-Bladed Dampers .1 Factory manufactured of material same as duct, 16 ga.
.2 Opposed blade configuration. Metal thickness and construction to recommendations of SMACNA.
.3 Maximum blade height: 200 mm [8"].
.4 Bearings: bronze oilite bushings.
.5 Linkage: shaft extension with locking quadrant.

- .6 Channel frame of same material as adjacent duct, complete with angle stop.

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 where indicated and where required by the Balancing Agent for balancing.
- .2 Install in accordance with recommendations of SMACNA and in accordance with manufacturer's instructions.
- .3 Runouts to registers and diffusers: install as far as possible from registers and diffusers.
- .4 All dampers shall be vibration free and have no free play when set.
- .5 The lever of quadrant operators shall be parallel with the blades.
- .6 Provide sheet metal bridge for operators on round ducts over 300 mm [12"] diameter and to raise operator above insulation on insulated ducts.
- .7 Ensure damper operators are observable and accessible.

END OF SECTION

PART 1 - GENERAL

- 1.1 Summary .1 Section includes materials, requirements and installation for acoustic duct lining.
- 1.2 Related Sections .1 This Section of the Specification forms part of the Contract Documents and is to be read, interpreted and coordinated with all other parts.
- 1.3 Submittals .1 Shop Drawings:
.1 Submit shop drawings for acoustic duct lining.
.2 Closeout Submittals
.1 Provide maintenance data for incorporation into Operation and Maintenance manual.

PART 2 - PRODUCTS

- 2.1 Fire and Smoke Rating .1 In accordance with BC Building Code, NFPA 90A and CAN/ULC-S102.
.1 Maximum flame spread rating: 25.
.2 Maximum smoke developed rating: 50.
- 2.2 Duct Liner - Flexible .1 Minimum Noise Reduction Criteria (NRC): 0.70 at 25 mm [1"] thickness based on Type A mounting to ASTM C423.
.2 Maximum thermal conductivity per 25 mm [1"]: 0.040 W/m-°C at 24°C [0.28 Btu-in/(hr-ft2-°F) at [75]°F].
- 2.3 Duct Liner - Rigid .1 Minimum Noise Reduction Criteria (NRC): 0.70 at 25 mm [1"] thickness based on Type A mounting to ASTM C423.
.2 Maximum thermal conductivity per 25 mm [1"]: 0.040 W/m-°C at 24°C [0.28 Btu-in/(hr-ft2-°F) at [75]°F].
- 2.4 Accessories .1 Insulation Adhesive: Water-based fire retardant type.
.2 Insulation Sealer.
.3 Fasteners: Weld pins, length to suit thickness of insulation. Polymer, nylon or metal retaining clips.
.4 Reinforcing Membrane: Glass fibre-reinforcing membrane.

2.5 Scope of Insulation

- .1 Scope 1: Internal Duct Liner – Flexible.

	Thickness	
	mm	[ins]
.1 All ductwork where indicated by single hatching.	25	[1]
.2 All ductwork where noted on the drawings.	refer to drawings	

PART 3 - EXECUTION

3.1 General

- .1 Where a duct is to be internally insulated, size the duct so as to provide the free area duct dimensions shown on the drawings.

3.2 Application of Internal Duct Liner - Flexible

- .1 Adhere insulation with insulation adhesive applied to the entire metal surface, with the coating side of insulation exposed to the air stream.
- .2 Ducts 610 mm [24"] in width and less require no further adhesion.
- .3 Seal all transverse joints, raw edges, and other points of penetration of the coating with reinforcing membrane and insulation coating/sealer.
- .4 Seal all longitudinal joints with insulation coating sealer.
- .5 No raw edges of internal insulation material shall be exposed to the moving air stream.
- .6 Duct size shown is dimension inside the insulation. Metal duct sizes shall be increased to allow for the internal acoustic insulation thickness.
- .7 Adhere UL Class I material film over the internal surface of all acoustic insulation. Overlap all edges and seal all joints with insulation adhesive/coating/sealer.

3.3 Application of Internal Duct Liner – Rigid

- .1 Adhere the internal rigid duct liner in the same manner as specified for internal flexible duct liner.
- .2 Adhere UL Class #1 Material film over the internal surface of all acoustic insulation. Overlap all edges and seal all joints with insulation adhesive/coating/sealer.

- .3 Cover plenum wall insulation with galvanized perforated metal sheet having over 50% open area. Protective metal shall be held in place by securing it to the projecting pins with washers.
- .4 All sheet metal and perforated sheet metal is under Section 23 3113.01 - Metal Ducts - Low Pressure to 500 Pa.

3.4 Insulation
Termination

- .1 Terminate insulation short of all control, smoke and fire dampers so as not to interfere with their operation.
- .2 Terminate insulation 900 mm [36"] short of duct mounted electric heating coils.
- .3 Seal butt joints, exposed edges, weld pin and clip penetrations and damaged areas of liner with sealer.
- .4 Replace damaged areas of liner at discretion of the Departmental Representative.
- .5 Protect leading and trailing edges of duct sections with sheet metal nosing having 15 mm overlap and fastened to duct.

END OF SECTION

PART 1 - GENERAL

- 1.1 Summary .1 Section includes materials, requirements and installation for supply, return and exhaust grilles and registers, diffusers and linear grilles, for commercial and residential use.
- 1.2 Related Sections .1 This Section of the Specification forms part of the Contract Documents and is to be read, interpreted and coordinated with all other parts.
- 1.3 Submittals .1 Shop Drawings:
.1 Submit shop drawings for diffusers, registers and grilles.
.2 Indicate, at minimum, following:
.1 Throw and terminal velocity.
.2 Noise criteria.
.3 Pressure drop.
.4 Neck velocity.
.3 Closeout Submittals
.1 Provide maintenance data for incorporation into Operation and Maintenance manual.
- 1.4 Performance Requirements .1 Catalogued or published ratings shall be those obtained from tests carried out by the manufacturer or those ordered by him from an independent testing agency signifying adherence to codes and standards.

PART 2 - PRODUCTS

- 2.1 Manufactured Units .1 Grilles, registers and diffusers of same generic type shall be the product of one manufacturer.
- 2.2 General .1 Acceptable Products for grilles, registers and diffusers shall meet capacity, pressure drop, terminal velocity, throw, noise level and neck velocity as indicated on equipment schedules on mechanical drawing coversheet.
.2 Frames:
.1 Full perimeter gaskets.
.2 Plaster frames where set into plaster or gypsum board.
.3 Concealed fasteners.
.3 Concealed manual volume control damper operators where scheduled.

- .4 Coordinate with ceiling type and grid size.
- .5 Means of attachment for two seismic restraint wires unless screwed to sheet metal duct.
- .6 Refer to Air Terminal schedules for terminal details and to drawings for sizes, air quantities and location.

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 Air Terminal Installation

- .1 Install in accordance with manufacturer's instructions.
- .2 Install with oval head, cadmium plated screws in countersunk holes where fastenings are visible.
- .3 Bolt grilles, registers and diffusers, in place, in gymnasium and similar game rooms.
- .4 Paint ductwork matte black behind terminals where internal surfaces are visible.
- .5 Install ductwork as high as practical using offsets if necessary to obtain a duct neck length of minimum two diameters.
- .6 Confer with the Departmental Representative in advance of ductwork construction where there are conflicts with light locations or where locations on mechanical drawings differ from the Architectural reflected ceiling plans.

END OF SECTION

PART 1 - GENERAL

- 1.1 Summary .1 Section includes at minimum detailed narrative description of Sequence of Operation for the Building Energy Monitoring and Control System (EMCS).
- 1.2 General .1 The existing controls system is manufactured by Delta Controls and provided by Island Temperature Controls or ESC Automation using competent personnel directly and regularly employed by that company.
- .2 Update the direct digital control system complete with all necessary components and connections to achieve the specified functions and to permit the HVAC systems to perform properly in the manner described and as hereinafter specified.
- .3 Set up, adjust, test and commission the control system to achieve optimum operation of the HVAC system. This includes sequencing, timing and readjustment, as required. These modifications shall continue through the construction period, commissioning period and warranty period as required to achieve optimum operation of the mechanical system.
- .4 This section is a performance specification clarified in certain sections to establish minimum standard of equipment, installation or level of control. The specification describes the basic functions required but not all of the installation details or components. The controls contractor is expected to have sufficient experience to be able to design and estimate the cost of an appropriate control system. Materials and work necessary to achieve a satisfactory result will not be considered extra to the contract.
- 1.3 Electrical Components, Wiring and Conduit .1 By Control Contractor:
- .1 All control system components to make a complete and operable system, except those supplied as part of packaged equipment controls, but including all auto-sequencing devices and electrical interlocks required to accomplish the sequences specified hereafter. Refer to the electrical equipment schedule, the electrical drawings and the electrical specification division serving mechanical systems. Materials, equipment, connections and power not provided by the electrical division 26 but required for the control system shall be provided under this section.
- .2 All control circuit transformers (120/1/60 or 24/1/60 and as designated).

- .3 All control wiring and metallic conduit for mechanical system controls.
- .4 Supply, installation and connection of all electric control items.
- .5 All wiring and conduit from power distribution system to any control devices needing power.
- .6 Coordinate with the electrical contractor.
- .7 Electrical work installed under this section shall be to the standards specified under division 26.
- .8 Obtain electrical permit.
- .2 Carrier system:
 - .1 All wiring in mechanical service spaces, where exposed to view and all 120 volt wiring shall be run in emt conduit except the final 900mm [36"] of wiring to all operators and to all sensors subject to vibration shall be run in flexible metallic conduit.
 - .2 Run wiring not installed in conduit parallel to building lines and support every one meter independent of piping, ductwork, and equipment.
 - .3 Provide steel fittings with nylon throats for all conduit connections.
 - .4 Identify each wire and cable at every termination point. Identify conduit with colour bands at no more than 7.5m [25'] intervals and on both sides of walls and floor.

1.4 Equipment Supplied For Installation Under Other

Sections

- .1 Hand over control valves, sensor wells and automatic control dampers to the appropriate trade sections for installation.
- .2 The controls contractor shall be responsible for arranging, coordinating and supervising the installation of the above devices in a suitable manner and readily accessible location.

1.5 Graphics, Calibration And Demonstration

- .1 Set up and calibrate all sensors during the initial start-up of the systems and check, recalibrate and readjust and debug operation as necessary.
- .2 Update the existing system graphics to incorporate the controls additions and modifications.
- .3 Demonstrate the controls system to the satisfaction of the consultant and the owner.

1.6 Related Sections .1 This Section of the Specification forms part of the Contract Documents and is to be read, interpreted and coordinated with all other parts.

1.7 Submittals .1 Shop Drawings:
.1 Submit with the shop drawings a written description indicating Sequence of Operation.

PART 2 - PRODUCTS

2.1 Not Used .1 Not Used.

PART 3 - EXECUTION

3.1 Occupancy Schedule .1 Provide a schedule to define OCCUPIED and UNOCCUPIED periods for each system and set up the specified related controls.

3.2 Definitions .1 For the purposes of the following controls Warm Weather shall be when the Outdoor Temperature at 5:00pm for the three previous days averages 20°C [68°F] or more.
.2 Percentage of fan speed shall be referenced to the fan speed that provides 100% of design airflow.
.3 “Free cooling” refers to the cooling provided by the use of outdoor air.

3.3 Miscellaneous Systems .1 Outdoor Air:
.1 Provide an outdoor air temperature sensor and monitor it. Locate it immediately inside the outdoor air louvre on AHU-1.
.2 Provide an outdoor air carbon dioxide sensor and monitor it. Locate it immediately inside the outdoor air louvre on AHU-1.

3.4 Marine Communication And Traffic Services Room Temperature Control .1 The system consists of:
.1 Existing air conditioning units (AC-15/16).
.2 Air cooled condensing units (CU-15/16).

3.5 Air Conditioning Unit

- Control .1 The air conditioning unit's wall mounted controller shall control the operation of the air conditioning unit.
- .2 Monitor the air conditioning system's alarm.

3.6 Alarms

- .1 Provide software high and low alarms for each space temperature sensor. Initially set at 10°C [18°F] above set point and 5°C [9°F] below set point.

END OF SECTION

Part 1 General**1.1 REFERENCE STANDARDS**

- .1 CSA Group
 - .1 CSA C22.1-18, Canadian Electrical Code, Part 1 (22nd Edition), Safety Standard for Electrical Installations.
 - .2 CAN3-C235-83 (R2010), 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 SP1122-2000, The Authoritative Dictionary of IEEE Standards Terms, 7th Edition.

1.2 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.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for all power, data, breakers, device cover plates and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Submit for review single line electrical diagram.
 - .1 Electrical distribution system in main electrical room.
- .4 Shop drawings:
 - .1 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.
 - .2 Identify on wiring diagrams circuit terminals and indicate internal wiring for each item of equipment and interconnection between each item of equipment.
 - .3 Indicate of drawings clearances for operation, maintenance, and replacement of operating equipment devices.
- .5 Certificates:
 - .1 Provide CSA certified equipment.
 - .2 Submit test results of installed electrical systems and instrumentation.
 - .3 Permits and fees: in accordance with General Conditions of contract.

- .6 Manufacturer's Field Reports: submit to manufacturer's written report, within [3] days of review, verifying compliance of Work and electrical system and instrumentation testing.
- .7 Sustainable Design Submittals:
 - .1 Construction Waste Management:
 - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.
 - .2 Recycled Content:
 - .1 Submit listing of recycled content products used.

1.4 CLOSEOUT SUBMITTALS

- .1 Operation and Maintenance Data: submit operation and maintenance data and 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 Post instructions where directed.
 - .4 Ensure operating instructions will not fade when exposed to sunlight and are secured to prevent easy removal or peeling.

1.5 DELIVERY, STORAGE AND HANDLING

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

2.2 MATERIALS AND EQUIPMENT

- .1 Factory assemble control panels and component assemblies.
- .2 Equipment and materials shall be NEW, CSA certified, and manufactured to standard quoted.
- .3 Where there is no alternative to supplying equipment which is not CSA certified, contractor shall obtain special prior approval from Departmental Representative. CSA equivalent inspection to be performed prior to being put into service.
- .4 Contractor shall use products of one manufacturer to match existing, including classification, unless otherwise specified.
- .5 Unless otherwise specified, Contractor shall comply with manufacturer's latest printed instructions for materials and installation methods.
- .6 Contractor shall deliver, store and maintain materials with manufacturer's seals and labels intact.
- .7 Contractor shall not store materials on site without Departmental Representative approval.
- .8 Departmental Representative accepts no responsibility for Contractor materials or equipment stored on site.
- .9 Contractor shall supply shop drawings and manufacturer's instructions and specifications on all new installations for inclusion in the building inventory.
- .10 Where the contractor supplies equipment purchased from a contractor manufacturer, the Contractor shall obtain from the Manufacturer the normal warranty period and such warranty shall be made out to Her Majesty the Queen in right of Canada.

2.3 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS

- .1 Verify installation and co-ordination responsibilities related to motors, equipment and controls, as indicated.
- .2 Control wiring and conduit: in accordance with Section 26 29 03 - Control Devices except for conduit, wiring and connections below 50 V which are related to control systems specified in mechanical sections.

2.4 WARNING SIGNS

- .1 Warning Signs: in accordance with requirements of Departmental Representative. 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-labels as follows:
 - .1 Nameplates: 3 lamicooid mm blackface, black core, lettering 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 to be approved by Departmental Representative prior to manufacture.
- .4 Allow for minimum of twenty-five (25) letters per nameplate.
- .5 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.
- .6 Disconnects, starters and contactors: indicate equipment being controlled and voltage.
- .7 Terminal cabinets and pull boxes: indicate system and voltage.
- .8 Transformers: indicate capacity, primary and secondary voltages.

2.7 WIRING IDENTIFICATION

- .1 Identify wiring with permanent indelible identifying markings, 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.

Type	Prime	Auxiliary
250 V Regular	Yellow	
250 V UPS	Yellow	Orange
250 V Emergency	Yellow	Red
600 V Regular	Yellow	Green
600 V UPS	Yellow/Green	Orange
600 V Emergency	Yellow/Green	Red
5 kV	Yellow	Blue
25 kV	Yellow	Black
Ground	Green	
Telephone	Green	Black
Data	Green	Blue
Fire Alarm	Red	
Emergency Voice	Red	Blue
Other Security Systems	Red	Black
DDC	Orange	

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.

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 installation in accordance with manufacturer's written instructions.

3.2 INSTALLATION

- .1 Do complete installation in accordance with CSA C22.1 except where specified otherwise.
- .2 Do overhead and underground systems in accordance with CAN/CSA-C22.3 No.1 except where specified otherwise.
- .3 BX, PVC and aluminum conduit not acceptable, except for short flexible connections to light fixtures from conduit boxes, not to exceed 2 meters in length per cable.
- .4 Flexible metal conduit runs shall not exceed 1200 mm.

- .5 Install separate ground wire in E.M.T. one size lower than the largest conductor pulled in. Minimum size #14 AWG.
- .6 Minimum conduit size 21mmC.
- .7 Lugs, terminals, screws used for termination of wiring to be suitable for copper conductors.
- .8 Minimum acceptable size wire to be used is #12 AWG copper conductors, except where permitted by the IOS Site Authority or representative.
- .9 Copper conductors with R90 insulation.
- .10 Copper wound transformers.
- .11 Dedicated neutral conductor for each receptacle circuit.

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 If plastic sleeves are used in fire rated walls or floors, remove before conduit installation.
- .3 Install cables, conduits and fittings embedded or plastered over, close to building structure so furring can be kept to minimum.

3.5 LOCATION OF OUTLETS

- .1 Locate outlets in accordance with Section 26 05 32 - Outlet Boxes, Conduit Boxes and 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.
- .4 Locate light switches on latch side of doors.
 - .1 Locate disconnect devices in mechanical and elevator machine rooms on latch side of floor.

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 Local switches: 1400 mm.
 - .2 Wall receptacles:
 - .1 General: 300 mm.
 - .2 Above top of continuous baseboard heater: 200 mm.
 - .3 Above top of counters or counter splash backs: 175 mm.
 - .4 In mechanical rooms: 1400 mm.
 - .3 Panel-boards: as required by Code or as indicated.
 - .4 Telephone and interphone outlets: 300 mm.
 - .5 Wall mounted telephone and interphone outlets: 1500 mm.
 - .6 Fire alarm stations: 1500 mm.
 - .7 Fire alarm bells: 2100 mm.
 - .8 Television outlets: 300 mm.
 - .9 Wall mounted speakers: 2100 mm.
 - .10 Clocks: 2100 mm.
 - .11 Door bell pushbuttons: 1500 mm.

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 Conduct following tests
 - .1 Power system including phasing, voltage, grounding and load balancing.
 - .2 Circuits originating from branch distribution panels.
 - .3 Lighting and its control.
 - .4 Motors, heaters and associated control equipment including sequenced operation of systems where applicable.
 - .5 Systems: communications fire alarm.
 - .6 Insulation resistance testing:
 - .1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.
 - .2 Megger 350-600 V circuits, feeders and equipment with a 1000 V instrument.
 - .3 Check resistance to ground before energizing.
- .2 Carry out tests in presence of Departmental Representative.

- .3 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.
- .4 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.
 - .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 Departmental Representative 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:
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

PART 1 GENERAL

1.1 RELATED WORK

- .1 This Section of the Specification is to be read, coordinated and implemented in conjunction with all other parts of the Contract Documents.

1.2 REGULATORY REQUIREMENTS

- .1 Restraints shall meet the requirements of the latest edition of the British Columbia Building Code and amendments.
- .2 The Seismic Consulting Engineer should be able to provide a proof of professional insurance and the related practice credentials if requested by the Electrical Consultant. The Seismic Consulting Engineer should be familiar with SMACNA, ECABC & NFPA guidelines as well as BCBC and VBBL requirements.
- .3 The Contractors' Seismic Consultant shall submit original signed BC Building Code "Letters of Assurance" "Schedules B and C-B" to the Prime Consultant or Electrical Consultant.
- .4 Project shall comply with the local bylaw where applicable.
- .5 The above requirements shall not restrict or supplant the requirements of any local bylaws, codes, or other certified agencies which may have jurisdiction over all or part of the installation.

1.3 SCOPE

- .1 It is the responsibility of equipment manufacturers to design their equipment so that the strength and anchorage of internal components of the equipment exceeds the force level used to restrain and anchor the unit itself to the supporting structure.
- .2 Manufacturer's shop drawings to be submitted with seismic information on equipment structure, bracing and internal components and as required by Division 01.
- .3 Provide restraint on all equipment and machinery, which is part of the building electrical services and systems, to prevent injury or hazard to persons and equipment in and around the structure. Restrain all such equipment in its normal position in the event of an earthquake.
- .4 The total electrical seismic restraint design and field review and inspection will be by a B.C. registered professional structural engineer who specializes in the restraint of building elements. Contractor to allow for coordination, provision of seismic restraints, as well as all costs for the services of the Seismic Restraint Engineer. This engineer, herein referred to as the Seismic Consultant, will provide normal engineering functions as they pertain to seismic restraint of electrical installations.
- .5 The Contractor shall be aware of, and comply with, all current seismic restraining requirements and make provision for those that may come into effect during construction of the project. Make proper allowance for such conditions in the tender.
- .6 The Seismic Consultant shall provide detailed seismic restraint installation shop drawings to the Contractor. Copies of the shop drawings to be included in the final project manual.

- .7 Provide seismic restraints on all equipment, and/or installations or assemblies, which are suspended, pendant, shelf mounted, freestanding and/or bolted to the building structure or support slabs.
- .8 The Seismic Consultant shall provide inspections during and after installation. The Contractor shall correct any deficiencies noted without additional cost to the contract.
- .9 Include all costs associated with the Seismic installation and certification in the base tender.

PART 2 EXECUTION

2.1 GENERAL

- .1 All seismic restraints systems shall conform to local authority having jurisdiction and all applicable code requirements.

2.2 CONDUITS

- .1 Provide restraint installation information and details on conduit and equipment as indicated below:
- .2 Vertical Conduit:
 - .1 Attachment - Secure vertical conduit at sufficiently close intervals to keep the conduit in alignment and carry the weight of the conduits and wiring. Stacks shall be supported at their bases and, if over 2 stories in height, at each floor by approved metal floor clamps.
 - .2 At vertical conduit risers, wherever possible, support the weight of the riser, at a point or points above the center of gravity of the riser. Provide lateral guides at the top and bottom of the riser, and at intermediate points not to exceed 9.2 m.
- .3 Riser joints shall be braced or stabilized between floors.
- .4 Horizontal Conduits:
 - .1 Supports - Horizontal conduit shall be supported at sufficiently close intervals to keep it in alignment and prevent sagging.
 - .2 EMT tubing - tubing shall be supported at approximately 1.2 m [4 ft] intervals for tubing.
- .5 Do not brace conduit runs against each other. Use separate support and restraint system.
- .6 Support all conduits in accordance with the capability of the pipe to resist seismic load requirements indicated.
- .7 Trapeze hangers may be used. Provide flexible conduit connections where conduits pass through building seismic or expansion joints, or where rigidly supported conduits connect to equipment with vibration or seismic isolators.
- .8 A conduit system shall not be braced to dissimilar parts of a building or two dissimilar building systems that may respond in a different mode during an earthquake. Examples: wall and a roof; solid concrete wall and a metal deck with lightweight concrete fill.

- .9 Provide large enough conduit sleeves through walls or floors to allow for anticipated differential movements with firestopping where required.
- .10 It is the responsibility of the contractor to ascertain that an appropriate size restraint device be selected for each individual piece of equipment. Submit details on shop drawings. Review with seismic consultant and submit shop drawings to consultants for their reference.

2.3 LIGHT FIXTURES

- .1 Fixtures in suspended ceilings shall be hung independently of the ceiling system. Fixtures shall be secured to concrete or structural deck above by at least two taught cables which are connected to the fixture at diagonal points.
- .2 Surface and recessed style fixtures shall be hung independently of the ceiling system. Fixtures shall be secured to concrete or structural deck above by taut cables.
- .3 Fixtures which are hung independently of ceiling systems shall have minimum of one seismic cable in addition to the chain or cable used to support the fixture. Seismic restraint cables shall be secured into the concrete or structural deck above.
- .4 Cables shall be corrosion resistant and approved for the application.
- .5 Fixtures which are rod hung shall have seismic ball alignment fittings at the ceiling and fixture.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 This Section includes requirements for selective demolition and removal of electrical communications components including removal of conduit, junction boxes, and panels to source (home run removal) and incidentals required to complete work described in this Section ready for new construction.

1.2 REFERENCE STANDARDS

- .1 CSA Group (CSA)
 - .1 CSA S350 M1980 (R2003), Code of Practice for Safety in Demolition of Structures

1.3 DEFINITIONS

- .1 Demolish: Detach items from existing construction and legally dispose of items off site, unless indicated as removed and salvaged, or removed and reinstalled.
- .2 Remove: Planned deconstruction and disassembly of electrical items from existing construction including removal of conduit, junction boxes, cabling and wiring from electrical component to panel taking care not to damage adjacent assemblies designated to remain; legally dispose of items off site, unless indicated as removed and salvaged, or removed and reinstalled.
- .3 Remove and Salvage: Detach items from existing construction
- .4 Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.
- .5 Existing to Remain: Existing items of construction that are not removed and that are not otherwise indicated as being removed and salvaged, or removed and reinstalled.
- .6 Hazardous Substances: Dangerous substances, dangerous goods, hazardous commodities and hazardous products may include asbestos, mercury and lead, PCB's, poisons, corrosive agents, flammable substances, radioactive substances, or other material that can endanger human health or wellbeing or environment if handled improperly as defined by Federal Hazardous Products Act (RSC 1985) including latest amendments.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Action Submittals:
 - .1 Construction Waste Management Plan (CWM Plan): Submit plan addressing opportunities for reduction, reuse, or recycling of materials prepared.
 - .2 Landfill Records: Indicate receipt and acceptance of selective demolition waste and hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1.5 ADMINISTRATIVE REQUIREMENTS

- .1 Coordination: Coordinate work of this Section to avoid interference with work by other Sections.

1.6 QUALITY ASSURANCE

- .1 Regulatory Requirements: Perform work of this Section in accordance with:
 - .1 Provincial/Territorial Workers' Compensation Boards/Commissions.
 - .2 Provincial/Territorial Occupational Health and Safety Standards and Programs.

1.7 SITE CONDITIONS

- .1 Existing Conditions: Condition of materials identified as being salvaged or demolished are based on their observed condition at time of site examination before tendering.

1.8 SALVAGE AND DEBRIS MATERIALS

- .1 Demolished items become Contractor 's property and will be removed from Project site;
- .2 Carefully remove materials and items designated for salvage and store in a manner to prevent damage or devaluation of materials.

Part 2 Products

2.1 MATERIALS

- .1 General Patching and Repair Materials: repair materials incidental to removal or demolition of components associated with work of this Section.
- .2 Electrical Repair Materials: Use only new materials, CSA or ULC labelled as appropriate and matching components remaining after work associated with components identified for removal or demolition are completed.
- .3 Fire stopping Repair Materials: Use fire stopping materials compatible with existing fire stopping systems where removal or demolition work affects rated assemblies, restore to match existing fire rated performance.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Existing Conditions: Visit site, thoroughly examine and become familiar with conditions that may affect the work of this Section before tendering the Bid; Departmental Representative will not consider claims for extras for work or materials necessary for proper execution and completion of the contract that could have been determined by a site visit.

3.2 PREPARATION

- .1 Protection of Existing Systems to Remain: Protect systems and components indicated to remain in place during selective demolition operations and as follows:
 - .1 Prevent movement and install bracing to prevent settlement or damage of adjacent services and parts of existing buildings scheduled to remain.
 - .2 Notify Departmental Representative and cease operations where safety of buildings being demolished, adjacent structures or services appears to be endangered and await additional instructions before resuming demolition work specified in this Section.
 - .3 Prevent debris from blocking drainage inlets.
 - .4 Protect mechanical systems that will remain in operation.

3.3 EXECUTION

- .1 Disconnect electrical circuits and panel feeders; maintain electrical service and main distribution panel as is, ready for subsequent Work.
- .2 Remove existing luminaires, electrical devices and equipment including associated conduits, boxes, wiring, and similar items unless specifically noted otherwise.
- .3 Disconnect and remove existing fire alarm system including associated conduits, boxes, wiring, and similar items unless specifically noted otherwise.
- .4 Disconnect and remove communication systems including associated conduits, boxes, cabling, and similar items unless specifically noted otherwise.
- .5 Disconnect and remove telephone outlets, associated conduit, cabling and sub terminal backboards and related accessories; maintain telephone service and main terminal backboard as is.
- .6 Perform demolition work in a neat and workmanlike manner:
 - .1 Remove tools or equipment after completion of work, and leave site clean and ready for subsequent renovation work.
 - .2 Repair and restore damages caused as a result of work of this Section to match existing materials and finishes.
- .7 Disconnect panel feeders back to main distribution panel and re label respective circuit breaker as "SPARE".
- .8 Place weatherproof blank cover plates on exterior outlet boxes remaining after demolition and removal activities.
- .9 Remove existing conduits, boxes, cabling and wiring associated with removed luminaires, electrical devices and equipment.
- .10 Grind off conduits and make flush with surface of concrete where conduits are cast into concrete; seal open ends of conduit with silicone sealant and leave in place.
- .11 Seal open ends of conduit with silicone sealant and leave in place where they are inaccessible or cannot be removed without damaging adjacent construction.

END OF SECTION

Part 1 General**1.1 REFERENCE STANDARDS**

- .1 CSA Group (CSA)
 - .1 CAN/CSA-C22.2 No.18-98 (R2003), Outlet Boxes, Conduit Boxes and Fittings.
 - .2 CAN/CSA-C22.2 No.65-03 (R2008), 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-[1961], Bushing Stud Connectors and Aluminum Adapters (1200 Ampere Maximum Rating).
- .3 National Electrical Manufacturers Association (NEMA)

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for wire and box connectors and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Sustainable Design Submittals:
 - .1 Construction Waste Management:
 - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.

1.3 CLOSEOUT SUBMITTALS

- .1 Operation and Maintenance Data: submit operation and maintenance data for wire and box connectors for incorporation into manual.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect wire and box connectors from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Develop Construction Waste Management Plan.

- .5 Packaging Waste Management: remove for reuse and return by manufacturer of packaging materials, padding, pallets, crates, as specified in Construction Waste Management Plan

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 sized to fit copper conductors 10 AWG or less.
- .3 Bushing stud connectors: to EEMAC 1Y-2 NEMA to consist of:
 - .1 Connector body and stud clamp for round copper
 - .2 Clamp for round copper conductors.
 - .3 Clamp for conductors
 - .4 Stud clamp bolts.
 - .5 Bolts for copper conductors.
 - .6 Bolts for cooper conductors .
 - .7 Sized for conductor's as indicated.
- .4 Clamps or connectors for flexible conduit, on-metallic sheathed cable as required to: CAN/CSA-C22.2 No.18.

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 wire and box connectors installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental 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 Departmental Representative.

3.2 INSTALLATION

- .1 Remove insulation carefully from ends of conductor's and cables and:
 - .1 Apply coat of zinc joint compound on aluminum conductors prior to installation of connectors.

- .2 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.
- .3 Install fixture type connectors and tighten to CAN/CSA-C22.2 No.65. Replace insulating cap.
- .4 Install bushing stud connectors in accordance with EEMAC 1Y-2.

3.3

CLEANING

- .1 Progress Cleaning:
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.
- .3 Waste Management: separate waste materials for reuse recycling.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 PRODUCT DATA

- .1 Provide product data

1.2 DELIVERY, STORAGE AND HANDLING

- .1 Packaging Waste Management: remove for reuse and return by manufacturer of crates pallets padding packaging materials.

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 Jacketed.

2.2 TECK 90 CABLE

- .1 Cable: Use of Teck cable with Departmental Representative permission only.
- .2 Conductors:
 - .1 Grounding conductor: copper
 - .2 Circuit conductors: copper size as indicated.
- .3 Insulation:
 - .1 Cross-linked polyethylene XLPE.
 - .2 Rating: 1000/600 V.
- .4 Inner jacket: polyvinyl chloride material.
- .5 Armour: galvanized steel.
- .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 1000mm centers.
 - .3 Threaded rods: 6 mm diameter to support suspended channels.
- .8 Connectors:
 - .1 Watertight for TECK cable.

2.3 CONTROL CABLES

- .1 Type: LVT: 2 soft annealed copper conductors, sized as indicated:
 - .1 Insulation: thermoplastic.
 - .2 Sheath: thermoplastic jacket [and armour of closely wound aluminum wire.
- .2 Type: low energy 300 V control cable: solid or stranded annealed copper conductors sized as indicated LVT:
 - .1 Insulation: TW 40 degrees C
 - .2 Overall covering: polyethylene jackets

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 Departmental Representative and local authority having jurisdiction over installation.
- .3 Perform tests before energizing electrical system.

3.2 GENERAL CABLE INSTALLATION

- .1 Lay cable in cable trays in accordance with Section 26 05 36 - Cable Trays for Electrical Systems.
- .2 Terminate cables in accordance with Section 26 05 20 - Wire and Box Connectors - (0-1000 V).
- .3 Cable Colour Coding: to Section 26 05 00 - Common Work Results for Electrical.
- .4 Conductor length for parallel feeders to be identical.
- .5 Lace or clip groups of feeder cables at distribution centres, pull boxes, and termination points.
- .6 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.
- .7 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.
- .8 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.

3.4 INSTALLATION OF TECK90 CABLE (0 -1000 V)

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

3.5 INSTALLATION OF CONTROL CABLES

- .1 Install control cables in conduit.
- .2 Ground control cable shield.

3.6 INSTALLATION OF NON-METALLIC SHEATHED CABLE

- .1 Use of non-metallic sheathed cable not acceptable on this site.

END OF SECTION

Part 1 General

1.1 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Product Data:
- .1 Submit manufacturer's instructions, printed product literature and data sheets for hangers and supports and include product characteristics, performance criteria, physical size, finish and limitations.

1.2 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
- .1 Store materials in dry location indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Store and protect hangers and supports from nicks, scratches, and blemishes.
- .3 Replace defective or damaged materials with new.
- .4 Develop Construction Waste Management Plan related to Work of this Section.
- .5 Packaging Waste Management: remove for reuse by manufacturer and return of pallets ,crates, padding, packaging materials as specified in Construction Waste Management Plan.

Part 2 Products

2.1 SUPPORT CHANNELS

- .1 U shape, size 41 x 41 mm, 2.5 mm thick, surface mounted.

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 hangers and supports installation in accordance with manufacturer's written instructions.
- .1 Visually inspect substrate in presence of Departmental Representative.
- .2 Inform Departmental 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 DCC Representative.

3.2 **INSTALLATION**

- .1 Secure equipment to solid masonry, tile and plaster surfaces with lead anchors.
- .2 Secure equipment to poured concrete with expandable inserts.
- .3 Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.
- .4 Secure surface mounted equipment with twist clip fasteners to inverted T bar ceilings. Ensure that T bars are adequately supported to carry weight of equipment specified before installation.
- .5 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.
- .6 Fasten exposed conduit or cables to building construction or support system using straps.
 - .1 One-hole steel-malleable iron 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.
- .7 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.
- .8 For surface mounting of two or more conduits use channels at 1 m on centre spacing.
- .9 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.
- .10 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.
- .11 Do not use wire lashing or perforated strap to support or secure raceways or cables.
- .12 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Departmental Representative.
- .13 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

3.3 **CLEANING**

- .1 Progress Cleaning:
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.

- .3 Waste Management: separate waste materials for recycling reuse.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General**1.1 REFERENCE STANDARDS**

- .1 CSA Group (CSA)
 - .1 CSA C22.1-18, Canadian Electrical Code, Part 1, 20th Edition.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 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 shop drawings:

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Waste Management and Disposal:
 - .1 Separate waste materials for recycling reuse.

Part 2 Products**2.1 SPLITTERS**

- .1 Construction: sheet metal enclosure, welded corners and formed hinged cover suitable for locking in closed position.
- .2 Terminations: main and branch lugs to match required size and number of incoming and outgoing conductors as indicated.
- .3 Spare Terminals: minimum three spare terminals or lugs on each connection or lug block sized less than 400 A.

2.2 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 turned edge covers.

2.3 CABINETS

- .1 Construction: welded sheet steel hinged door, latch and catch

Part 3 Execution

3.1 SPLITTER INSTALLATION

- .1 Mount plumb, true and square to building lines.
- .2 Extend splitters full length of equipment arrangement except where indicated otherwise.

3.2 JUNCTION, PULL BOXES AND CABINETS INSTALLATION

- .1 Install pull boxes in inconspicuous but accessible locations.
- .2 Mount cabinets with top not higher than 2 m above finished floor except where indicated otherwise.
- .3 Install [terminal block] as indicated in Type T cabinets.
- .4 Only main junction and pull boxes are indicated. Install additional pull boxes as required by CSA C22.1.

3.3 IDENTIFICATION

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

END OF SECTION

Part 1 General**1.1 REFERENCE STANDARDS**

- .1 CSA Group (CSA)
 - .1 CSA C22.1-18, Canadian Electrical Code, Part 1, 20th Edition.

1.2 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials
- .2 Waste Management and Disposal:
 - .1 Separate waste materials for reuse recycling.

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.
- .5 347 V outlet boxes for 347 V switching devices.
- .6 Combination boxes with barriers where outlets for more than one system are grouped.

2.2 GALVANIZED STEEL OUTLET BOXES

- .1 One-piece electro-galvanized construction.
- .2 and multi Single gang flush device boxes for flush installation, minimum size 76 x 50 x 38 mm or as indicated. 102 mm square outlet boxes when more than one conduit enters one side with extension and plaster rings as required.
- .3 Utility boxes for outlets connected to surface-mounted EMT conduit, minimum size 102 x 54 x 48 mm.
- .4 102 mm square or octagonal outlet boxes for lighting fixture outlets.
- .5 Extension and plaster rings for flush mounting devices in finished plaster tile walls.

2.3 OUTLET BOXES FOR NON-METALLIC SHEATHED CABLE

- .1 Electro-galvanized, sectional, screw ganging steel boxes, minimum size 76 x 50 x 63 mm with two double clamps to take non-metallic sheathed cables.

2.4 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.

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 REFERENCE STANDARDS**

- .1 CSA Group (CSA)
 - .1 CAN/CSA-C22.2 No. 62-[93 (R2003)], Surface Raceway Systems.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals
 - .1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Indicate types of raceways with terminology similar to that used in this Section.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Waste Management and Disposal:
 - .1 Separate waste materials for recycling reuse

Part 2 Products**2.1 SURFACE RACEWAY SYSTEM (WIRING PULLED IN)**

- .1 One piece steel, free of sharp edges to CAN/CSA-C22.2 No. 62.
- .2 Corners, pull boxes, elbows, tees, two piece assembly to facilitate site wiring.
- .3 Finish: ivory enamel.
- .4 Switch, receptacle, extension boxes, adapters and fittings required for complete installation.

2.2 SURFACE RACEWAY SYSTEM (WIRING LAID IN)

- .1 Two piece steel assembly CAN/CSA-C22.2 No. 62.
 - .1 Finish: ivory enamel.
- .2 Switch, receptacle, extension boxes, adapters and fittings required for complete installation.

2.3 LIGHTING FIXTURE RACEWAY

- .1 Fluorescent fixture support system using channel type raceway with snap-on cover.
- .2 Channel: minimum [1.6] mm thick.
- .3 Clamp hangers with threaded rod hangers.

2.4 FITTINGS

- .1 Elbows, tees, supports, connectors couplings and fittings: to CAN/CSA-C22.2 No. 62.

Part 3 Execution

3.1 INSTALLATION

- .1 Install raceway systems as indicated and in accordance with manufacturer's instructions.
- .2 Install supports, elbows, tees, connectors, fittings, bushings, adaptors as required.
- .3 Keep number of elbows, offsets and connections to minimum.
- .4 Use wiring with mechanical protection in channel raceways.
- .5 Install barriers in raceways for different services where required by code.
- .6 Install wiring after installation of raceway system is complete.

END OF SECTION

Part 1 General**1.1 REFERENCE STANDARDS**

- .1 CSA Group (CSA)
 - .1 CAN/CSA C22.2 No. 18-98 (R2003), Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware, A National Standard of Canada.
 - .2 CSA C22.2 No. 45-M1981 (R2003), Rigid Metal Conduit.
 - .3 CSA C22.2 No. 56-04, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
 - .4 CSA C22.2 No. 83-M1985 (R2003), Electrical Metallic Tubing.
 - .5 CSA C22.2 No. 211.2-M1984 (R2003), Rigid PVC (Unplasticized) Conduit.
 - .6 CAN/CSA C22.2 No. 227.3-05, Nonmetallic Mechanical Protection Tubing (NMPT), A National Standard of Canada (February 2006).

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product data: submit manufacturer's printed product literature, specifications and datasheets.
 - .1 Submit cable manufacturing data.
- .3 Quality assurance submittals:
 - .1 Test reports: submit certified test reports.
 - .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .3 Instructions: submit manufacturer's installation instructions.

1.3 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse recycling
- .2 Place materials defined as hazardous or toxic waste in designated containers.
- .3 Ensure emptied containers are sealed and stored safely for disposal away from children.

Part 2 Products**2.1 CABLES AND REELS**

- .1 Provide cables on reels or coils.
 - .1 Mark or tag each cable and outside of each reel or coil, to indicate cable length, voltage rating, conductor size, and manufacturer's lot number and reel number.

- .2 Each coil or reel of cable to contain only one continuous cable without splices.
- .3 Identify cables for exclusively dc applications.
- .4 Reel and mark shielded cables rated 2,001 volts and above.

2.2 CONDUITS

- .1 Rigid metal conduit: to CSA C22.2 No. 45, hot dipped galvanized steel threaded.
- .2 Epoxy coated conduit: to CSA C22.2 No. 45, with zinc coating and corrosion resistant epoxy finish inside and outside.
- .3 Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with expanded ends with couplings.
- .4 Rigid pvc conduit: to CSA C22.2 No. 211.2.
- .5 Flexible metal conduit: to CSA C22.2 No. 56, liquid-tight flexible metal.
- .6 Flexible pvc conduit: to CAN/CSA-C22.2 No. 227.3

2.3 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 1.0 m on centre.
- .4 Threaded rods, 6 mm diameter, to support suspended channels.

2.4 CONDUIT FITTINGS

- .1 Fittings: to CAN/CSA C22.2 No. 18, 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 to be steel.
 - .1 Set-screws are acceptable.

2.5 EXPANSION FITTINGS FOR RIGID CONDUIT

- .1 Weatherproof expansion fittings with internal bonding assembly suitable for 200 mm linear expansion.
- .2 Watertight expansion fittings with integral bonding jumper suitable for linear expansion and 19 mm deflection.
- .3 Weatherproof expansion fittings for linear expansion at entry to panel.

2.6 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 conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.
- .2 Conceal conduits
- .3 Surface mount conduits except.
- .4 Use rigid hot dipped galvanized steel threaded conduit except where specified otherwise.
- .5 Use epoxy coated conduit underground
- .6 Use electrical metallic tubing (EMT) above 2.4 m not subject to mechanical injury except in cast concrete.
- .7 Use rigid pvc conduit in corrosive areas underground.
- .8 Use flexible metal conduit for connection to surface or recessed fluorescent fixtures connection to motors in dry areas work in movable metal partitions.
- .9 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment in damp, wet or corrosive locations.
- .10 Use explosion proof flexible connection for connection to explosion proof motors.
- .11 Install conduit sealing fittings in hazardous areas.
 - .1 Fill with compound.
- .12 Minimum conduit size for lighting and power circuits: 19 mm.
- .13 Install EMT conduit from branch circuit panel to outlet boxes located in sub floor.
- .14 Bend conduit cold:
 - .1 Replace conduit if kinked or flattened more than 1/10th of its original diameter.
- .15 Mechanically bend steel conduit over 19 mm diameter.
- .16 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.
- .17 Install fish cord in empty conduits.
- .18 Remove and replace blocked conduit sections.
 - .1 Do not use liquids to clean out conduits.
- .19 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 surface 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.
- .3 Do not install conduits in terrazzo or concrete toppings.

3.5 CONDUITS UNDERGROUND

- .1 Slope conduits to provide drainage.
- .2 Waterproof joints (pvc excepted) with heavy coat of bituminous paint.

3.6 CLEANING

- .1 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 CSA Group (CSA)
 - .1 CSA C22.2 No.42-10, General Use Receptacles, Attachment Plugs and Similar Devices.
 - .2 CAN/CSA C22.2 No.42.1-00 (R2009), Cover Plates for Flush-Mounted Wiring Devices (Bi-national standard, with UL 514D).
 - .3 CSA C22.2 No.55[M1986 (R2008), Special Use Switches.
 - .4 CSA C22.2 No.111-10, General-Use Snap Switches (Bi-national standard, with UL 20).

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for wiring devices and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Sustainable Design Submittals:
 - .1 Construction Waste Management:
 - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.

1.3 CLOSEOUT SUBMITTALS

- .1 Operation and Maintenance Data: submit operation and maintenance data for wiring devices for incorporation into manual.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials in dry location indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect wiring devices from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Develop Construction Waste Management Plan related to Work of this Section.

- .5 Packaging Waste Management: remove for reuse by manufacturer and return of packaging materials, crates, padding, pallets, as specified in Construction Waste Management Plan in accordance with Section.

Part 2 Products

2.1 SWITCHES

- .1 20 A, 120 V single pole, double pole, three-way, four-way switches to: CSA C22.2 No.111.
- .2 Manually-operated general purpose AC switches with following features:
 - .1 Terminal holes approved for No. 10 AWG wire.
 - .2 Silver alloy contacts.
 - .3 Urea or melamine moulding for parts subject to carbon tracking.
 - .4 Suitable for back and side wiring.
 - .5 Ivory toggle.
- .3 Switches of one manufacturer throughout project.

2.2 RECEPTACLES

- .1 Duplex receptacles, CSA type 5-15 R, 125 V, 15 A, U ground, to: CSA C22.2 No.42 with following features:
 - .1 Ivory urea moulded housing.
 - .2 Suitable for No. 10 AWG for back and side wiring.
 - .3 Break-off links for use as split receptacles.
 - .4 Eight back wired entrances, four side wiring screws.
 - .5 Triple wipe contacts and rivetted grounding contacts.
- .2 Single receptacles CSA type 5-15 R, 125 V, 15 A, U ground with following features:
 - .1 Ivory urea moulded housing.
 - .2 Suitable for No. 10 AWG for back and side wiring.
 - .3 Four back wired entrances, 2 side wiring screws.
- .3 Other receptacles with ampacity and voltage as indicated.
- .4 Receptacles of one manufacturer throughout project.
 - .1 Pilot lights as indicated, with neon type 0.04 W, 125 V lamp and red plastic lense flush type.

2.3 COVER PLATES

- .1 Cover plates for wiring devices to: CSA C22.2 No.42.1.
- .2 Sheet steel utility box cover for wiring devices installed in surface-mounted utility boxes.

- .3 Stainless steel, 1 mm thick cover plates, thickness 2.5 mm for wiring devices mounted in flush-mounted outlet box.
- .4 Weatherproof double lift spring-loaded cast aluminum cover plates, complete with gaskets for duplex receptacles as indicated.

2.4 SOURCE QUALITY CONTROL

- .1 Cover plates from one manufacturer throughout project.

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 wiring devices installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental 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 Departmental Representative.

3.2 INSTALLATION

- .1 Switches:
 - .1 Install single throw switches with handle in "UP" position when switch closed.
 - .2 Install switches in gang type outlet box when more than one switch is required in one location.
 - .3 Mount toggle switches at height in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Receptacles:
 - .1 Install receptacles in gang type outlet box when more than one receptacle is required in one location.
 - .2 Mount receptacles at height in accordance with Section 26 05 00 - Common Work Results for Electrical.
 - .3 Where split receptacle has one portion switched, mount vertically and switch upper portion.
 - .4 Install GFI type receptacles as indicated.
- .3 Cover plates:
 - .1 Install suitable common cover plates where wiring devices are grouped.
 - .2 Do not use cover plates meant for flush outlet boxes on surface-mounted boxes.

3.3 CLEANING

- .1 Progress Cleaning:
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment
- .3 Waste Management: separate waste materials for recycling reuse
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.4 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Protect stainless steel cover plate finish with paper or plastic film until painting and other work is finished.
- .3 Repair damage to adjacent materials caused by wiring device installation.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 CSA Group (CSA)
 - .1 CSA C22.2 No. 5-09, Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, and NMX-J-266-ANCE-2010).

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for circuit breakers and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Certificates:
 - .1 Production certificate of origin must contain:
 - .1 Manufacturer's name and address and person responsible for authentication. Person responsible must sign and date certificate.
 - .2 Licensed dealer's name and address and person of distributor responsible for Contractor's account.
 - .3 Contractor's name and address and person responsible for project.
 - .4 Local manufacturer's representative name and address. Local manufacturer's representative must sign and date certificate.
 - .5 Name and address of building where circuit breakers will be installed:
 - .1 Project title:
 - .2 End user's reference number:
 - .3 List of circuit breakers:
- .3 Sustainable Design Submittals:
 - .1 Construction Waste Management:
 - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.
 - .2 Submit calculations on end-of-project recycling rates, salvage rates, and

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

- .3 Storage and Handling Requirements:
 - .1 Store circuit breakers indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect circuit breakers from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Develop Construction Waste Management Plan related to Work of this Section.
- .5 Packaging Waste Management: remove for reuse and return by manufacturer of crates, packaging materials, padding, pallets, as specified in Construction Waste Management Plan.

Part 2 Products

2.1 BREAKERS GENERAL

- .1 Circuit breakers, accessory high-fault protectors Moulded-case circuit breakers, fused circuit breakers, ground-fault circuit-interrupters,: to CSA C22.2 No. 5
- .2 Bolt-on moulded case circuit breaker: quick- make, quick-break type, for manual and automatic operation [with temperature compensation for 40 degrees C ambient].
- .3 Common-trip breakers: with single handle for multi-pole applications.
- .4 Circuit breakers to have minimum 10ka symmetrical rms interrupting capacity rating.

2.2 THERMAL MAGNETIC BREAKERS

- .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.

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 installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental 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 Departmental Representative.

3.2 INSTALLATION

- .1 Install circuit breakers as indicated.

3.3 CLEANING

- .1 Progress Cleaning:
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment
- .3 Waste Management: separate waste materials for reuse recycling.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 American National Standards Institute (ANSI)
 - .1 ANSI C82.1-04, Lamp Ballasts-Line Frequency Fluorescent Lamp Ballast.
 - .2 ANSI C82.4-02 (R2007), Ballasts for High-Intensity-Discharge and Low-Pressure Sodium Lamps Multi Supply Type.
- .2 American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE)
 - .1 ANSI/IEEE C62.41-1991, Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits.
- .3 ASTM International Inc.
 - .1 ASTM F1137-00 (2006), Standard Specification for Phosphate/Oil and Phosphate/Organic Corrosion Protective Coatings for Fasteners.
- .4 CSA Group (CSA)
- .5 ICES-005-07, Radio Frequency Lighting Devices.
- .6 Underwriters' Laboratories of Canada (ULC)

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 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 approval by Departmental Representative.
 - .3 Photometric data to include: spacing criterion
- .2 Quality assurance submittals:
 - .1 Manufacturer's instructions: provide manufacturer's written installation instructions and special handling criteria, installation sequence, cleaning procedures.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .2 Packaging Waste Management: remove for reuse and return by manufacturer of packaging materials, padding, crates, pallets
- .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.

Part 2 Products

2.1 FINISHES

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

2.2 OPTICAL CONTROL DEVICES

- .1 As indicated in luminaire schedule.

2.3 LUMINAIRES

- .1 As indicated in luminaire schedule.

Part 3 Execution

3.1 INSTALLATION

- .1 Locate and install luminaires as indicated.
- .2 Provide adequate support to suit ceiling system.

3.2 WIRING

- .1 Connect luminaires to lighting circuits:
 - .1 Install flexible or rigid conduit for luminaires as indicated.

3.3 LUMINAIRE SUPPORTS

- .1 For suspended ceiling installations support luminaires independently of ceiling.

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 CLEANING

- .1 Remove surplus materials, excess materials, rubbish, tools and equipment.
- .2 Waste Management: separate waste materials for reuse recycling

END OF SECTION

Part 1 General**1.1 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for communication raceway systems and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Sustainable Design Submittals:
 - .1 Construction Waste Management:
 - .1 Submit project Waste Management Plan lighting recycling and salvage requirements.

1.2 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect communication raceway systems from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Develop Construction Waste Management Plan related to Work of this Section
- .5 Packaging Waste Management: remove for reuse and return by manufacturer of [padding, crates, packaging materials, pallets, as specified in Construction Waste Management Plan.

Part 2 Products**2.1 SYSTEM DESCRIPTION**

- .1 telecommunications raceways system consists of outlet boxes, cover plates, terminal distribution cabinets, conduits, cable trays, pull boxes, sleeves and caps, fish wires, service poles, service fittings, concrete encased ducts.

2.2 MATERIAL

- .1 Conduits: EMT type, in accordance with Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

- .2 Cable trays: Wiremesh type, in accordance with Section 26 05 36 - Cable Trays for Electrical Systems.
- .3 Junction boxes, cabinets: in accordance with Section 26 05 31 - Splitters, Junction, Pull Boxes and Cabinets.
- .4 Outlet boxes, conduit boxes, and fittings: in accordance with Section 26 05 31 - Splitters, Junction, Pull Boxes and Cabinets
- .5 Fish wire: polypropylene type.

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 communication raceway systems installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative
 - .2 Inform Departmental 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 Departmental Representative.

3.2 INSTALLATION

- .1 Install empty raceway system, including underfloor distribution system, fish wire, terminal cabinets, outlet boxes, floor boxes, pull boxes, cover plates, conduit, sleeves and caps, cable tray, service poles, miscellaneous and positioning material to constitute complete system.

3.3 CLEANING

- .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment
- .3 Waste Management: separate waste materials for reuse, recycling
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.4 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by pathways for communications systems installation.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 CSA Group (CSA)
 - .1 CSA-C22.2 No. 214-02, Communications Cables (Bi-National standard with UL 444).
 - .2 CSA-C22.2 No. 232-M1988 (R2004), Optical Fiber Cables.
- .2 Telecommunications Industry Association (TIA)/Electronic Industries Alliance (EIA)
 - .1 TIA/EIA-568-B.1-(2001), Commercial Building Telecommunications Cabling Standard, Part 1: General Requirements.
 - .2 TIA/EIA-568-B.2-(2001), Commercial Building Telecommunications Cabling Standard, Part 2: Balanced Twisted-Pair Cabling Components.
 - .3 TIA/EIA-568-B.3-(2000), Optical Fiber Cabling Components Standard.
 - .4 TIA/EIA-606-A-(2002), Administration Standard for the Commercial Telecommunications Infrastructure.
 - .5 TIA TSB-140-2004, Telecommunications Systems Bulletin - Additional Guidelines for Field-Testing Length, Loss and Polarity of Optical Fiber Cabling Systems.
 - .6 TIA-598-C-(2005), Optical Fiber Cable Colour Coding.

1.2 DEFINITIONS

- .1 Refer to TIA/EIA-598-C, Annex A for definitions of terms: optical-fiber interconnect, distribution, and breakout cables.

1.3 SYSTEM DESCRIPTION

- .1 Structured telecommunications wiring system consist of unshielded-twisted-pair and, terminations, connectors, cross-connection hardware and related equipment installed inside building for occupant's telecommunications systems, including voice (telephone), data, and image.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals
- .2 As-built Records and Drawings:
 - .1 Provide Microsoft Access database reflecting cable installation and cross-connections.
 - .2 Provide electronic drawings in AutoCAD 2007 format depicting all construction.

- .3 Provide two (2) bound complete hard-copy sets of as-built records to the Departmental Representative.
 - .1 Provide and place one hard copy of as-built records for each telecommunications room in plan holder in each telecommunications room.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Waste Management and Disposal: separate waste materials for recycling, reuse

Part 2 Products

2.1 WORK AREA UTP 4-PAIR MODULAR JACK

- .1 Eight-position modular jack ("RJ-45"), type T568B Category 6 to: TIA/EIA-568-B.2 :
 - .1 In self-contained surface-mount box, jacks per box.
 - .2 Mounted in compatible double gang faceplate, flush entry, 8 jack positions per faceplate.
- .2 Multi-user telecommunications outlet assembly (MUTOA), 4 ports, each port equipped with factory installed "RJ-45" jacks, type Category 6T568A to: TIA/EIA-568-B.2.

2.2 TERMINATION AND CROSS-CONNECTION HARDWARE FOR UTP

- .1 IDC Terminal strips, 25 pair, for terminating multi pair 100 W balanced twisted pair cables and supporting cross-connections using jumper wires or compatible plug-ended patch cords: Category 6 to: TIA/EIA-568-B.2.
- .2 Mount or block for housing 10 IDC terminal strips, mounted on wall.
 - .1 Distribution rings or channels capable of externally mating with the above mount for managing cross-connection wires.
- .3 Patch panel, , 48ports:
 - .1 Each port equipped with field installed "RJ-45" jacks, type T568B Category 6 to: TIA/EIA-568-B.2.
 - .2 Horizontal cable-management unit for every 48 ports.
- .4 Consolidation point, terminates 12 UTP horizontal cables from telecommunications room on IDC terminations. Cables extending to work areas terminate on IDC terminal strips RJ-45 jacksT568B. Category 6 to: TIA/EIA-568-B.2.

2.3 UTP CROSS-CONNECT WIRE

- .1 Category 6, 4 pairs to: TIA/EIA-568-B.2.

2.4 UTP PATCH CORDS

- .1 3 metres long, with factory-installed male plug at one end to mate with "RJ-45" jack and with factory-installed male plug at other end to mate with Category 6, 4 pairs "RJ-45" jack to: TIA/EIA-568-B.2.

2.5 UTP EQUIPMENT CABLE

- .1 4 pair "pigtail", 6 metres long, with factory-installed male plug on one end to mate with "RJ-45" jack and other end equipped with factory-installed male plug to mate with RJ-45" jack: Category 6 to: TIA/EIA-568-B.2.

2.6 UTP WORK AREA CORDS

- .1 3 metres long, each end equipped with "RJ-45" plug Category 6 to: TIA/EIA-568-B.2.

Part 3 Execution

3.1 INSTALLATION OF TERMINATION AND CROSS-CONNECT HARDWARE

- .1 Install termination and cross-connect hardware on wall or in rack as indicated and according to manufacturers' instructions. Identify and label as indicated to: TIA/EIA-606-A.
- .2 Install consolidation points, as indicated according to manufacturer's instructions. Identify and label as indicated to: TIA/EIA-606-A.

3.2 INSTALLATION OF HORIZONTAL DISTRIBUTION CABLES

- .1 Install horizontal cables as indicated in conduits and cable trays from telecommunication rooms to MUTOA consolidation point individual work-area jacks. Identify and label as indicated to: TIA/EIA-606-A.
- .2 Support horizontal cables at intervals not exceeding 2 metres.
 - .1 Where raceways are used to distribute cables to each zone, provide supplementary "J" hooks to support cables at intervals not exceeding 2 metres.
- .3 Install horizontal cables from consolidation point to individual work-area jacks.
 - .1 Provide supplementary "J" hooks to support cables at intervals not exceeding 2 metres.
 - .2 Identify and label as indicated to: TIA/EIA-606-A.
- .4 Terminate horizontal cables in telecommunications room and at individual work-area jacks
 - .1 Identify and label as indicated to: TIA/EIA-606-A.
- .5 Coil spare cables and store in ceiling space in zone.
- .6 Harness slack cable in cabinets, racks, and wall-mounted termination and cross-connection hardware.

3.3 INSTALLATION OF BACKBONE CABLES

- .1 Install backbone cables from each telecommunications room to main terminal/equipment room (MT/ER) as indicated and according to manufacturers' instructions.
 - .1 Identify and label as indicated to: TIA/EIA-606-A.
- .2 Install backbone cables from MT/ER to carrier demarcation point in Entrance Room as indicated and according to manufacturer's instructions.
 - .1 Identify and label as indicated to: TIA/EIA-606-A.

3.4 INSTALLATION OF EQUIPMENT CABLES

- .1 Install equipment cables from equipment patch panel terminal strips as indicated.
 - .1 Identify and label as indicated to: TIA/EIA-606-A.

3.5 IMPLEMENT CROSS-CONNECTIONS

- .1 Implement cross-connections using jumper wires patch cords as specified.

3.6 FIELD QUALITY CONTROL

- .1 Test horizontal UTP cables as specified below and correct deficiencies provide record of results as hard copy electronic record on floppy disk CD.
 - .1 Perform tests for Permanent Link on installed cables, including spares:
 - .1 Category 5e using certified level IIe tester to: TIA/EIA-568-B.1.
 - .2 Category 6 using certified level III tester to: TIA/EIA-568-B.2.
 - .2 Perform tests for Channel on 20 % of cross-connected data horizontal cabling installed from each telecommunications room, including shortest and longest drops from each telecommunications room: should more than 5 % of tested cables fail, test remaining cross-connected data cables.
 - .1 Category 5e using certified level IIe tester to: TIA/EIA-568-B.1.
 - .2 Category 6 using certified level III tester to: TIA/EIA-568-B.2.
- .2 Test backbone UTP cables as specified below and correct deficiencies: provide record of results as hard copy electronic record on CD floppy disk.
 - .1 Perform tests for Permanent Link on 4-pair cables:
 - .1 Category 5e using certified level IIe tester to: TIA/EIA-568-B.1.
 - .2 Category 6 using certified level III tester to: TIA/EIA-568-B.2.
 - .2 Perform Wire Map tests on multi-pair UTP cables to: TIA/EIA-568-B.1.
- .3 Test Optical-fiber strands for attenuation to: TIA/EIA-568-B.1 and correct deficiencies: provide record of results as hard copy electronic record on floppy disk CD.
 - .1 Test horizontal links need at only one wavelength (850 nm or 1300 nm) and in one direction.
 - .1 Attenuation to be less than 2.0 dB, unless consolidation point is used.

- .2 If consolidation point is used, attenuation test result to be less than 2.75 dB when testing between horizontal cross-connect and telecommunications outlet/connector.
- .2 Test backbone links in one both direction(s). Backbone links:
 - .1 Test multi-mode fibre at both applicable wavelengths (850 nm and 1300 nm).
 - .2 Test single-mode fibre at both applicable wavelengths (1550 nm and 1310 m).
- .3 Maximum attenuation: Cable attenuation + Connector loss + Splice loss.
 - .1 Multi-mode-fiber attenuation coefficients:
 - .1 3.5 db/km @ 850 nm; and
 - .2 1.5 db km @ 1300 nm
 - .2 Single-mode fibre attenuation coefficients at both 1310 nm and 1550 nm:
 - .1 1.0 db/km for inside plant cable; and
 - .2 0.5 db/km for outside plant cables.
 - .3 Maximum connector insertion loss: 0.75 db per pair and maximum splice insertion loss: 0.3 db.
- .4 Perform additional Tier 2 tests using optical time domain reflectometer (OTDR) on horizontal backbone fibre pairs to: TSB-140.
 - .1 Correct deficiencies.
 - .2 Provide record of results as described in SUBMITTALS.
- .5 Provide record of results as hard copy-electronic record on CD floppy disk to: TIA/TSB-140.

END OF SECTION