

**GENERAL**

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**END OF SECTION**

**Part 1            General**

**1.1                WORK COVERED BY CONTRACT DOCUMENTS**

- .1        Work of this Contract comprises renovation of the dish room located at the Grande Cache Institute.

**1.2                WORK SEQUENCE**

- .1        Construct Work in stages to accommodate Owner's continued functioning of facility during construction.
- .2        Co-ordinate project Schedule and co-ordinate with Owner Occupancy during construction.
- .3        Required stages:
  - .1        Installation of temporary dishwash facility.
  - .2        Hoarding and security measures.
  - .3        Demolition, renovation, and commissioning of dish room.
  - .4        Removal of hoarding and temporary dishwash facility.
- .4        Maintain fire access/control.

**1.3                CONTRACTOR USE OF PREMISES**

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

**1.4                OWNER OCCUPANCY**

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

**1.5 PARTIAL OWNER OCCUPANCY**

- .1 Owner will occupy designated areas for purpose of conveyance of dish wares.
- .2 On occupancy, Owner will provide for occupied areas:
  - .1 Operation of HVAC and electrical systems.
  - .2 Maintenance.
  - .3 Security.

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

- .1 Execute work with least possible interference or disturbance to building operations, occupants, and normal use of premises. Arrange with Departmental Representative to facilitate execution of work.
- .2 Use only designated routes existing in building for moving workers and material.
  - .1 Accept liability for damage, safety of equipment, and overloading of existing equipment.

**1.7 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 facility operations.
- .3 Provide alternative routes for personnel traffic.
- .4 Establish location and extent of service lines in area of work before starting Work. Notify Departmental Representative of findings.
- .5 Submit schedule to and obtain approval from Departmental Representative for any shut-down or closure of active service or facility including power and communications services. Adhere to approved schedule and provide notice to affected parties.
- .6 Provide temporary services when directed by Departmental Representative to maintain critical building and tenant systems.
- .7 Where unknown services are encountered, immediately advise Departmental Representative and confirm findings in writing.
- .8 Protect, relocate, or maintain existing active services. When inactive services are encountered, cap off in manner approved by authorities having jurisdiction.
- .9 Record locations of maintained, re-routed, and abandoned service lines.
- .10 Construct barriers in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.

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**1.8 DOCUMENTS REQUIRED**

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

**Part 2 Products**

**2.1 NOT USED**

- .1 Not used.

**Part 3 Execution**

**3.1 NOT USED**

- .1 Not used.

**END OF SECTION**



**Part 1            General**

**1.1            ACCESS AND EGRESS**

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

**1.2            USE OF SITE AND FACILITIES**

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

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

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

**1.4            EXISTING SERVICES**

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

**1.5            SPECIAL REQUIREMENTS**

- .1      Ensure Contractor's personnel employed on site become familiar with and obey regulations including safety, fire, traffic and security regulations.
- .2      Keep within limits of work and avenues of ingress and egress.
- .3      Deliver materials outside of peak traffic hours 17:00 to 07:00 and 13:00 to 15:00 unless otherwise approved by Departmental Representative.

**1.6 SECURITY**

- .1 Where security has been reduced by Work of Contract, provide temporary means to maintain security.
- .2 Security clearances:
  - .1 Personnel employed on this project will be subject to security check. Obtain clearance, as instructed, for each individual who will require to enter premises.
  - .2 Obtain requisite clearance, as instructed, for each individual required to enter premises.
  - .3 Personnel will be checked daily at start of work shift and provided with pass which must be worn at all times. Pass must be returned at end of work shift and personnel checked out.
  - .4 Contractor's personnel will require satisfactory RCMP initiated security screening in order to complete Work in premises and on site.
- .3 Security escort:
  - .1 Personnel employed on this project must be escorted when executing work in non-public areas during normal working hours. Personnel must be escorted in all areas after normal working hours.
  - .2 Submit an escort request to Departmental Representative at least 14 days before service is needed. For requests submitted within time noted above, costs of security escort will be paid for by Departmental Representative Consultant. Cost incurred by late request will be Contractor's responsibility.
  - .3 Any escort request may be cancelled free of charge if notification of cancellation is given at least 4 hours before scheduled time of escort. Cost incurred by late request will be Contractor's responsibility.
  - .4 Calculation of costs will be based on average hourly rate of security officer for minimum of 8 hours per day for late service request and of 4 hours for late cancellations.

**1.7 BUILDING SMOKING ENVIRONMENT**

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

**Part 2 Products**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 Execution**

**3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

**Part 1 General**

**1.1 ADMINISTRATIVE**

- .1 Schedule and administer project meetings throughout the progress of the work at the call of Departmental Representative.
- .2 Prepare agenda for meetings.
- .3 Distribute written notice of each meeting four days in advance of meeting date to Departmental Representative.
- .4 Provide physical space and make arrangements for meetings.
- .5 Preside at meetings.
- .6 Record the meeting minutes. Include significant proceedings and decisions. Identify actions by parties.
- .7 Reproduce and distribute copies of minutes within three days after meetings and transmit to meeting participants and Departmental Representative.
- .8 Representative of Contractor, Subcontractor and suppliers attending meetings will be qualified and authorized to act on behalf of party each represents.

**1.2 PRECONSTRUCTION MEETING**

- .1 Within 15 days after award of Contract, request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.
- .2 Departmental Representative, Contractor, major Subcontractors, field inspectors and supervisors will be in attendance.
- .3 Establish time and location of meeting and notify parties concerned minimum 4 days before meeting.
- .4 Incorporate mutually agreed variations to Contract Documents into Agreement, prior to signing.
- .5 Agenda to include:
  - .1 Appointment of official representative of participants in the Work.
  - .2 Schedule of Work: in accordance with Section 01 32 16.07 - Construction Progress Schedules - Bar (GANTT) Chart.
  - .3 Schedule of submission of shop drawings, samples, colour chips. Submit submittals in accordance with Section 01 33 00 - Submittal Procedures.
  - .4 Requirements for temporary facilities, site sign, offices, storage sheds, utilities, fences in accordance with Section 01 52 00 - Construction Facilities.
  - .5 Site security in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.
  - .6 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements.
  - .7 Owner provided products.
  - .8 Record drawings in accordance with Section 01 33 00 - Submittal Procedures.
  - .9 Maintenance manuals in accordance with Section 01 78 00 - Closeout Submittals.

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

### **1.3 PROGRESS MEETINGS**

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

### **Part 2 Products**

#### **2.1 NOT USED**

- .1 Not Used.
- .2 Execution

#### **2.2 NOT USED**

- .1 Not Used.

**END OF SECTION**

**Part 1 General**

**1.1 DEFINITIONS**

- .1 Activity: element of Work performed during course of Project. Activity normally has expected duration, and expected cost and expected resource requirements. Activities can be subdivided into tasks.
- .2 Bar Chart (GANTT Chart): graphic display of schedule-related information. In typical bar chart, activities or other Project elements are listed down left side of chart, dates are shown across top, and activity durations are shown as date-placed horizontal bars. Generally Bar Chart should be derived from commercially available computerized project management system.
- .3 Baseline: original approved plan (for project, work package, or activity), plus or minus approved scope changes.
- .4 Construction Work Week: Monday to Friday, inclusive, will provide five day work week and define schedule calendar working days as part of Bar (GANTT) Chart submission.
- .5 Duration: number of work periods (not including holidays or other nonworking periods) required to complete activity or other project element. Usually expressed as workdays or workweeks.
- .6 Master Plan: summary-level schedule that identifies major activities and key milestones.
- .7 Milestone: significant event in project, usually completion of major deliverable.
- .8 Project Schedule: planned dates for performing activities and the planned dates for meeting milestones. Dynamic, detailed record of tasks or activities that must be accomplished to satisfy Project objectives. Monitoring and control process involves using Project Schedule in executing and controlling activities and is used as basis for decision making throughout project life cycle.
- .9 Project Planning, Monitoring and Control System: overall system operated by Departmental Representative to enable monitoring of project work in relation to established milestones.

**1.2 REQUIREMENTS**

- .1 Ensure Master Plan and Detail Schedules are practical and remain within specified Contract duration.
- .2 Plan to complete Work in accordance with prescribed milestones and time frame.
- .3 Limit activity durations to maximum of approximately 10 working days, to allow for progress reporting.
- .4 Ensure that it is understood that Award of Contract or time of beginning, rate of progress, Interim Certificate and Final Certificate as defined times of completion are of essence of this contract.

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

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

- .2 Submit to Departmental Representative within five working days of Award of Contract Bar (GANTT) Chart as Master Plan for planning, monitoring and reporting of project progress.
- .3 Submit Project Schedule to Departmental Representative within 5 working days of receipt of acceptance of Master Plan.

#### **1.4 PROJECT MILESTONES**

- .1 Project milestones form interim targets for Project Schedule.
  - .1 Interior finishing and fitting, mechanical, and electrical work completed within seventy working days of Award of Contract date.
  - .2 Interim Certificate (Substantial Completion) within eighty working days of Award of Contract date.

#### **1.5 MASTER PLAN**

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

#### **1.6 PROJECT SCHEDULE**

- .1 Develop detailed Project Schedule derived from Master Plan.
- .2 Ensure detailed Project Schedule includes as minimum milestone and activity types as follows:
  - .1 Award.
  - .2 Shop Drawings, Samples.
  - .3 Permits.
  - .4 Mobilization.
  - .5 Hoarding
  - .6 Demolition
  - .7 Interior Architecture (Walls, Floors and Ceiling).
  - .8 Plumbing.
  - .9 Lighting.
  - .10 Electrical.
  - .11 Heating, Ventilating, and Air Conditioning.
  - .12 Kitchen Equipment
  - .13 Testing and Commissioning.

**1.7 PROJECT SCHEDULE REPORTING**

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

**1.8 PROJECT MEETINGS**

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

**Part 2 Products**

**2.1 NOT USED**

- .1 Not used.

**Part 3 Execution**

**3.1 NOT USED**

- .1 Not used.

**END OF SECTION**



**Part 1 General**

**1.1 ADMINISTRATIVE**

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

**1.2 SHOP DRAWINGS AND PRODUCT DATA**

- .1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.
- .2 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Alberta.
- .3 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been co-ordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.
- .4 Allow ten days for Departmental Representative's review of each submission.
- .5 Adjustments made on shop drawings by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.

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

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

### 1.3 SAMPLES

- .1 Submit for review samples in duplicate as requested in respective specification Sections. Label samples with origin and intended use.
- .2 Deliver samples prepaid to Departmental Representative's business address site 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 samples.
- .5 Adjustments made on samples by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.
- .6 Make changes in samples which Departmental Representative may require, consistent with Contract Documents.
- .7 Reviewed and accepted samples will become standard of workmanship and material against which installed Work will be verified.

#### **1.4 MOCK-UPS**

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

#### **1.5 PHOTOGRAPHIC DOCUMENTATION**

- .1 Submit electronic copy of 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: locations.
  - .1 Viewpoints and their location as determined by Departmental Representative.
- .4 Frequency of photographic documentation: as directed by Departmental Representative.
  - .1 Upon completion of: demolition, framing and services before concealment, of Work, as directed by Departmental Representative.

#### **1.6 CERTIFICATES AND TRANSCRIPTS**

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

### **Part 2 Products**

#### **2.1 NOT USED**

- .1 Not Used.
- .2 Execution

#### **2.2 NOT USED**

- .1 Not Used.

**END OF SECTION**

**Part 1            General**

**1.1                REFERENCES AND CODES**

- .1        Perform Work in accordance with National Building Code of Canada (NBC) including amendments up to tender closing date and other codes of provincial or local application provided that in case of conflict or discrepancy, more stringent requirements apply.
- .2        Meet or exceed requirements of:
  - .1            Contract documents.
  - .2            Specified standards, codes and referenced documents.

**1.2                HAZARDOUS MATERIAL DISCOVERY**

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

**1.3                BUILDING SMOKING ENVIRONMENT**

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

**Part 2            Products**

**2.1                NOT USED**

- .1        Not Used.

**Part 3            Execution**

**3.1                NOT USED**

- .1        Not Used.

**END OF SECTION**



**Part 1 General**

**1.1 INSPECTION**

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

**1.2 INDEPENDENT INSPECTION AGENCIES**

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

**1.3 ACCESS TO WORK**

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

**1.4 PROCEDURES**

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

**1.5 REJECTED WORK**

- .1 Remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by Departmental Representative as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.
- .2 Make good other Contractor's work damaged by such removals or replacements promptly.

**1.6 REPORTS**

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

**1.7 TESTS AND MIX DESIGNS**

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

**1.8 MILL TESTS**

- .1 Submit mill test certificates as required of specification Sections.

**1.9 EQUIPMENT AND SYSTEMS**

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

**Part 2 Products**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 Execution**

**3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

**Part 1 General**

**1.1 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 Departmental Representative will pay for utility charges.

**1.3 TEMPORARY HEATING AND VENTILATION**

- .1 Provide temporary heating required during construction period, including attendance, maintenance and fuel.
- .2 Construction heaters used inside building must be vented to outside or be non-flameless type. Solid fuel salamanders are not permitted.
- .3 Provide temporary heat and ventilation in enclosed areas as required to:
  - .1 Facilitate progress of Work.
  - .2 Protect Work and products against dampness and cold.
  - .3 Prevent moisture condensation on surfaces.
  - .4 Provide ambient temperatures and humidity levels for storage, installation and curing of materials.
  - .5 Provide adequate ventilation to meet health regulations for safe working environment.
- .4 Maintain temperatures of minimum 10 degrees C in areas where construction is in progress.
- .5 Ventilating:
  - .1 Prevent accumulations of dust, fumes, mists, vapours or gases in areas occupied during construction.
  - .2 Provide local exhaust ventilation to prevent harmful accumulation of hazardous substances into atmosphere of occupied areas.
  - .3 Dispose of exhaust materials in manner that will not result in harmful exposure to persons.
  - .4 Ventilate storage spaces containing hazardous or volatile materials.
  - .5 Ventilate temporary sanitary facilities.
  - .6 Continue operation of ventilation and exhaust system for time after cessation of work process to assure removal of harmful contaminants.
- .6 Permanent heating system of building, to be used when available. Be responsible for damage to heating system if use is permitted.
- .7 On completion of Work for which permanent heating system is used, replace filters, clean ducts and diffusers.
- .8 Ensure Date of Substantial Performance and Warranties for heating system do not commence until entire system is in as near original condition as possible and is certified by Departmental Representative.

- .9 Maintain strict supervision of operation of temporary heating and ventilating equipment to:
  - .1 Conform with applicable codes and standards.
  - .2 Enforce safe practices.
  - .3 Prevent abuse of services.
  - .4 Prevent damage to finishes.
  - .5 Vent direct-fired combustion units to outside.
- .10 Be responsible for damage to Work due to failure in providing adequate heat and protection during construction.

#### **1.4 TEMPORARY POWER AND LIGHT**

- .1 Departmental Representative will pay for temporary power during construction for temporary lighting and operating of power tools, to a maximum supply of 230 volts 30 amps.
- .2 Temporary power for electric cranes and other equipment required in excess of above is responsibility of Departmental Representative.
- .3 Provide and maintain temporary lighting throughout project. Ensure level of illumination on all floors and stairs is not less than 162 lx.
- .4 Electrical power and lighting systems installed under this Contract may be used for construction requirements only with prior approval of Departmental Representative provided that guarantees are not affected. Make good damage to electrical system caused by use under this Contract. Replace lamps which have been used for more than 3 months.

#### **1.5 TEMPORARY COMMUNICATION FACILITIES**

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

#### **1.6 FIRE PROTECTION**

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

### **Part 2 Products**

#### **2.1 NOT USED**

- .1 Not Used.

### **Part 3 Execution**

#### **3.1 NOT USED**

- .1 Not Used

**END OF SECTION**

**Part 1 General**

**1.1 REFERENCES**

- .1 Public Works Government Services Canada (PWGSC) Standard Acquisition Clauses and Conditions (SACC)-ID: R0202D, Title: General Conditions 'C', In Effect as of: May 14, 2004.

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

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

**1.3 INSTALLATION AND REMOVAL**

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

**1.4 SITE STORAGE/LOADING**

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

**1.5 CONSTRUCTION PARKING**

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

**1.6 SECURITY**

- .1 Provide hoarding necessary to create a secure construction area. Departmental representative will arrange for security personnel.

**1.7 OFFICES**

- .1 Provide office heated to 22 degrees C, lighted 750 lx and ventilated, of sufficient size to accommodate site meetings and furnished with drawing laydown table.
- .2 Provide marked and fully stocked first-aid case in a readily available location.
  - .1 Inside dimensions minimum 3.6 m long x 3 m wide x 2.4 m high, with floor 0.3 m above grade, complete with 4 50% opening windows and one lockable door.
  - .2 Insulate building and provide heating system to maintain 22 degrees C inside temperature at -20 degrees C outside temperature.

- .3 Finish inside walls and ceiling with plywood, hardboard or wallboard. Finish floor with 19 mm thick plywood.
- .4 Install electrical lighting system to provide min 750 lx using surface mounted, shielded commercial fixtures with 10 % upward light component.
- .5 Provide private washroom facilities adjacent to office complete with flush or chemical type toilet, lavatory and mirror and maintain supply of paper towels and toilet tissue.
- .6 Equip office with 1 x 2 m table, 4 chairs, 6 m of shelving 300 mm wide, one 3 drawer filing cabinet, one plan rack and one coat rack and shelf.
- .7 Maintain in clean condition.

#### **1.8 EQUIPMENT, TOOL AND MATERIALS STORAGE**

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

#### **1.9 SANITARY FACILITIES**

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

#### **1.10 CONSTRUCTION SIGNAGE**

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

#### **1.11 PROTECTION AND MAINTENANCE OF TRAFFIC**

- .1 Provide access as necessary to maintain traffic.
- .2 Maintain and protect traffic on affected roads during construction period except as otherwise specifically directed by Departmental Representative.
- .3 Provide measures for protection and diversion of traffic, including provision of watch-persons and flag-persons, erection of barricades, placing of lights around and in front of equipment and work, and erection and maintenance of adequate warning, danger, and direction signs

- .4 Contractor's traffic on roads selected for hauling material to and from site to interfere as little as possible with public traffic.
- .5 Verify adequacy of existing roads and allowable load limit on these roads. Contractor: responsible for repair of damage to roads caused by construction operations.

**1.12 CLEAN-UP**

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

**Part 2 Products**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 Execution**

**3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**



**Part 1 General**

**1.1 REFERENCES**

- .1 Canadian General Standards Board (CGSB)
  - .1 CGSB 1.59-97, Alkyd Exterior Gloss Enamel.
  - .2 CAN/CGSB 1.189-00, Exterior Alkyd Primer for Wood.
- .2 Canadian Standards Association (CSA International)
  - .1 CSA-O121-M1978(R2003), Douglas Fir Plywood.
- .3 Public Works Government Services Canada (PWGSC) Standard Acquisition Clauses and Conditions (SACC)-ID: R0202D, Title: General Conditions 'C', In Effect as Of: May 14, 2004.

**1.2 INSTALLATION AND REMOVAL**

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

**1.3 HOARDING**

- .1 Erect temporary construction area enclosures using 38 x 89 mm construction grade lumber framing at 600 mm centres and 1200 x 2400 x 13 mm fir plywood to CSA O121.
- .2 Apply plywood panels vertically flush and butt jointed.

**1.4 DUST TIGHT SCREENS**

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

**1.5 FIRE ROUTES**

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

**1.6 PROTECTION OF BUILDING FINISHES**

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

**Part 2            Products**

**2.1                NOT USED**

.1            Not Used.

**Part 3            Execution**

**3.1                NOT USED**

.1            Not Used.

**END OF SECTION**

**Part 1 General**

**1.1 REFERENCES**

- .1 Within text of each specifications section, reference may be made to reference standards.
- .2 Conform to these reference standards, in whole or in part as specifically requested in specifications.
- .3 If there is question as to whether products or systems are in conformance with applicable standards, Departmental Representative reserves right to have such products or systems tested to prove or disprove conformance.
- .4 Cost for such testing will be born by Departmental Representative in event of conformance with Contract Documents or by Contractor in event of non-conformance.

**1.2 QUALITY**

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

**1.3 AVAILABILITY**

- .1 Immediately upon signing Contract, review product delivery requirements and anticipate foreseeable supply delays for items. If delays in supply of products are foreseeable, notify Departmental Representative of such, in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of Work.
- .2 In event of failure to notify Departmental Representative at commencement of Work and should it subsequently appear that Work may be delayed for such reason, Departmental Representative reserves right to substitute more readily available products of similar character, at no increase in Contract Price or Contract Time.

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**1.4 STORAGE, HANDLING AND PROTECTION**

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

**1.5 TRANSPORTATION**

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

**1.6 MANUFACTURER'S INSTRUCTIONS**

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

**1.7 QUALITY OF WORK**

- .1 Ensure Quality of Work is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed. Immediately notify Departmental Representative if required Work is such as to make it impractical to produce required results.
- .2 Do not employ anyone unskilled in their required duties. Departmental Representative reserves right to require dismissal from site, workers deemed incompetent or careless.
- .3 Decisions as to standard or fitness of Quality of Work in cases of dispute rest solely with Departmental Representative, whose decision is final.

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**1.8 CO-ORDINATION**

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

**1.9 CONCEALMENT**

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

**1.10 REMEDIAL WORK**

- .1 Perform remedial work required to repair or replace parts or portions of Work identified as defective or unacceptable. Co-ordinate adjacent affected Work as required.
- .2 Perform remedial work by specialists familiar with materials affected. Perform in a manner to neither damage nor put at risk any portion of Work.

**1.11 LOCATION OF FIXTURES**

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

**1.12 FASTENINGS**

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

**1.13 FASTENINGS - EQUIPMENT**

- .1 Use fastenings of standard commercial sizes and patterns with material and finish suitable for service.
- .2 Use heavy hexagon heads, semi-finished unless otherwise specified. Use No. 304 stainless steel for exterior areas.
- .3 Bolts may not project more than one diameter beyond nuts.

- .4 Use plain type washers on equipment, sheet metal and soft gasket lock type washers where vibrations occur. Use resilient washers with stainless steel.

#### **1.14 PROTECTION OF WORK IN PROGRESS**

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

#### **1.15 EXISTING UTILITIES**

- .1 When breaking into or connecting to existing services or utilities, execute Work at times directed by local governing authorities, with minimum of disturbance to Work, and/or building occupants.
- .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            ACTION AND INFORMATIONAL SUBMITTALS**

- .1      Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2      Submit written request in advance of cutting or alteration which affects:
  - .1          Structural integrity of elements of project.
  - .2          Integrity of weather-exposed or moisture-resistant elements.
  - .3          Efficiency, maintenance, or safety of operational elements.
  - .4          Visual qualities of sight-exposed elements.
  - .5          Work of Owner or separate contractor.
- .3      Include in request:
  - .1          Identification of project.
  - .2          Location and description of affected Work.
  - .3          Statement on necessity for cutting or alteration.
  - .4          Description of proposed Work, and products to be used.
  - .5          Alternatives to cutting and patching.
  - .6          Effect on Work of Owner or separate contractor.
  - .7          Written permission of affected separate contractor.
  - .8          Date and time work will be executed.

**1.2            MATERIALS**

- .1      Required for original installation.
- .2      Change in Materials: Submit request for substitution in accordance with Section 01 33 00 - Submittal Procedures.

**1.3            PREPARATION**

- .1      Inspect existing conditions, including elements subject to damage or movement during cutting and patching.
- .2      After uncovering, inspect conditions affecting performance of Work.
- .3      Beginning of cutting or patching means acceptance of existing conditions.
- .4      Provide supports to assure structural integrity of surroundings; provide devices and methods to protect other portions of project from damage.
- .5      Provide protection from elements for areas which are to be exposed by uncovering work; maintain excavations free of water.

**1.4            EXECUTION**

- .1      Execute cutting, fitting, and patching to complete Work.
- .2      Fit several parts together, to integrate with other Work.

- .3 Uncover Work to install ill-timed Work.
- .4 Remove and replace defective and non-conforming Work.
- .5 Provide openings in non-structural elements of Work for penetrations of mechanical and electrical Work.
- .6 Execute Work by methods to avoid damage to other Work, and which will provide proper surfaces to receive patching and finishing.
- .7 Employ original installer to perform cutting and patching for weather-exposed and moisture-resistant elements, and sight-exposed surfaces.
- .8 Cut rigid materials using masonry saw or core drill. Pneumatic or impact tools not allowed on masonry work without prior approval.
- .9 Restore work with new products in accordance with requirements of Contract Documents.
- .10 Fit Work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- .11 Refinish surfaces to match adjacent finishes: Refinish continuous surfaces to nearest intersection. Refinish assemblies by refinishing entire unit.
- .12 Conceal pipes, ducts and wiring in floor, wall and ceiling construction of finished areas except where indicated otherwise.

**1.5 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for reuse or recycling to minimize amount of waste going to landfill.

**Part 2 Products**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 Execution**

**3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

**Part 1 General**

**1.1 REFERENCES**

- .1 Public Works Government Services Canada (PWGSC) Standard Acquisition Clauses and Conditions (SACC)-ID: R0202D, Title: General Conditions "C", In Effect as Of: May 14, 2004.

**1.2 PROJECT CLEANLINESS**

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

**1.3 FINAL CLEANING**

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

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

**1.4 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for reuse or recycling to minimize amount of materials going to landfill..

**Part 2 Products**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 Execution**

**3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

**Part 1            General**

**1.1                ADMINISTRATIVE REQUIREMENTS**

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

- .7 Final Payment:
  - .1 When Departmental Representative considers final deficiencies and defects corrected and requirements of Contract met, make application for final payment.
  - .2 When Work deemed incomplete by Departmental Representative, complete outstanding items and request re-inspection.
- .8 Payment of Holdback: after issuance of Certificate of Substantial Performance of Work, submit application for payment of holdback amount in accordance with contractual agreement.

**1.2 FINAL CLEANING**

- .1 Clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.
- .2 Waste Management: separate waste materials for reuse recycling to minimize amount of waste going to landfill.

**Part 2 Products**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 Execution**

**3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

**Part 1 General**

**1.1 ADMINISTRATIVE REQUIREMENTS**

- .1 Pre-warranty Meeting:
  - .1 Convene meeting one week prior to contract completion with contractor's representative and Departmental Representative, in accordance with Section 01 31 19 - Project Meetings to:
    - .1 Verify Project requirements.
    - .2 Review warranty requirements and manufacturer's installation instructions.
  - .2 Departmental Representative to establish communication procedures for:
    - .1 Notifying construction warranty defects.
    - .2 Determine priorities for type of defects.
    - .3 Determine reasonable response time.
  - .3 Contact information for bonded and licensed company for warranty work action: provide name, telephone number and address of company authorized for construction warranty work action.
  - .4 Ensure contact is located within local service area of warranted construction, is continuously available, and is responsive to inquiries for warranty work action.

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

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

**1.3 FORMAT**

- .1 Organize data as instructional manual.
- .2 Binders: vinyl, hard covered, 3 'D' ring, loose leaf 216 x 279 mm with spine and face pockets.
- .3 When multiple binders are used, correlate data into related consistent groupings.
  - .1 Identify contents of each binder on spine.
- .4 Cover: identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.
- .5 Arrange content by systems, under Section numbers and sequence of Table of Contents.
- .6 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.

- .7 Text: manufacturer's printed data, or typewritten data.
- .8 Drawings: provide with reinforced punched binder tab.
  - .1 Bind in with text; fold larger drawings to size of text pages.

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

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

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

- .1 Maintain, at site for Departmental Representative one record copy of:
  - .1 Contract Drawings.
  - .2 Specifications.
  - .3 Addenda.
  - .4 Change Orders and other modifications to Contract.
  - .5 Reviewed shop drawings, product data, and samples.
  - .6 Field test records.
  - .7 Inspection certificates.
  - .8 Manufacturer's certificates.
- .2 Store record documents and samples in field office apart from documents used for construction.
  - .1 Provide files, racks, and secure storage.
- .3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual.
  - .1 Label each document "PROJECT RECORD" in neat, large, printed letters.
- .4 Maintain record documents in clean, dry and legible condition.

- .1 Do not use record documents for construction purposes.
- .5 Keep record documents and samples available for inspection by Departmental Representative.

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

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

## **1.7 EQUIPMENT AND SYSTEMS**

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

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

## **1.8 MATERIALS AND FINISHES**

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

## **1.9 MAINTENANCE MATERIALS**

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

- .1 Submit inventory listing to Departmental Representative.
  - .2 Include approved listings in Maintenance Manual.
  - .5 Obtain receipt for delivered products and submit prior to final payment.
- .2 Extra Stock Materials:
  - .1 Provide maintenance and extra materials, in quantities specified in individual specification sections.
  - .2 Provide items of same manufacture and quality as items in Work.
  - .3 Deliver to site, place and store.
  - .4 Receive and catalogue items.
    - .1 Submit inventory listing to Departmental Representative.
    - .2 Include approved listings in Maintenance Manual.
    - .5 Obtain receipt for delivered products and submit prior to final payment.
- .3 Special Tools:
  - .1 Provide special tools, in quantities specified in individual specification section.
  - .2 Provide items with tags identifying their associated function and equipment.
  - .3 Deliver to site; place and store.
  - .4 Receive and catalogue items.
    - .1 Submit inventory listing to Departmental Representative.
    - .2 Include approved listings in Maintenance Manual.

**1.10 DELIVERY, STORAGE AND HANDLING**

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

**1.11 WARRANTIES AND BONDS**

- .1 Develop warranty management plan to contain information relevant to Warranties.
- .2 Submit warranty management plan, 30 days before planned pre-warranty conference, to Departmental Representative for approval.
- .3 Warranty management plan to include required actions and documents to assure that Departmental Representative receives warranties to which it is entitled.
- .4 Provide plan in narrative form and contain sufficient detail to make it suitable for use by future maintenance and repair personnel.
- .5 Submit warranty information made available during construction phase, to Departmental Representative for approval prior to each monthly pay estimate.

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

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

**1.12 WARRANTY TAGS**

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

**Part 2 Products**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 Execution**

**3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**



**Part 1 General**

**1.1 ADMINISTRATIVE REQUIREMENTS**

- .1 Demonstrate operation and maintenance of equipment and systems to Owner's personnel two weeks prior to date of final inspection.
- .2 Owner: provide list of personnel to receive instructions, and co-ordinate their attendance at agreed-upon times.
- .3 Preparation:
  - .1 Verify conditions for demonstration and instructions comply with requirements.
  - .2 Verify designated personnel are present.
  - .3 Ensure equipment has been inspected and put into operation in accordance with Section 01 77 00 Closeout Procedures.
  - .4 Ensure testing, adjusting, and balancing has been performed in accordance with Section 01 91 13 - General Commissioning (Cx) Requirements and equipment and systems are fully operational.
- .4 Demonstration and Instructions:
  - .1 Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, and maintenance of each item of equipment at scheduled times, at the equipment location.
  - .2 Instruct personnel in phases of operation and maintenance using operation and maintenance manuals as basis of instruction.
  - .3 Review contents of manual in detail to explain aspects of operation and maintenance.
  - .4 Prepare and insert additional data in operations and maintenance manuals when needed during instructions.
  - .5 Time allocated for instructions: Ensure amount of time required for instruction of each item of equipment or system as follows:
    - .1 Division 11 – Food Service Equipment : 2 hours of instructions.

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

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

**1.3 QUALITY ASSURANCE**

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

**Part 2 Products**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 Execution**

**3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

**Part 1 General**

**1.1 SUMMARY**

- .1 Acronyms:
  - .1 BMM - Building Management Manual.
  - .2 Cx - Commissioning.
  - .3 EMCS - Energy Monitoring and Control Systems.
  - .4 O M - Operation and Maintenance.
  - .5 PI - Product Information.
  - .6 PV - Performance Verification.
  - .7 TAB - Testing, Adjusting and Balancing.

**1.2 GENERAL**

- .1 Cx is a planned program of tests, procedures and checks carried out systematically on systems and integrated systems of the finished Project. Cx is performed after systems and integrated systems are completely installed, functional and Contractor's Performance Verification responsibilities have been completed and approved. Objectives:
  - .1 Verify installed equipment, systems and integrated systems operate in accordance with contract documents and design criteria and intent.
  - .2 Ensure appropriate documentation is compiled into the BMM.
  - .3 Effectively train O M staff.
- .2 Contractor assists in Cx process, operating equipment and systems, troubleshooting and making adjustments as required.
  - .1 Systems to be operated at full capacity under various modes to determine if they function correctly and consistently at peak efficiency. Systems to be interactively with each other as intended in accordance with Contract Documents and design criteria.
  - .2 During these checks, adjustments to be made to enhance performance to meet environmental or user requirements.
- .3 Design Criteria: as per client's requirements or determined by designer. To meet Project functional and operational requirements.

**1.3 COMMISSIONING OVERVIEW**

- .1 Section 01 91 31 - Commissioning (Cx) Plan.
- .2 For Cx responsibilities refer to Section 01 91 31 - Commissioning (Cx) Plan.
- .3 Cx to be a line item of Contractor's cost breakdown.
- .4 Cx activities supplement field quality and testing procedures described in relevant technical sections.
- .5 Cx is conducted in concert with activities performed during stage of project delivery. Cx identifies issues in Planning and Design stages which are addressed during Construction

and Cx stages to ensure the built facility is constructed and proven to operate satisfactorily under weather, environmental and occupancy conditions to meet functional and operational requirements. Cx activities includes transfer of critical knowledge to facility operational personnel.

- .6 Departmental Representative will issue Interim Acceptance Certificate when:
  - .1 Completed Cx documentation has been received, reviewed for suitability and approved by Departmental Representative.
  - .2 Equipment, components and systems have been commissioned.
  - .3 O M training has been completed.

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

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

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

- .1 Before Construction:
  - .1 Review contract documents, confirm by writing to Departmental Representative.
    - .1 Adequacy of provisions for Cx.
    - .2 Aspects of design and installation pertinent to success of Cx.
- .2 During Construction:
  - .1 Co-ordinate provision, location and installation of provisions for Cx.
- .3 Before start of Cx:
  - .1 Have completed Cx Plan up-to-date.
  - .2 Ensure installation of related components, equipment, sub-systems, systems is complete.
  - .3 Fully understand Cx requirements and procedures.
  - .4 Have Cx documentation shelf-ready.
  - .5 Understand completely design criteria and intent and special features.
  - .6 Submit complete start-up documentation to Departmental Representative.
  - .7 Have Cx schedules up-to-date.
  - .8 Ensure systems have been cleaned thoroughly.
  - .9 Complete TAB procedures on systems, submit TAB reports to Departmental Representative for review and approval.
  - .10 Ensure "As-Built" system schematics are available.

- .4 Inform Departmental Representative in writing of discrepancies and deficiencies on finished works.

## **1.6 CONFLICTS**

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

## **1.7 ACTION AND INFORMATIONAL SUBMITTALS**

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

## **1.8 COMMISSIONING DOCUMENTATION**

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

## **1.9 COMMISSIONING SCHEDULE**

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

## **1.10 COMMISSIONING MEETINGS**

- .1 Convene Cx meetings following project meetings: 01 32 16.07 - Construction Progress Schedules - Bar (GANTT) Chart and as specified herein.

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

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

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

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

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

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

- .1 Factory testing: manufacturer to:
  - .1 Coordinate time and location of testing.
  - .2 Provide testing documentation for approval by Departmental Representative.
  - .3 Arrange for Departmental Representative to witness tests.
  - .4 Obtain written approval of test results and documentation from Departmental Representative before delivery to site.
- .2 Obtain manufacturers installation, start-up and operations instructions prior to start-up of components, equipment and systems and review with Departmental Representative.
  - .1 Compare completed installation with manufacturer's published data, record discrepancies, and review with manufacturer.
  - .2 Modify procedures detrimental to equipment performance and review same with manufacturer before start-up.

- .3 Integrity of warranties:
  - .1 Use manufacturer's trained start-up personnel where specified elsewhere in other divisions or required to maintain integrity of warranty.
  - .2 Verify with manufacturer that testing as specified will not void warranties.
- .4 Qualifications of manufacturer's personnel:
  - .1 Experienced in design, installation and operation of equipment and systems.
  - .2 Ability to interpret test results accurately.
  - .3 To report results in clear, concise, logical manner.

#### **1.14 PROCEDURES**

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

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

- .1 Assemble start-up documentation and submit to Departmental Representative for approval before commencement of commissioning.

- .2 Start-up documentation to include:
  - .1 Factory and on-site test certificates for specified equipment.
  - .2 Pre-start-up inspection reports.
  - .3 Signed installation/start-up check lists.
  - .4 Start-up reports,
  - .5 Step-by-step description of complete start-up procedures, to permit Departmental Representative to repeat start-up at any time.

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

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

#### **1.17 TEST RESULTS**

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

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

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

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

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

## **1.20 COMMISSIONING PERFORMANCE VERIFICATION**

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

## **1.21 WITNESSING COMMISSIONING**

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

## **1.22 AUTHORITIES HAVING JURISDICTION**

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

## **1.23 EXTENT OF VERIFICATION**

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

## **1.24 REPEAT VERIFICATIONS**

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

**1.25 SUNDRY CHECKS AND ADJUSTMENTS**

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

**1.26 DEFICIENCIES, FAULTS, DEFECTS**

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

**1.27 COMPLETION OF COMMISSIONING**

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

**1.28 ACTIVITIES UPON COMPLETION OF COMMISSIONING**

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

**1.29 TRAINING**

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

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

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

**1.31 OCCUPANCY**

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

**1.32 INSTALLED INSTRUMENTATION**

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

**1.33 PERFORMANCE VERIFICATION TOLERANCES**

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

**1.34 OWNER'S PERFORMANCE TESTING**

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

**Part 2 Products**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 Execution**

**3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**



**Part 1            General**

**1.1            REFERENCES**

- .1    Public Works and Government Services Canada (PWGSC)
  - .1        PWGSC - Commissioning Guidelines CP.4 -3rd edition-03.
- .2    Underwriters' Laboratories of Canada (ULC)

**1.2            GENERAL**

- .1    Provide a fully functional facility:
  - .1        Systems, equipment and components meet user's functional requirements before date of acceptance, and operate consistently at peak efficiencies and within specified energy budgets under normal loads.
  - .2        Facility user and O M personnel have been fully trained in aspects of installed systems.
  - .3        Optimized life cycle costs.
  - .4        Complete documentation relating to installed equipment and systems.
- .2    Term "Cx" in this section means "Commissioning".
- .3    Use this Cx Plan as master planning document for Cx:
  - .1        Outlines organization, scheduling, allocation of resources, documentation, pertaining to implementation of Cx.
  - .2        Communicates responsibilities of team members involved in Cx Scheduling, documentation requirements, and verification procedures.
  - .3        Sets out deliverables relating to O M, process and administration of Cx.
  - .4        Describes process of verification of how built works meet design requirements.
  - .5        Produces a complete functional system prior to issuance of Certificate of Occupancy.
  - .6        Management tool that sets out scope, standards, roles and responsibilities, expectations, deliverables, and provides:
    - .1            Overview of Cx.
    - .2            General description of elements that make up Cx Plan.
    - .3            Process and methodology for successful Cx.
- .4    Acronyms:
  - .1        Cx - Commissioning.
  - .2        BMM - Building Management Manual.
  - .3        MSDS - Material Safety Data Sheets.
  - .4        PI - Product Information.
  - .5        PV - Performance Verification.
  - .6        TAB - Testing, Adjusting and Balancing.
  - .7        WHMIS - Workplace Hazardous Materials Information System.

- .5 Commissioning terms used in this Section:
  - .1 Bumping: short term start-up to prove ability to start and prove correct rotation.
  - .2 Deferred Cx - Cx activities delayed for reasons beyond Contractor's control due to lack of occupancy, weather conditions, need for heating/cooling loads.

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

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

### **1.4 REFINEMENT OF CX PLAN**

- .1 During construction phase, revise, refine and update Cx Plan to include:
  - .1 Changes resulting from Client program modifications.
  - .2 Approved design and construction changes.
- .2 Revise, refine and update every four weeks during construction phase. At each revision, indicate revision number and date.
- .3 Submit each revised Cx Plan to Departmental Representative for review and obtain written approval.
- .4 Include testing parameters at full range of operating conditions and check responses of equipment and systems.

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

- .1 Departmental Representative to maintain overall responsibility for project and is sole point of contact between members of commissioning team.
- .2 Project Manager will select Cx Team consisting of following members:
  - .1 PWGSC Design Quality Review Team: during construction, will conduct periodic site reviews to observe general progress.
  - .2 PWGSC Quality Assurance Commissioning Manager: ensures Cx activities are carried out to ensure delivery of a fully operational project including:
    - .1 Review of Cx documentation from operational perspective.
    - .2 Review for performance, reliability, durability of operation, accessibility, maintainability, operational efficiency under conditions of operation.
    - .3 Protection of health, safety and comfort of occupants and O M personnel.
    - .4 Monitoring of Cx activities, training, development of Cx documentation.

- .5 Work closely with members of Cx Team.
- .3 Departmental Representative is responsible for:
  - .1 Organizing Cx.
  - .2 Monitoring operations Cx activities.
  - .3 Witnessing, certifying accuracy of reported results.
  - .4 Witnessing and certifying TAB and other tests.
  - .5 Developing BMM.
  - .6 Ensuring implementation of final Cx Plan.
  - .7 Performing verification of performance of installed systems and equipment.
  - .8 Implementation of Training Plan.
- .4 Construction Team: contractor, sub-contractors, suppliers and support disciplines, is responsible for construction/installation in accordance with contract documents, including:
  - .1 Testing.
  - .2 TAB.
  - .3 Performance of Cx activities.
  - .4 Delivery of training and Cx documentation.
  - .5 Assigning one person as point of contact with Consultant and PWGSC Cx Manager for administrative and coordination purposes.
- .5 Contractor's Cx agent implements specified Cx activities including:
  - .1 Demonstrations.
  - .2 Training.
  - .3 Testing.
  - .4 Preparation, submission of test reports.
- .6 Property Manager: represents lead role in Operation Phase and onwards and is responsible for:
  - .1 Receiving facility.
  - .2 Day-To-Day operation and maintenance of facility.

## 1.6 CX PARTICIPANTS

- .1 Employ the following Cx participants to verify performance of equipment and systems:
  - .1 Installation contractor/subcontractor:
    - .1 Equipment and systems except as noted.
  - .2 Equipment manufacturer: equipment specified to be installed and started by manufacturer.
    - .1 To include performance verification.
  - .3 Specialist subcontractor: equipment and systems supplied and installed by specialist subcontractor.

- .4 Specialist Cx agency:
  - .1 Possessing specialist qualifications and installations providing environments essential to client's program but are outside scope or expertise of Cx specialists on this project.
- .5 Client: responsible for intrusion and access security systems.
- .6 Ensure that Cx participant:
  - .1 Could complete work within scheduled time frame.
  - .2 Available for emergency and troubleshooting service during first year of occupancy by user for adjustments and modifications outside responsibility of O M personnel, including:
    - .1 Modify ventilation rates to meet changes in off-gassing.
    - .2 Changes to heating or cooling loads beyond scope of EMCS.
    - .3 Redistribution of electrical services.
    - .4 Modifications of fire alarm systems.
    - .5 Modifications to voice communications systems.
- .7 Provide names of participants to Departmental Representative and details of instruments and procedures to be followed for Cx 3 months prior to starting date of Cx for review and approval.

## 1.7 EXTENT OF CX

- .1 Cx Structural and Architectural Systems:
  - .1 Architectural and structural:
    - .1 Equipment.
    - .2 Kitchen equipment installed under contract.
- .2 Commission mechanical systems and associated equipment:
  - .1 Plumbing systems:
    - .1 Domestic CWS and HWS.
    - .2 Regular sanitary waste systems.
  - .2 HVAC and exhaust systems:
    - .1 HVAC systems.
    - .2 General exhaust systems.
    - .3 Exhaust systems and related systems.
  - .3 Fire and lift safety systems:
    - .1 Wet pipe sprinkler systems.
  - .4 Commission electrical systems and equipment:
    - .1 Lighting Systems
      - .1 Lighting equipment
    - .2 Fire alarm system and equipment:
      - .1 Annunciators.

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

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

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

- .1 General:
  - .1 Start-up, testing and Cx requirements, conditions for acceptance and specifications form part of relevant technical sections of these specifications.
- .2 Definitions:
  - .1 Cx as used in this section includes:
    - .1 Cx of components, equipment, systems, subsystems, and integrated systems.
    - .2 Factory inspections and performance verification tests.
- .3 Deliverables: provide:
  - .1 Cx Specifications.
  - .2 Startup, pre-Cx activities and documentation for systems, and equipment.
  - .3 Completed installation checklists (ICL).
  - .4 Completed product information (PI) report forms.
  - .5 Completed performance verification (PV) report forms.
  - .6 Results of Performance Verification Tests and Inspections.
  - .7 Description of Cx activities and documentation.
  - .8 Description of Cx of integrated systems and documentation.
  - .9 Tests of following witnessed by PWGSC Design Quality Review Team:
    - .1 Kitchen equipment.
  - .10 Tests performed by Owner/User.
  - .11 Training Plans.
  - .12 Cx Reports.
  - .13 Prescribed activities during warranty period.

- .4 Departmental Representative to witness and certify tests and reports of results provided to Departmental Representative.
- .5 Departmental Representative to participate.

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

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

- .1 Tests to include verification of lighting levels and coverage, initially by disrupting normal power.
- .2 Fire alarm systems: test after other safety and security systems are completed. Testing to include a complete verification in accordance with ULC requirements. Departmental Representative has witnessed and certified report, demonstrate devices and zones to Departmental Representative.
- .3 Low voltage systems: these include:
  - .1 Communications, low voltage lighting control systems and data communications systems.
- .4 Security, surveillance systems: to include verification by Departmental Representative.

#### **1.11 START-UP**

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

#### **1.12 CX ACTIVITIES AND RELATED DOCUMENTATION**

- .1 Perform Cx by specified Cx agency using procedures developed by Departmental Representative and approved by Departmental Representative.
- .2 Departmental Representative to monitor Cx activities.
- .3 Upon satisfactory completion, Cx agency performing tests to prepare Cx Report using approved PV forms.
- .4 Departmental Representative to witness, certify reported results of, Cx activities and forward to Departmental Representative.

- .5 Departmental Representative reserves right to verify a percentage of reported results at no cost to contract.

### **1.13 CX OF INTEGRATED SYSTEMS AND RELATED DOCUMENTATION**

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

### **1.14 INSTALLATION CHECK LISTS (ICL)**

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

### **1.15 PRODUCT INFORMATION (PI) REPORT FORMS**

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

### **1.16 PERFORMANCE VERIFICATION (PV) REPORT**

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

### **1.17 DELIVERABLES RELATING TO ADMINISTRATION OF CX**

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

### **1.18 CX SCHEDULES**

- .1 Prepare detailed Cx Schedule and submit to Departmental Representative for review and approval same time as project Construction Schedule. Include:

- .1 Milestones, testing, documentation, training and Cx activities of components, equipment, subsystems, systems and integrated systems, including:
  - .1 Design criteria, design intents.
  - .2 Pre-TAB review: 14days after contract award, and before construction starts.
  - .3 Cx agents' credentials: 60 days before start of Cx.
  - .4 Cx procedures: 1 months after award of contract.
  - .5 Cx Report format: 1months after contract award.
  - .6 Notification of intention to start TAB: 14 days before start of TAB.
  - .7 TAB: after successful start-up, correction of deficiencies and verification of normal and safe operation.
  - .8 Notification of intention to start Cx: 14 days before start of Cx.
  - .9 Notification of intention to start Cx of integrated systems: after Cx of related systems is completed 14days before start of integrated system Cx.
  - .10 Identification of deferred Cx.
  - .11 Implementation of training plans.
  - .12 Cx reports: immediately upon successful completion of Cx.
- .2 Detailed training schedule to demonstrate no conflicts with testing, completion of project and hand-over.
- .2 After approval, incorporate Cx Schedule into Construction Schedule.
- .3 Consultant, Contractor, Contractor's Cx agent, and Departmental Representative will monitor progress of Cx against this schedule.

#### **1.19 CX REPORTS**

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

#### **1.20 ACTIVITIES DURING WARRANTY PERIOD**

- .1 Cx activities must be completed before issuance of Interim Certificate, it is anticipated that certain Cx activities may be necessary during Warranty Period, including:
  - .1 Fine tuning of HVAC systems.
  - .2 Adjustment of ventilation rates to promote good indoor air quality and reduce deleterious effects of VOCs generated by off-gassing from construction materials and furnishings.

#### **1.21 TESTS TO BE PERFORMED BY OWNER/USER**

- .1 None is anticipated on this project.

**1.22 TRAINING PLANS**

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

**1.23 FINAL SETTINGS**

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

**Part 2 Products**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 Execution**

**3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

**Part 1 General**

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

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

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

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

**1.3 PERFORMANCE VERIFICATION (PV) FORMS**

- .1 PV forms to be used for checks, running dynamic tests and making adjustments carried out on equipment and systems to ensure correct operation, efficiency and that they function independently or interactively with other systems as intended with project requirements.
- .2 PV report forms include those developed by Contractor to record measured data and readings taken during functional testing and Performance Verification procedures.
- .3 Prior to PV of integrated system, complete PV forms of related systems and obtain Departmental Representative's approval.

**1.4 SAMPLES OF COMMISSIONING FORMS**

- .1 Departmental Representative will develop and provide to Contractor required project-specific Commissioning forms in electronic format complete with specification data.

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**1.5 CHANGES AND DEVELOPMENT OF NEW REPORT FORMS**

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

**1.6 COMMISSIONING FORMS**

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

**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 TRAINEES**

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

**1.2 INSTRUCTORS**

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

**1.3 TRAINING OBJECTIVES**

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

**1.4 TRAINING MATERIALS**

- .1 Instructors to be responsible for content and quality.
- .2 Training materials to include:
  - .1 "As-Built" Contract Documents.
  - .2 Operating Manual.

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

## **1.5 SCHEDULING**

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

## **1.6 RESPONSIBILITIES**

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

## **1.7 TRAINING CONTENT**

- .1 Training to include demonstrations by Instructors using the installed equipment and systems.
- .2 Content includes:
  - .1 Review of facility and occupancy profile.
  - .2 Functional requirements.
  - .3 System philosophy, limitations of systems and emergency procedures.
  - .4 Review of system layout, equipment, components and controls.
  - .5 Equipment and system start-up, operation, monitoring, servicing, maintenance and shut-down procedures.
  - .6 System operating sequences, including step-by-step directions for starting up, shut-down, operation of valves, dampers, switches, adjustment of control settings and emergency procedures.

- .7 Maintenance and servicing.
- .8 Trouble-shooting diagnosis.
- .9 Inter-Action among systems during integrated operation.
- .10 Review of O M documentation.
- .3 Provide specialized training as specified in relevant Technical Sections of the construction specifications.

**1.8 VIDEO-BASED TRAINING**

- .1 Manufacturer's videotapes to be used as training tool with Departmental Representative's review and written approval 2 months prior to commencement of scheduled training.

**Part 2 Products**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 Execution**

**3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**



**Part 1            General**

**1.1               SUMMARY**

- .1    Acronyms:
  - .1    BMM - Building Management Manual.
  - .2    Cx - Commissioning.
  - .3    HVAC - Heating, Ventilation and Air Conditioning.
  - .4    PI - Product Information.
  - .5    PV - Performance Verification.
  - .6    TAB - Testing, Adjusting and Balancing.
  - .7    WHMIS - Workplace Hazardous Materials Information System.

**1.2               GENERAL REQUIREMENTS**

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

**1.3               APPROVALS**

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

**1.4               GENERAL INFORMATION**

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

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

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

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

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

- .1 Samples of LSC Manual will be available from Departmental Representative.
- .2 Content of Manual:
  - .1 All possible Emergency situations modes including: presence of fire and smoke, power failure, lose of water or pressure, chemical spills and refrigerant release.
  - .2 Failure of elevators and escalators.
  - .3 HVAC emergencies and fuel supply failures.
  - .4 Intrusion and security breach.

- .5 Emergency provisions for natural disasters, bomb threats and other disruptive situations.
- .6 Dedicated emergency generators for high security projects, medical facilities and computer systems.
- .7 Emergency control procedures for fire, power and major equipment failure.
- .8 Emergency contacts and numbers.
- .9 Manual to be readily available and comprehensible to non- technical readers.

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

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

## **1.8 IDENTIFICATION OF FACILITY**

- .1 When submitting information to Departmental Representative for incorporation into BMM, use following system for identification of documentation:
  - .1 Grande Cache Institute Dish Room Revitalization.

**1.9 USE OF CURRENT TECHNOLOGY**

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

**Part 2 Products**

**2.1 NOT USED**

- .1 Not used.

**Part 3 Execution**

**3.1 NOT USED**

- .1 Not used.

**END OF SECTION**

**Part 1 General**

**1.1 REFERENCES**

- .1 Definitions:
  - .1 Demolition: rapid destruction of building following removal of hazardous materials.
  - .2 Hazardous Materials: dangerous substances, dangerous goods, hazardous commodities and hazardous products, may include but not limited to: asbestos PCB's, CFC's, HCFC's poisons, corrosive agents, flammable substances, ammunition, explosives, radioactive substances, or other material that can endanger human health or well being or environment if handled improperly.
- .2 Reference Standards:
  - .1 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
    - .1 Material Safety Data Sheets (MSDS).

**1.2 ADMINISTRATIVE REQUIREMENTS**

- .1 Site Meetings.
  - .1 Convene pre-demolition meeting one week prior to beginning work of this Section in accordance with Section 01 32 16.07 - Construction Progress Schedules - Bar (GANTT) Chart to:
    - .1 Verify project requirements.
    - .2 Review installation and substrate conditions.
    - .3 Co-ordination with other building subtrades.
  - .2 Arrange for site visit with Departmental Representative to examine existing site conditions adjacent to demolition work, prior to start of Work.

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Hazardous Materials:
  - .1 Provide description of Hazardous Materials and Notification of Filing with proper authorities prior to beginning of Work as required.

**1.4 QUALITY ASSURANCE**

- .1 Regulatory Requirements: ensure Work is performed in compliance with applicable Provincial/Territorial regulations.

## **1.5 DELIVERY, STORAGE AND HANDLING**

- .1 Storage and Protection.
  - .1 Protect existing items designated to remain and items designated for salvage. In event of damage to such items, immediately replace or make repairs to approval of Departmental Representative and at no cost to Departmental Representative.
  - .2 Remove and store materials to be salvaged, in manner to prevent damage.
  - .3 Store and protect in accordance with requirements for maximum preservation of material.
  - .4 Handle salvaged materials as new materials.

## **1.6 SITE CONDITIONS**

- .1 Site Environmental Requirements.
  - .1 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.
  - .2 Do not pump water containing suspended materials into watercourses, storm or sanitary sewers or onto adjacent properties.

## **Part 2 Products**

### **2.1 EQUIPMENT**

- .1 Leave machinery running only while in use, except where extreme temperatures prohibit shutting machinery down.

## **Part 3 Execution**

### **3.1 PREPARATION**

- .1 Inspect site with Departmental Representative and verify extent and location of items designated for removal, disposal, alternative disposal, recycling, salvage and items to remain.
- .2 Locate and protect utilities. Preserve active utilities traversing site in operating condition.

### **3.2 REMOVAL OPERATIONS**

- .1 Remove items as indicated.
- .2 Do not disturb items designated to remain in place.
- .3 Salvage:
  - .1 All equipment designated for demolition becomes the property of the general contractor to salvage or to dispose of at his discretion.
- .4 Disposal of Material:
  - .1 Dispose of materials not selected for salvage at authorized facilities.

**3.3 REMOVAL FROM SITE**

- .1 Remove waste materials from site at daily regularly scheduled times.
- .2 Dispose of materials not designated for alternate disposal in accordance with applicable local regulations.

**3.4 RESTORATION**

- .1 Restore areas and existing works outside areas of demolition to match condition of adjacent, undisturbed areas.

**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.
- .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 or recycling as acceptable to local facilities.
  - .1 Remove recycling materials from site and dispose of materials at appropriate facility.

**3.6 PROTECTION**

- .1 Repair damage to adjacent materials or property caused by selective site demolition.

**END OF SECTION**



**Part 1 General**

**1.1 REFERENCES**

- .1 ASTM International
  - .1 ASTM A185/A185M-07, Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
- .2 CSA International
  - .1 CSA-A23.1/A23.2-2004, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
  - .2 CSA A3000-08, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
  - .3 CAN/CSA-G30.18-M92(R2002), Billet-Steel Bars for Concrete Reinforcement.

**1.2 ADMINISTRATIVE REQUIREMENTS**

- .1 Pre-installation Meetings: in accordance with Section 01 32 16.07 - Construction Progress Schedules - Bar (GANTT) Chart, convene pre-installation meeting one week prior to beginning concrete works.
  - .1 Ensure Departmental Representative attend.
  - .2 Verify project requirements.

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Provide testing results for review by Departmental Representative and do not proceed without written approval when deviations from mix design or parameters are found.
- .3 Concrete hauling time: provide for review by Departmental Representative deviations exceeding maximum allowable time of 120 minutes for concrete to be delivered to site of Work and discharged after batching.

**1.4 QUALITY ASSURANCE**

- .1 Provide to Departmental Representative, 2 weeks minimum prior to starting concrete work, valid and recognized certificate from plant delivering concrete.
  - .1 Quality Control: provide written report to Departmental Representative verifying compliance that concrete in place meets performance requirements.

**1.5 DELIVERY, STORAGE AND HANDLING**

- .1 Delivery and Acceptance Requirements:
  - .1 Concrete hauling time: deliver to site of Work and discharged within 120 minutes maximum after batching.
    - .1 Do not modify maximum time limit without receipt of prior written agreement from Departmental Representative and concrete producer as described in CSA A23.1/A23.2.

- .2 Deviations to be submitted for review by the Departmental Representative.
- .2 Concrete delivery: ensure continuous concrete delivery from plant meets CSA A23.1/A23.2.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Cement: to CSA A3001, Type GU
- .2 Blended hydraulic cement: Type GUb to CSA A3001.
- .3 Supplementary cementing materials: with minimum 20% type F fly ash replacement, by mass of total cementitious materials to CSA A3001.
- .4 Water: to CSA A23.1/A23.2.
- .5 Reinforcing bars: to CAN/CSA-G30.18, Grade 400.
- .6 Welded steel wire fabric: to CAN/CSA G30.5
- .7 Joint sealer/filler: grey to CAN/CGSB-19.24, Type 1, Class B.
- .8 Air entraining admixture to ASTM C260-10.
- .9 Shrinkage reducing admixture.
- .10 Other concrete materials: to CSA A23.1/A23.2.

### **2.2 MIXES**

- .1 Alternative 1 - Performance Method for specifying concrete: to meet Departmental Representative performance criteria to CSA A23.1/A23.2.
  - .1 Ensure concrete supplier meets performance criteria as established below and provide verification of compliance as described in PART 3 – VERIFICATION.
  - .2 Provide concrete mix to meet following plastic state requirements:
    - .1 Uniformity to meet requirements of CSA A23.1/A23.2
    - .2 Workability: free of surface blemishes and segregation.
  - .3 Provide concrete mix to meet following hard state requirements:
    - .1 Durability and class of exposure: N
    - .2 Compressive strength at 28 days 35 MPa minimum.
    - .3 Intended application: Interior Floor Slab.
    - .4 Aggregate size: 19 mm maximum.
    - .5 Volume stability: minimize volume change due to shrinkage.
  - .4 Concrete supplier's certification.
  - .5 Provide quality management plan to ensure verification of concrete quality to specified performance.

**Part 3 Execution**

**3.1 PREPARATION**

- .1 Provide Departmental Representative 24 hours notice before each concrete pour.
- .2 Place concrete reinforcing in accordance with CSA A23.1.
- .3 During concreting operations:
  - .1 Development of cold joints not allowed.
  - .2 Ensure concrete delivery and handling facilitates placing with minimum of rehandling, and without damage to existing structure or Work.
- .4 Protect previous Work from staining.
- .5 Clean and remove stains prior to application of concrete finishes.

**3.2 INSTALLATION/APPLICATION**

- .1 Do cast-in-place concrete work in accordance with CSA A23.1/A23.2.
- .2 Sleeves and inserts:
  - .1 Cast in sleeves, ties, slots, anchors, reinforcement, frames, conduit, bolts, waterstops, joint fillers and other inserts required to be built-in.
  - .2 Sleeves and openings greater than 100 mm x 100 mm not indicated, must be reviewed by Departmental Representative.

**3.3 FINISHES**

- .1 Interior floor slabs to receive quarry tile flooring requiring smooth surface: initial finishing operations followed by final finishing comprising mechanical floating and steel trowelling as specified in CSA A23.1/A23.2 to produce hard, smooth, dense trowelled surface free from blemishes.

**3.4 EXPANSION AND ISOLATION JOINTS**

- .1 Install premoulded joint filler in expansion and isolation joints full depth of slab flush with finished surface to CSA A23.1/A23.2.

**3.5 CURING**

- .1 Use curing compounds compatible with applied finish on concrete surfaces free of bonding agents and to CSA A23.1/A23.2.

**3.6 SITE TOLERANCES**

- .1 Concrete floor slab finishing tolerance to CSA A23.1/A23.2.

**3.7 FIELD QUALITY CONTROL**

- .1 Concrete testing: to CSA A23.1/A23.2 by testing laboratory designated and paid for by Departmental Representative. Accelerated test methods will apply.

**3.8                    CLEANING**

- .1            Clean in accordance with Section 01 74 11 - Cleaning.
- .2            Use trigger operated spray nozzles for water hoses.
- .3            Designate cleaning area for tools to limit water use and runoff.

**END OF SECTION**

**Part 1 General**

**1.1 REFERENCES**

- .1 ASTM International
  - .1 ASTM A496/A496M-07, Standard Specification for Steel Wire, Deformed, for Concrete Reinforcement.
- .2 CSA International
  - .1 CAN/CSA-A165 SERIES-04(R2009), CSA Standards on Concrete Masonry Units covers: A165.1, A165.2, A165.3.
  - .2 CAN/CSA-A179-04(R2009), Mortar and Grout for Unit Masonry.
  - .3 CAN/CSA-A370-04(R2009), Connectors for Masonry.
  - .4 CSA G30.18-09, Carbon Steel Bars for Concrete Reinforcement.

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

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

**1.3 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 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 off ground indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect masonry products from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.

**Part 2 Products**

**2.1 MASONRY UNITS**

- .1 Standard concrete block units: to CAN/CSA-A165 Series (CAN/CSA-A165.1).
  - .1 Classification: H/15/D/M.
  - .2 Size: modular.

## **2.2 REINFORCEMENT AND CONNECTORS**

- .1 Bar reinforcement: to CSA G30.18, Grade 400.
- .2 Wire reinforcement: to CAN/CSA-A371, truss type.
- .3 Connectors shall be corrosion resistant: to CSA S304.1.

## **2.3 MORTAR AND GROUT**

- .1 Mortar: to CAN/CSA-A179.
  - .1 Use aggregate passing 1.18 mm sieve where 6 mm thick joints are indicated.
  - .2 Colour: ground coloured natural aggregates or metallic oxide pigments.
- .2 Mortar Type: S based on specifications,
- .3 Following applies regardless of mortar types and uses specified above:
  - .1 Mortar for grouted reinforced masonry: type S based on property specifications.
- .4 Grout: to CAN/CSA-A179, Table 3.
- .5 Parging mortar: type N to CAN/CSA-A179.

## **Part 3 Execution**

### **3.1 EXAMINATION**

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for product 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

### **3.2 INSTALLATION**

- .1 Do masonry work in accordance with CAN/CSA-A371 except where specified otherwise.
  - .1 Bond: running stretcher bond with vertical joints in perpendicular alignment and centred on adjacent stretchers above and below.
  - .2 Coursing height: 200 mm for one block and one joint.
  - .3 Jointing: cut joints flush.
- .2 Build masonry plumb, level, and true to line, with vertical joints in alignment.
- .3 Layout coursing and bond to achieve correct coursing heights, and continuity of bond above and below openings, with minimum of cutting.

### **3.3 CONSTRUCTION**

- .1 Building-in:
  - .1 Install masonry connectors and reinforcement where indicated on drawings.
  - .2 Build in items required to be built into masonry.
  - .3 Prevent displacement of built-in items during construction. Check plumb, location and alignment frequently, as work progresses.
  - .4 Brace door jambs to maintain plumb. Fill spaces between jambs and masonry with mortar.
- .2 Support of loads:
  - .1 Use 35 MPa concrete to Section 03 30 00 - Cast-in-Place Concrete, where concrete fill is used in lieu of solid units.
  - .2 Use grout to CAN/CSA-A179 where grout is used in lieu of solid units.
  - .3 Install building paper below voids to be filled with concrete or grout; keep paper 25 mm back from faces of units.
- .3 Interface with other work:
  - .1 Cut openings in existing work as indicated.
  - .2 Openings in walls: approved by Departmental Representative.
  - .3 Make good existing work. Use materials to match existing.

### **3.4 REINFORCING AND CONNECTING**

- .1 Install masonry connectors and reinforcement in accordance with CAN/CSA-A370, CAN/CSA-A371 and CSA S304.1 unless indicated otherwise.
- .2 Prior to placing concrete or mortar, obtain Departmental Representative's approval of placement of reinforcement and connectors.

### **3.5 BONDING AND TYING**

- .1 Bond walls of two or more wythes using metal connectors in accordance with CAN/CSA-A371, CSA S304.1 and as indicated.

### **3.6 GROUTING**

- .1 Grout masonry in accordance with CAN/CSA-A179, CAN/CSA-A371 and CSA S304.1 and as indicated.

### **3.7 ANCHORS**

- .1 Supply and install metal anchors as indicated.

### **3.8 LATERAL SUPPORT AND ANCHORAGE**

- .1 Supply and install lateral support and anchorage in accordance with CSA S304.1 and as indicated.

### **3.9 SITE TOLERANCES**

- .1 Tolerances of CAN/CSA-A371 apply.

**3.10 FIELD QUALITY CONTROL**

- .1 Inspection and testing will be carried out by Testing Laboratory designated by Departmental Representative.

**3.11 CLEANING**

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

**3.12 PROTECTION**

- .1 Protect masonry and other work from marking and other damage. Protect completed work from mortar droppings. Use non-staining coverings.
- .2 Repair damage to adjacent materials caused by masonry products installation.

**END OF SECTION**

**Part 1 General**

**1.1 REFERENCES**

- .1 ASTM International
  - .1 ASTM A53/A53M-07, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
  - .2 ASTM A269-08, Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
  - .3 ASTM A307-07b, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
- .2 CSA International
  - .1 CSA G40.20/G40.21-04(R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
  - .2 CAN/CSA G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
  - .3 CSA S16-09, Design of Steel Structures.
  - .4 CSA W48-06, Filler Metals and Allied Materials for Metal Arc Welding (Developed in co-operation with the Canadian Welding Bureau).
  - .5 CSA W59-M03(R2008), Welded Steel Construction (Metal Arc Welding) Metric.
- .3 The Master Painters Institute (MPI)
  - .1 Architectural Painting Specification Manual.

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Shop Drawings:
  - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Alberta, Canada.
  - .2 Indicate materials, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.

**1.3 QUALITY ASSURANCE**

- .1 Test Reports: submit certified test reports showing compliance with specified performance characteristics and physical properties.
- .2 Certifications: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

**1.4 DELIVERY, STORAGE AND HANDLING**

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

- .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 off ground indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Replace defective or damaged materials with new.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Steel sections and plates: to CSA G40.20/G40.21, Grade 300W 350W.
- .2 Steel pipe: to ASTM A53/A53M standard weight galvanized finish.
- .3 Welding materials: to CSA W59.
- .4 Welding electrodes: to CSA W48 Series.
- .5 Bolts and anchor bolts: to ASTM A307.
- .6 Stainless steel tubing: to ASTM A269, Type 302 commercial grade seamless welded with AISI No. 4 finish.

### **2.2 FABRICATION**

- .1 Fabricate work square, true, straight and accurate to required size, with joints closely fitted and properly secured.
- .2 Use self-tapping shake-proof flat headed screws on items requiring assembly by screws or as indicated.
- .3 Where possible, fit and shop assemble work, ready for erection.
- .4 Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush.

### **2.3 CHANNEL FRAMES**

- .1 Fabricate frames from steel, sizes of channel and opening as indicated.
- .2 Weld channels together to form continuous frame for jambs and head of openings, sizes as indicated.
- .3 Weld 100 x 40 x 3 mm thick steel strap anchors to channel jamb frame at 600 mm on centre.
- .4 Finish: prime coat painted.

**Part 3 Execution**

**3.1 EXAMINATION**

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for metal fabrications 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 ERECTION**

- .1 Do welding work in accordance with CSA W59 unless specified otherwise.
- .2 Erect metalwork square, plumb, straight, and true, accurately fitted, with tight joints and intersections.
- .3 Provide suitable means of anchorage acceptable to Departmental Representative such as dowels, anchor clips, bar anchors, expansion bolts and shields, and toggles.
- .4 Exposed fastening devices to match finish and be compatible with material through which they pass.
- .5 Supply components for work by other trades in accordance with shop drawings and schedule.
- .6 Weld field connections.
- .7 Deliver items over for casting into concrete and building into masonry together with setting templates to appropriate location and construction personnel.
- .8 Touch-up rivets, field welds, bolts and burnt or scratched surfaces with primer after completion:
  - .1 Primer: maximum VOC limit 250 g/L to GS-11.
- .9 Touch-up galvanized surfaces with zinc rich primer where burned by field welding.
  - .1 Primer: maximum VOC limit 250 g/L to GS-11.

**3.3 CHANNEL FRAMES**

- .1 Install steel channel frames to openings as indicated.

**3.4 CLEANING**

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

**3.5 PROTECTION**

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by metal fabrications installation.

**END OF SECTION**

**Part 1 General**

**1.1 REFERENCES**

- .1 ASTM International
  - .1 ASTM C919-08, Standard Practice for Use of Sealants in Acoustical Applications.
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for joint sealants and include product characteristics, performance criteria, physical size, finish and limitations.
  - .2 Manufacturer's product to describe:
    - .1 Caulking compound.
    - .2 Primers.
    - .3 Sealing compound, each type, including compatibility when different sealants are in contact with each other.
  - .3 Submit electronic copies of WHMIS MSDS.
- .3 Manufacturer's Instructions:
  - .1 Submit electronic copy of installation instructions for each product used.

**1.3 CLOSEOUT SUBMITTALS**

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for incorporation into manual.

**1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 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 off ground indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Replace defective or damaged materials with new.

## 1.5 SITE CONDITIONS

- .1 Ambient Conditions:
  - .1 Proceed with installation of joint sealants only when:
    - .1 Ambient and substrate temperature conditions are within limits permitted by joint sealant manufacturer or are above 4.4 degrees C.
    - .2 Joint substrates are dry.
    - .3 Conform to manufacturer's recommended temperatures, relative humidity, and substrate moisture content for application and curing of sealants including special conditions governing use.
- .2 Joint-Width Conditions:
  - .1 Proceed with installation of joint sealants only where joint widths are more than those allowed by joint sealant manufacturer for applications indicated.
- .3 Joint-Substrate Conditions:
  - .1 Proceed with installation of joint sealants only after contaminants capable of interfering with adhesion are removed from joint substrates.

## 1.6 ENVIRONMENTAL REQUIREMENTS

- .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labelling and provision of Material Safety Data Sheets (MSDS) acceptable to Health Canada.
- .2 Ventilate area of work as directed by Departmental Representative by use of approved portable supply and exhaust fans.

## Part 2 Products

### 2.1 SEALANT MATERIALS

- .1 Do not use caulking that emits strong odours, contains toxic chemicals or is not certified as mould resistant in air handling units.
- .2 When low toxicity caulks are not possible, confine usage to areas which off gas to exterior, are contained behind air barriers, or are applied several months before occupancy to maximize off gas time.
- .3 Where sealants are qualified with primers use only these primers.

### 2.2 SEALANT MATERIAL DESIGNATIONS

- .1 Urethanes one part:
  - .1 Non-sag: to CAN/CGSB-19.13, Type 2, MCG-2-25 MCG-2-40, colour.
- .2 Silicones one part: to CAN/CGSB-19.13.
- .3 Acrylics one part: to CGSB 19-GP-5M.
- .4 Acrylic latex one part: to CAN/CGSB-19.17.

- .5 Acoustical sealant: to ASTM C919.
- .6 Butyl: to CGSB 19-GP-14M.
- .7 Preformed compressible and non-compressible back-up materials:
  - .1 Polyethylene, urethane, neoprene or vinyl foam:
    - .1 Extruded closed cell foam backer rod.
    - .2 Size: oversize 30 to 50 %.
  - .2 Neoprene or butyl rubber:
    - .1 Round solid rod, Shore A hardness 70.
  - .3 High density foam:
    - .1 Extruded closed cell polyvinyl chloride (PVC), extruded polyethylene, closed cell, Shore A hardness 20, tensile strength 140 to 200 kPa, extruded polyolefin foam, 32 kg/m<sup>3</sup> density, or neoprene foam backer, size as recommended by manufacturer.
  - .4 Bond breaker tape:
    - .1 Polyethylene bond breaker tape which will not bond to sealant.

## **2.3 SEALANT SELECTION**

- .1 Interior control and expansion joints in floor surfaces: sealant type: Urethane.
- .2 Perimeters of interior frames, as detailed and itemized: sealant type: Urethane.

## **2.4 JOINT CLEANER**

- .1 Non-corrosive and non-staining type, compatible with joint forming materials and sealant in accordance with sealant manufacturer's written recommendations.
- .2 Primer: in accordance with sealant manufacturer's written recommendations.

# **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 joint sealants 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 SURFACE PREPARATION**

- .1 Examine joint sizes and conditions to establish correct depth to width relationship for installation of backup materials and sealants.

- .2 Clean bonding joint surfaces of harmful matter substances including dust, rust, oil grease, and other matter which may impair Work.
- .3 Do not apply sealants to joint surfaces treated with sealer, curing compound, water repellent, or other coatings unless tests have been performed to ensure compatibility of materials. Remove coatings as required.
- .4 Ensure joint surfaces are dry and frost free.
- .5 Prepare surfaces in accordance with manufacturer's directions.

### **3.3 PRIMING**

- .1 Where necessary to prevent staining, mask adjacent surfaces prior to priming and caulking.
- .2 Prime sides of joints in accordance with sealant manufacturer's instructions immediately prior to caulking.

### **3.4 BACKUP MATERIAL**

- .1 Apply bond breaker tape where required to manufacturer's instructions.
- .2 Install joint filler to achieve correct joint depth and shape, with approximately 30% compression.

### **3.5 MIXING**

- .1 Mix materials in strict accordance with sealant manufacturer's instructions.

### **3.6 APPLICATION**

- .1 Sealant:
  - .1 Apply sealant in accordance with manufacturer's written instructions.
  - .2 Mask edges of joint where irregular surface or sensitive joint border exists to provide neat joint.
  - .3 Apply sealant in continuous beads.
  - .4 Apply sealant using gun with proper size nozzle.
  - .5 Use sufficient pressure to fill voids and joints solid.
  - .6 Form surface of sealant with full bead, smooth, free from ridges, wrinkles, sags, air pockets, embedded impurities.
  - .7 Tool exposed surfaces before skinning begins to give slightly concave shape.
  - .8 Remove excess compound promptly as work progresses and upon completion.
- .2 Curing:
  - .1 Cure sealants in accordance with sealant manufacturer's instructions.
  - .2 Do not cover up sealants until proper curing has taken place.

### **3.7 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work area clean at end of each day.

- .2 Clean adjacent surfaces immediately.
- .3 Remove excess and droppings, using recommended cleaners as work progresses.
- .4 Remove masking tape after initial set of sealant.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

**3.8 PROTECTION**

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by joint sealants installation.

**END OF SECTION**



**Part 1 General**

**1.1 ACTION AND INFORMATIONAL SUBMITTALS**

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

**1.2 CLOSEOUT SUBMITTALS**

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for cleaning and maintenance of stainless steel finishes for incorporation into manual.

**1.3 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 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 off ground indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect access doors from nicks, scratches, and blemishes.
  - .3 Apply temporary protective coating to finished surfaces. Remove coating after installation.
    - .1 Use coatings in accordance with manufacturer's written instructions that are easily removable.
    - .2 Leave protective coating in place until final cleaning of building.
  - .4 Replace defective or damaged materials with new.

**Part 2 Products**

**2.1 ACCESS DOORS**

- .1 Sizes: as follows unless indicated otherwise:
  - .1 For body entry: 600 x 600 mm minimum.
  - .2 For hand entry: 300 x 300 mm minimum.
- .2 Construction: rounded safety corners, continuous concealed rod hinges, mortise cylinder, anchor straps.

- .3 Materials:
  - .1 Stainless steel with polished finish.

**Part 3 Execution**

**3.1 EXAMINATION**

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for access door 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.

**3.2 INSTALLATION**

- .1 Installation: locate access doors within view of equipment and ensure equipment is accessible for operating, inspecting, adjusting, servicing without using special tools.
  - .1 Install gypsum board surfaces: in accordance with Section 09 21 16 - Gypsum Board Assemblies 09 23 00 - Gypsum Plastering.

**3.3 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

**3.4 PROTECTION**

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by access door installation.

**END OF SECTION**

**Part 1 General**

**1.1 REFERENCES**

- .1 Aluminum Association (AA)
  - .1 AA DAF 45-03(R2009), Designation System for Aluminum Finishes.
- .2 American Architectural Manufacturers Association (AAMA)
  - .1 AAMA 609/610-09, Cleaning and Maintenance Guide for Architecturally Finished Aluminum.
- .3 ASTM International
  - .1 ASTM A167-99(R2009), Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.
  - .2 ASTM A276-10, Standard Specification for Stainless Steel Bars and Shapes.
  - .3 ASTM A480/480M-11, Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet and Strip.
- .4 National Fire Prevention Association (NFPA)
  - .1 NFPA 80-2010, Standard for Fire Doors and Other Opening Protectives.
- .5 Underwriters Laboratories of Canada (ULC)
  - .1 CAN/ULC-S104-10, Standard Method for Fire Tests of Door Assemblies.
  - .2 CAN/ULC-S105-09, Standard Specification for Fire Door Frames.

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for coiling counter doors and hardware and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
  - .1 Indicate each type of coiling counter door, arrangement of hardware, operating mechanism and required clearances.
- .4 Manufacturers Reports:
  - .1 Manufacturer's Field Reports: submit manufacturer's written reports within 3 days of review, verifying compliance of Work, as described in Part 3 - FIELD QUALITY CONTROL.

**1.3 CLOSEOUT SUBMITTALS**

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for coiling counter doors and hardware for incorporation into manual.

## **1.4 QUALITY ASSURANCE**

- .1 Regulatory Agency Approvals:
  - .1 Steel fire rated doors and frames: labelled and listed by an organization accredited by Standards Council of Canada to CAN/ULC-S104 and CAN/ULC-S105 for ratings specified or indicated.
  - .2 Fabricate and install fire rated coiling metal counter doors in accordance with NFPA 80 to suit fire protection rating required.
- .2 Certifications: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

## **1.5 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 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 off ground indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect coiling counter doors from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Coiling doors.
- .2 Galvanized steel sheet: commercial quality, with ASTM A653 galvanized base coat, bonderized coating for prime coat adhesion, corrosion inhibiting primer 0.2 mils per side and thermosetting gray polyester top coat 0.6 mils per side.
  - .1 Locations: as indicated.
- .3 Primer: to MPI Painting Specification Manual.
  - .1 For galvanized sheet steel: to MPI #26.

### **2.2 COILING COUNTER DOORS**

- .1 Rivet continuous end locks to slat ends.
- .2 Assemble coiling counter door curtain of 32 mm wide x 10 mm thick, flat steel extruded interlocking slat sections.
- .3 Provide bottom bar of tubular extruded steel 51 mm x 32 mm.
- .4 Form guides of metal sections of 5 mm minimum thickness for face wall installation.
- .5 Construct counterbalance assembly consisting of torsion spring with 25% overload factor. Enclose spring in steel pipe to support door curtain and counterbalance

mechanism with maximum deflection of 1/400th of opening width. Provide ball bearings at rotating points. Provide spring tension adjusting wheel, accessible for setting.

- .6 Support counterbalance assembly on 5 mm minimum thickness steel plate brackets, forming end enclosures.
- .7 Enclose counter balance assembly with galvanized steel sheet formed hood.
- .8 Attach to hood sheet metal flame and smoke baffle to drop in place automatically when activated.
- .9 Equip coiling doors for latching from inside with slide bolts.

## **2.3 OPERATION**

- .1 Equip coiling counter doors for operation by:
  - .1 Hand, install 1 lift handle at coiling counter door bottom on inside face of coiling counter door or provide continuous extruded lifting strip.

## **Part 3 Execution**

### **3.1 EXAMINATION**

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for coiling counter doors 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 coiling counter door in accordance with manufacturers' printed instructions.
- .2 Adjust operable parts for correct function and smooth operation.

### **3.3 FIELD QUALITY CONTROL**

- .1 Site Test: Test doors for normal operation.

### **3.4 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work area clean at end of each day.
  - .2 Perform cleaning of aluminum components in accordance with: AAMA 609.
  - .3 Remove traces of primer, caulking; clean doors and frames.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

**3.5                PROTECTION**

- .1        Protect installed products and components from damage during construction.
- .2        Repair damage to adjacent materials caused by coiling counter door installation.

**END OF SECTION**

**Part 1 General**

**1.1 REFERENCES**

- .1 ASTM International
  - .1 ASTM C542-05, Standard Specification for Lock-Strip Gaskets.
  - .2 ASTM D2240-05, Standard Test Method for Rubber Property - Durometer Hardness.
  - .3 ASTM F1233-08, Standard Test Method for Security Glazing Materials and Systems.
- .2 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-12.1-M90, Tempered or Laminated Safety Glass.
- .3 Environmental Choice Program (ECP)
  - .1 CCD-045-95(R2005), Sealants and Caulking Compounds.
- .4 Glass Association of North American (GANA)
  - .1 GANA Glazing Manual - 2008.
  - .2 GANA Laminated Glazing Reference Manual - 2009.

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for sealants, and glazing accessories and include product characteristics, performance criteria, finish and limitations.

**1.3 CLOSEOUT SUBMITTALS**

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

**1.4 QUALITY ASSURANCE**

- .1 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

**1.5 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .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 off ground indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

- .2 Replace defective or damaged materials with new.

## **1.6 AMBIENT CONDITIONS**

- .1 Ambient Requirements:
  - .1 Install glazing when ambient temperature is 10 degrees C minimum. Maintain ventilated environment for 24 hours after application.
  - .2 Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Sealant: in accordance with Section 07 92 00 – Joint Sealants.
  - .1 VOC Limit: 250 g/L maximum by weight to CCD-045.
  - .2 Ensure sealant does not contain chemical restrictions to CCD-045.

### **2.2 ACCESSORIES**

Lock-strip gaskets: to ASTM C542.

## **Part 3 Execution**

### **3.1 EXAMINATION**

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for glazing installation in accordance with manufacturer's written instructions.
  - .1 Verify that openings for glazing are correctly sized and within tolerance.
  - .2 Verify that surfaces of glazing channels or recesses are clean, free of obstructions, and ready to receive glazing.
  - .3 Visually inspect substrate in presence of Departmental Representative
  - .4 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  - .5 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

### **3.2 PREPARATION**

- .1 Clean contact surfaces with solvent and wipe dry.
- .2 Seal porous glazing channels or recesses with substrate compatible primer or sealer.
- .3 Prime surfaces scheduled to receive sealant.

**3.3                    INSTALLATION: INTERIOR - WET METHOD COMPOUND AND COMPOUND**

- .1      Perform work in accordance with GANA Glazing Manual GANA Laminated Glazing Reference Manual for glazing installation methods.
- .2      Install glazing resting on setting blocks. Install applied stop and centre light by use of spacer shims at 600 mm centres, 6 mm below sight line.
- .3      Locate and secure glazing light using spring wire clips glazers' clips.
- .4      Fill gaps between glazing and stops with glazing compound until flush with sight line. Tool surface to straight line.

**3.4                    CLEANING**

- .1      Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1          Leave Work area clean at end of each day.
    - .1              Remove traces of primer, caulking.
    - .2              Remove glazing materials from finish surfaces.
    - .3              Remove labels.
    - .4              Clean glass using approved non-abrasive cleaner in accordance with manufacturer's instructions.
  - .2          Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

**3.5                    PROTECTION**

- .1      Protect installed products and components from damage during construction.
- .2      After installation, mark each light with an "X" by using removable plastic tape or paste.
  - .1          Do not mark heat absorbing or reflective glass units.
- .3      Repair damage to adjacent materials caused by glazing installation.

**3.6                    SCHEDULE**

- .1      Existing glazing removed and reinstalled in new location, as indicated on drawings.

**END OF SECTION**



**Part 1 General**

**1.1 REFERENCES**

- .1 ASTM International
  - .1 ASTM C475-02(2007), Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
  - .2 ASTM C840-08, Standard Specification for Application and Finishing of Gypsum Board.
  - .3 ASTM C1002-07, Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
  - .4 ASTM C1047-09, Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.
  - .5 ASTM C1396/C1396M-09a, Standard Specification for Gypsum Wallboard.
- .2 Association of the Wall and Ceilings Industries International (AWCI)
  - .1 AWCI Levels of Gypsum Board Finish-97.

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

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

**1.3 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .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 gypsum board assemblies materials level off ground indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect gypsum board materials from nicks, scratches, and blemishes.
  - .3 Protect from weather, elements and damage from construction operations.
  - .4 Handle gypsum boards to prevent damage to edges, ends or surfaces.
  - .5 Replace defective or damaged materials with new.

**1.4 AMBIENT CONDITIONS**

- .1 Maintain temperature 10 degrees C minimum, 21 degrees C maximum for 48 hours prior to and during application of gypsum boards and joint treatment, and for 48 hours minimum after completion of joint treatment.
- .2 Apply board and joint treatment to dry, frost free surfaces.
- .3 Ventilation: ventilate building spaces as required to remove excess moisture that would prevent drying of joint treatment material immediately after its application.

**Part 2 Products**

**2.1 MATERIALS**

- .1 Water-resistant board: to ASTM C1396/C1396M regular, 16 mm thick, 1220mm wide x maximum practical length.
- .2 Metal furring runners to ASTM A653M - 00 hangers and tie wires to ASTM C754, inserts, anchors
- .3 Drywall furring channels: 0.5 mm core thickness galvanized steel channels for screw attachment of gypsum board to ASTM A645.
- .4 Casing beads, corner beads, control joints and edge trim: to ASTM C1047, metal, zinc-coated by hot-dip process 0.5 mm base thickness, perforated flanges, one piece length per location.
- .5 Sealants: in accordance with Section 07 92 00 - Joint Sealants.
  - .1 VOC limit 250 g/L maximum to SCAQMD Rule 1168.
  - .2 Acoustic sealant: in accordance with Section 07 92 00 - Joint Sealants.
- .6 Joint compound: to ASTM C475, asbestos-free.

**Part 3 Execution**

**3.1 EXAMINATION**

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for gypsum board assemblies 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 ERECTION**

- .1 Do application and finishing of gypsum board to ASTM C840 except where specified otherwise.

- .2 Erect hangers and runner channels for suspended gypsum board ceilings to ASTM C840 except where specified otherwise.
- .3 Support light fixtures by providing additional ceiling suspension hangers within 150 mm of each corner and at maximum 600 mm around perimeter of fixture.
- .4 Install work level to tolerance of 1:1200.
- .5 Frame with furring channels, perimeter of openings for access panels, light fixtures, diffusers, grilles, and any other service penetrations.

### 3.3 APPLICATION

- .1 Apply gypsum board after bucks, anchors, blocking, sound attenuation, electrical and mechanical work have been approved.
- .2 Apply single layer gypsum board to metal furring or framing using screw fasteners. Maximum spacing of screws 300 mm on centre.
  - .1 Single-Layer Application:
    - .1 Apply gypsum board on ceilings prior to application of walls to ASTM C840.
- .3 Apply water resistant gypsum board to dish room ceiling. Apply water resistant sealant to edges, ends, cut outs which expose gypsum core and to fastener heads.
- .4 Install ceiling boards in direction that will minimize number of end-butt joints. Stagger end joints at least 250 mm locate edge or end joints under supports.
- .5 Install gypsum board with face side out.
- .6 Do not install damaged or damp boards.

### 3.4 INSTALLATION

- .1 Erect accessories straight, plumb or level, rigid and at proper plane. Use full length pieces where practical. Make joints tight, accurately aligned and rigidly secured. Mitre and fit corners accurately, free from rough edges. Secure using contact adhesive for full length or at 150 mm on centre.
- .2 Install casing beads around perimeter of suspended ceilings.
- .3 Install casing beads where gypsum board butts against surfaces having no trim concealing junction and where indicated. Seal joints with sealant.
- .4 Install access doors to electrical and mechanical fixtures specified in respective sections.
  - .1 Rigidly secure frames to furring or framing systems.
- .5 Finish face panel joints and internal angles with joint system consisting of joint compound, joint tape and taping compound installed according to manufacturer's directions and feathered out onto panel faces.
- .6 Gypsum Board Finish: finish gypsum board walls and ceilings to following levels in accordance with AWCI Levels of Gypsum Board Finish:
  - .1 Levels of finish:
    - .1 Level 0: no tapping, finishing or accessories required.

- .2 Level 1: embed tape for joints and interior angles in joint compound. Surfaces to be free of excess joint compound; tool marks and ridges are acceptable.
- .3 Level 2: embed tape for joints and interior angles in joint compound and apply one separate coat of joint compound over joints, angles, fastener heads and accessories; surfaces free of excess joint compound; tool marks and ridges are acceptable.
- .4 Level 3: embed tape for joints and interior angles in joint compound and apply two separate coats of joint compound over joints, angles, fastener heads and accessories; surfaces smooth and free of tool marks and ridges.
- .5 Level 4: embed tape for joints and interior angles in joint compound and apply three separate coats of joint compound over joints, angles, fastener heads and accessories; surfaces smooth and free of tool marks and ridges.
- .6 Level 5: embed tape for joints and interior angles in joint compound and apply three separate coats of joint compound over joints, angles, fastener heads and accessories; apply a thin skim coat of joint compound to entire surface; surfaces smooth and free of tool marks and ridges.
- .7 Finish corner beads and trim as required with two coats of joint compound and one coat of taping compound, feathered out onto panel faces.
- .8 Fill screw head depressions with joint and taping compounds to bring flush with adjacent surface of gypsum board so as to be invisible after surface finish is completed.
- .9 Sand lightly to remove burred edges and other imperfections. Avoid sanding adjacent surface of board.
- .10 Completed installation to be smooth, level or plumb, free from waves and other defects and ready for surface finish.
- .11 Mix joint compound slightly thinner than for joint taping.
- .12 Apply thin coat to entire surface using trowel or drywall broad knife to fill surface texture differences, variations or tool marks.
- .13 Allow skim coat to dry completely.
- .14 Remove ridges by light sanding or wiping with damp cloth.

### **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 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

### **3.6 PROTECTION**

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by gypsum board assemblies installation.

**END OF SECTION**

**Part 1 General**

**1.1 REFERENCES**

- .1 American National Standards Institute (ANSI)/Ceramic Tile Institute (CTI)
  - .1 ANSI A108.1-99, Specification for the Installation of Ceramic Tile (Includes ANSI A108.1A-C, 108.4-.13, A118.1-.10, ANSI A136.1).
  - .2 CTI A118.4-92, Specification for Latex Cement Mortar (included in ANSI A108.1).
  - .3 CTI A118.6-92, Specification for Ceramic Tile Grouts (included in ANSI A108.1).
- .2 Terrazzo Tile and Marble Association of Canada (TTMAC)
  - .1 Tile Specification Guide 09 30 00 2006/2007, Tile Installation Manual.
  - .2 Tile Maintenance Guide 2000.

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Provide product data in accordance with Section 01 33 00 - Submittal Procedures.
  - .1 Include manufacturer's information on:
    - .1 Ceramic tile, marked to show each type, size, and shape required.
    - .2 Dry-set cement mortar and grout.
    - .3 Latex cement mortar and grout.
    - .4 Commercial cement grout.
    - .5 Organic adhesive.
- .3 Provide samples in accordance with Section 01 33 00 - Submittal Procedures.
  - .1 Wall tile: submit full size sample of each colour, texture, size, and pattern of tile.
  - .2 Floor base tile: submit full size sample of each colour, texture, size, and pattern of tile.

**1.3 QUALITY ASSURANCE**

- .1 Quality Assurance Submittals:
  - .1 Manufacturer's Instructions: manufacturer's installation instructions.
  - .2 Manufacturer's Field Reports: manufacturer's field reports specified.

**1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Packing, shipping, handling and unloading:
  - .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.

**1.5 AMBIENT CONDITIONS**

- .1 Maintain air temperature and structural base temperature at ceramic tile installation area above 12 degrees C for 48 hours before, during, and 48 hours after, installation.
- .2 Do not install tiles at temperatures less than 12 degrees C or above 38 degrees C.
- .3 Do not apply epoxy mortar and grouts at temperatures below 15 degrees C or above 25 degrees C.

**1.6 MAINTENANCE**

- .1 Extra Materials:
  - .1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.
  - .2 Provide minimum 2% of each type and colour of tile required for project for maintenance use. Store where directed.
  - .3 Maintenance material same production run as installed material.

**Part 2 Products**

**2.1 WALL AND CEILING TILE**

- .1 Ceramic tile: type, size, colour, and texture to match existing adjacent wall tile.

**2.2 BASE TILE**

- .1 Base: type, size, colour and texture to match existing adjacent flooring material.

**2.3 MORTAR AND ADHESIVE MATERIALS**

- .1 Cement: to CSA-A5, type 10.
- .2 Sand: to ASTM C144, passing 16 mesh.
- .3 Hydrated lime: to ASTM C207, Type N.
- .4 Latex additive: formulated for use in cement mortar and thin set bond coat.
- .5 Water: potable and free of minerals and chemicals which are detrimental to mortar and grout mixes.

**2.4 BOND COAT**

- .1 Latex Cement mortar: to ANSI A108.1, two-component universal dry-set mortar.

**2.5 GROUT**

- .1 Colouring Pigments:
  - .1 Pure mineral pigments, limeproof and nonfading, complying with ASTM C979.
  - .2 Coloring pigments to be added to grout by manufacturer.
  - .3 Job colored grout are not acceptable.
  - .4 Use in commercial cement grout, dry-set grout and latex cement grout.

## **2.6 MIXES**

- .1 Cement:
  - .1 Scratch coat: 1 part cement, 1/5 to 1/2 parts hydrated lime to suit job conditions, 4 parts sand, 1 part water, and latex additive where required. Adjust water volume depending on water content of sand.
  - .2 Mortar bed for walls: 1 part cement, 1/5 to 1/2 parts hydrated lime to suit job conditions, 4 parts sand and 1 part water. Adjust water volume depending on water content of sand. Latex additive may be included.
  - .3 Bond or setting coat: 1 part cement, 1/3 part hydrated lime, 1 part water.
  - .4 Measure mortar ingredients by volume.
- .2 Mix bond coats, and grout to manufacturer's instructions.
- .3 Adjust water volumes to suit water content of sand.

## **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 WORKMANSHIP**

- .1 Do tile work in accordance with TTMAC Tile Installation Manual 2006/2007, "Ceramic Tile", except where specified otherwise.
- .2 Apply tile or backing coats to clean and sound surfaces.
- .3 Fit tile around corners, fitments, fixtures, drains and other built-in objects. Maintain uniform joint appearance. Cut edges smooth and even. Do not split tiles.
- .4 Maximum surface tolerance 1:800.
- .5 Make joints between tile uniform and approximately 1.5 mm wide, plumb, straight, true, even and flush with adjacent tile. Ensure sheet layout not visible after installation. Align patterns.
- .6 Lay out tiles so perimeter tiles are minimum 1/2 size.
- .7 Sound tiles after setting and replace hollow-sounding units to obtain full bond.
- .8 Allow minimum 24 hours after installation of tiles, before grouting.
- .9 Clean installed tile surfaces after installation and grouting cured.

### **3.3 WALL TILE**

- .1 Install in accordance with TTMAC detail 302 W.

### **3.4 BASE TILE**

- .1 install in accordance with TTMAC detail 302 W.

**3.5 FIELD QUALITY CONTROL**

- .1 Manufacturer's Field Services:
  - .1 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.

**3.6 CLEANING**

- .1 Proceed in accordance with Section 01 74 11 - Cleaning.

**END OF SECTION**

**Part 1 General**

**1.1 REFERENCES**

- .1 American National Standards Institute (ANSI)/Ceramic Tile Institute (CTI)
  - .1 ANSI/CTI A108.1-1999, Specification for the Installation of Ceramic Tile.
- .2 American Society for Testing and Materials International (ASTM)
  - .1 ASTM C136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  - .2 ASTM C207-06, Standard Specification for Hydrated Lime for Masonry Purposes.
  - .3 ASTM C847-06, Standard Specification for Metal Lath.
- .3 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-8.1-M88, Sieves, Testing, Woven Wire, Metric.
  - .2 CAN/CGSB-25.20-95, Surface Sealer for Floors.
  - .3 CAN/CGSB-51.34-M86(R1988), Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
  - .4 CGSB 71-GP-29M-79, Adhesive, Elastomeric, for Installation of Quarry Tiles.
  - .5 CGSB 71-GP-30M-79, Adhesive, Epoxy and Modified Mortar Systems, for Installation of Quarry Tiles.
  - .6 CAN/CGSB-75.1-M88, Tile, Ceramic.
- .4 Canadian Standards Association (CSA International)
  - .1 CAN/CSA-A3000-03(R2006), Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
- .5 International Organization for Standardization (ISO)
  - .1 ISO 9001-00, Quality Management Systems Requirements.
  - .2 ISO 9002-98, Quality System Manual.
  - .3 ISO 14001-96(R2001), Environmental Management Systems.
- .6 Terrazzo, Tile and Marble Association of Canada (TTMAC)
  - .1 Tile Installation Manual 2006/2007.

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Provide product data in accordance with Section 01 33 00 - Submittal Procedures.
- .3 Submit proof of manufacturer's ISO 9001 registration and compliance to representative.
- .4 Provide samples in accordance with Section 01 33 00 - Submittal Procedures.
  - .1 Submit duplicate full size samples of each colour, texture, size and pattern of quarry tile.

### **1.3 DELIVERY, STORAGE AND HANDLING**

- .1 Packing, shipping, handling and unloading:
  - .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
  - .2 Deliver, store and handle products in manner to avoid damage.
  - .3 Have materials delivered to job site just prior to installation.
  - .4 Deliver products to job site in manufacturer's unopened cartons with labels intact and legible.
  - .5 Keep cartons dry and protected from vandalism and away from heavy traffic areas.
  - .6 Store cartons in upright position.
- .2 Safety: comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of materials.

### **1.4 AMBIENT CONDITIONS**

- .1 Ventilation:
  - .1 Provided continuously during and after installation. Run system 24 hours per day during installation; provide continuous ventilation for 7 days after completion of installation.
- .2 Temperature:
  - .1 Maintain ambient temperature of not less than 12 degrees C from 72 hours before installation until fully cured.
  - .2 Maintain ambient temperature of not less than 10 degrees C from 72 hours before installation until fully cured.
  - .3 Maintain ambient temperature of not less than 20 degrees C or above 35 degrees C from 72 hours before installation until fully cured.

### **1.5 MAINTENANCE**

- .1 Extra Materials:
  - .1 Provide minimum 2 % of each type and colour of quarry tile required for project maintenance use. Store where directed.
  - .2 Maintenance material same production run as installed material.

## **Part 2 Products**

### **2.1 TILES AND PAVERS**

- .1 Quarry tile: to CAN/CGSB-75.1, Type 4, Class MR 2 size to match existing, slip resistant face, cushioned edges, red colour. Matching square base.

### **2.2 MORTAR AND ADHESIVE MATERIALS**

- .1 Cement: to CAN/CSA-A3000.

- .2 Sand:
- .1 Crushed or pit run consisting of hard durable particles free from clay lumps, cementation, organic material, frozen material and other deleterious materials.
- .2 Gradations to be within limits specified when tested to ASTM C136. Sieve sizes to CAN/CGSB-8.1.
- .3 Table:

Sieve Designation	% Passing
4.75 mm	100
2.36 mm	95-100
1.18 mm	60-100
0.600 mm	35-80
0.300 mm	15-50
0.150 mm	2-15
0.075 mm	0-5

- .4 Hydrated lime: to ASTM C207.
- .5 Latex additive: formulated for use in cement mortar.
- .6 Water: potable and free of minerals which are detrimental to mortar and grout mixes.
- .7 Dry set mortar:
- .1 To ANSI A108.1
- .2 Water retentive cement mortar.
- .8 Elastomeric adhesive: to CGSB 71-GP-29M.
- .9 Epoxy adhesive: to CGSB 71-GP-30M, Type 1.
- .10 Modified Mortar adhesive: to CGSB 71-GP-30M, Type 2.
- .11 Adhesives: in accordance with Section 07 92 00 - Joint Sealants.
- .12 Colour pigment: non fading mineral oxides, unaffected by lime or cement and which will not stain tile.

## 2.3 GROUT

- .1 Cement grout: to ANSI/CTI A108.1.
- .2 Epoxy grout:
- .1 To ANSI/CTI A108.1
- .2 100 % solids epoxy mortar composed of 2 part thermosetting epoxy and graded silica sand.
- .3 Grout preparation: to manufacturer's instructions.

## 2.4 ACCESSORIES

- .1 Reinforcing mesh: 50 x 50 x 1.6 mm galvanized steel wire mesh.
- .2 Waterproofing and crack prevention/anti-fracture membrane.
- .3 Protective coating: to tile and grout manufacturer's recommendations.
- .4 Sealants: in accordance with Section 07 92 00 - Joint Sealants.

- .1 Type: Elastomeric
- .2 Sealants primers:

## **2.5 MIXES**

- .1 Scratch coat: 1 part cement, 1/5 to 1/2 parts hydrated lime to suit job conditions, 4 parts sand, 1 part water. Adjust water volume depending on water content of sand.
- .2 Slurry bond coat: cement and water mixed to creamy paste. Latex additive may be included.
- .3 Mortar bed for floors: 1 part cement, 4 parts sand, 1 part water. Adjust water volume depending on water content of sand. Latex additive may be included.
- .4 Levelling coat: 1 part cement, 4 parts sand, minimum 1/10 part latex additive, 1 part water, including latex additive.
- .5 Bond or setting coat: 1 part cement, 1/3 part hydrated lime, 1 part water.
- .6 Mortar ingredients: measured by volume.
- .7 Dry set mortar: mixed to manufacturer's instructions.

## **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 WORKMANSHIP**

- .1 Do tile work in accordance with TTMAC Tile Installation Manual 2006/2007.
- .2 Apply mortar bed or bond coat to clean and sound surfaces.
- .3 Fit tile units around corners, fitments, fixtures, drains and other built-in objects. Maintain uniform joint appearance. Make cut edges smooth and even.
- .4 Maximum surface tolerance: 1:800.
- .5 Make joints between tiles uniform and approximately 6 mm wide, plumb, straight, true, even and with adjacent units flush. Align patterns.
- .6 Lay out units so perimeter tiles are minimum 1/2 size.
- .7 Sound tiles after setting and replace hollow sounding units to obtain full bond.
- .8 Make internal angles square, external angles rounded.
- .9 Construct base 200 mm high with square top edge.
- .10 Cleaned installed tile surfaces after installation cured.
- .11 Use slip resistant tiles in kitchen areas.

**3.3 SETTING SYSTEM**

- .1 Install tile and bases on substrate in accordance with TTMAC details 309 F.

**3.4 CONTROL JOINTS**

- .1 Provide control joints 6 mm wide where specified.
- .2 Provide control joints around perimeter of large areas, around columns, in locations where area changes direction and where tile abuts other hard material. Place control joints directly over subfloor expansion/control joints.
- .3 Fill joints with sealant.

**3.5 FLOOR SEALER AND PROTECTIVE COATING**

- .1 Apply 2 coats in accordance with manufacturer's printed instructions.

**3.6 FIELD QUALITY CONTROL**

- .1 Manufacturer's Field Services:
  - .1 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.

**3.7 CLEANING**

- .1 Proceed in accordance with Section 01 74 11 - Cleaning.

**3.8 PROTECTION**

- .1 Protect new floors from after application of sealer and protective coating until final inspection.
- .2 Prohibit traffic on floor for 48 hours after installation.

**END OF SECTION**



**Part 1 General**

**1.1 REFERENCES**

- .1 Green Seal Environmental Standards (GS)
  - .1 GS-11-2008, 2nd Edition, Paints and Coatings.
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).
- .3 The Master Painters Institute (MPI)
  - .1 Architectural Painting Specification Manual - current edition.
  - .2 Maintenance Repainting Manual - current edition.

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for paint and coating products and include product characteristics, performance criteria, physical size, finish and limitations.
  - .2 Submit electronic copies of WHMIS MSDS.
- .3 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

**1.3 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements 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 Provide and maintain dry, temperature controlled, secure storage.
  - .2 Store painting materials and supplies away from heat generating devices.
  - .3 Store materials and equipment in well ventilated area within temperature as recommended by manufacturer.
- .4 Fire Safety Requirements:
  - .1 Supply 1 9 kg Type ABC fire extinguisher adjacent to storage area.
  - .2 Store oily rags, waste products, empty containers and materials subject to spontaneous combustion in ULC approved, sealed containers and remove from site on a daily basis.
  - .3 Handle, store, use and dispose of flammable and combustible materials in accordance with National Fire Code of Canada requirements.

## 1.4 SITE CONDITIONS

- .1 Heating, Ventilation and Lighting:
  - .1 Ventilate enclosed spaces in accordance with Section 01 51 00 - Temporary Utilities.
  - .2 Co-ordinate use of existing ventilation system with Departmental Representative and ensure its operation during and after application of paint as required.
  - .3 Provide minimum lighting level of 323 Lux on surfaces to be painted.
- .2 Temperature, Humidity and Substrate Moisture Content Levels:
  - .1 Apply paint finishes when ambient air and substrate temperatures at location of installation can be satisfactorily maintained during application and drying process, within MPI and paint manufacturer's prescribed limits.
  - .2 Test concrete, masonry and plaster surfaces for alkalinity as required.
  - .3 Apply paint to adequately prepared surfaces, when moisture content is below paint manufacturer's prescribed limits.
- .3 Additional application requirements:
  - .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 in occupied facilities during silent hours only. Schedule operations to approval of Departmental Representative such that painted surfaces will have dried and cured sufficiently before occupants are affected.

## Part 2 Products

### 2.1 MATERIALS

- .1 Supply paint materials for paint systems from single manufacturer.
- .2 Conform to latest MPI requirements for painting work including preparation and priming.
- .3 Materials in accordance with MPI - Architectural Painting Specification Manual or MPI - Maintenance Repainting Manual "Approved Product" listing.
  - .1 Primer: VOC limit 100 g/L maximum
  - .2 Paint: VOC limit 100 g/L maximum
- .4 Colours:
  - .1 Submit proposed Colour Schedule to Departmental Representative for review.
  - .2 Base colour schedule on selection of 2 base colours and 1 trim colour.
- .5 Mixing and tinting:
  - .1 Perform colour tinting operations prior to delivery of paint to site, in accordance with manufacturer's written recommendations. Obtain written approval from Departmental Representative for tinting of painting materials.
  - .2 Use and add thinner in accordance with paint manufacturer's recommendations.

- .1 Do not use kerosene or similar organic solvents to thin water-based paints.
- .3 Re-mix paint in containers prior to and during application to ensure break-up of lumps, complete dispersion of settled pigment, and colour and gloss uniformity.
- .6 Gloss/sheen ratings:
  - .1 Paint gloss is defined as sheen rating of applied paint, in accordance with following values:

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

- .2 Gloss level ratings of painted surfaces as indicated.
- .7 Interior painting:
  - .1 Plaster and gypsum board: gypsum wallboard, drywall, "sheet rock" type material, etc.
    - .1 INT 9.2 E – Epoxy over Latex Primer Sealer.
- .8 Interior re-painting:
  - .1 Structural Steel and Metal Fabrications: columns, beams, joists and miscellaneous metal.
    - .1 RIN 5.1K – Epoxy
  - .2 Plaster and gypsum board: gypsum wallboard, drywall, etc.
    - .1 RIN 9.2D – Epoxy.

### Part 3 Execution

#### 3.1 GENERAL

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and data sheets.
- .2 Perform preparation and operations for interior painting in accordance with MPI - Architectural Painting Specifications Manual or MPI - Maintenance Repainting Manual except where specified otherwise.

#### 3.2 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.

- .2 Conduct moisture testing of surfaces to be painted using properly calibrated electronic moisture meter, except test concrete floors for moisture using simple "cover patch test". Do not proceed with work until conditions fall within acceptable range as recommended by manufacturer.

### 3.3 PREPARATION

- .1 Protection of in-place conditions:
  - .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.
- .2 Surface Preparation:
  - .1 Remove electrical cover plates, light fixtures, surface hardware on doors, bath accessories and other surface mounted equipment, fittings and fastenings prior to undertaking painting operations. Identify and store items in secure location and re-installed after painting is completed.
  - .2 Move and cover furniture and portable equipment as necessary to carry out painting operations. Replace as painting operations progress.
  - .3 Place "WET PAINT" signs in occupied areas as painting operations progress. Signs to approval of Departmental Representative.
  - .4 Clean and prepare surfaces in accordance with MPI - Architectural Painting Specification Manual MPI - Maintenance Repainting Manual specific requirements and coating manufacturer's recommendations.
  - .5 Prevent contamination of cleaned surfaces by salts, acids, alkalis, other corrosive chemicals, grease, oil and solvents before prime coat is applied and between applications of remaining coats. Apply primer, paint, or pretreatment as soon as possible after cleaning and before deterioration occurs.
  - .6 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.
  - .7 Clean metal surfaces to be painted by removing rust, loose mill scale, welding slag, dirt, oil, grease and other foreign substances in accordance with MPI requirements.
  - .8 Touch up of shop primers with primer as specified.

### 3.4 APPLICATION

- .1 Paint only after prepared surfaces have been accepted by Departmental Representative.
- .2 Use method of application approved by Departmental Representative.
  - .1 Conform to manufacturer's application recommendations.
- .3 Apply coats of paint in continuous film of uniform thickness.
  - .1 Repaint thin spots or bare areas before next coat of paint is applied.

- .4 Allow surfaces to dry and properly cure after cleaning and between subsequent coats for minimum time period as recommended by manufacturer.
- .5 Sand and dust between coats to remove visible defects.
- .6 Finish surfaces both above and below sight lines as specified for surrounding surfaces, including such surfaces as tops of interior cupboards and cabinets and projecting ledges.

### **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 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Place paintprimer defined as hazardous or toxic waste, including tubes and containers, in containers or areas designated for hazardous waste.

**END OF SECTION**



**Part 1 General**

**1.1 REFERENCES**

- .1 American Iron and Steel Institute (AISI)
- .2 American National Standards Institute (ANSI)
  - .1 ANSI Z83.21-2005/CAN/CSA-C22.2 No.168-2005, Commercial Dishwashers.
- .3 American Society for Testing and Materials International (ASTM)
  - .1 ASTM A167-99(2004), Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
  - .2 ASTM A240/A240M-07e1, Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels, and for General Applications.
- .4 Canadian Standards Association (CSA International)
  - .1 ANSI Z83.21-2005/CAN/CSA-C22.2 No.168-2005, Commercial Dishwashers.
- .5 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).
- .6 The Public Health and Safety Company (NSF International)

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's printed product literature and datasheet and include product characteristics, performance criteria, physical size, finish and limitations and the following:
    - .1 Description of equipment giving manufacturers name, type, model, year and capacity.
    - .2 Details of operation, servicing and maintenance.
    - .3 Recommended spare parts list.
- .3 Quality control submittals: submit following in accordance with Section 01 45 00 - Quality Control.
  - .1 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, cleaning procedures and maintenance.
- .4 Closeout Submittals:
  - .1 Provide operation and maintenance data for all equipment specified for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

**1.3 QUALITY ASSURANCE**

- .1 Pre-Installation Meetings: convene pre-installation meeting one week prior to beginning work of this Section, with contractor's representative in accordance with to verify project requirements.

**Part 2 Products**

**2.1 GENERAL**

- .1 Stainless steel: to AISI, grade 18-8, of types and finishes specified herein.

**2.2 DISHWASHING MACHINE AND BLOWER DRYER**

- .1 The dishwasher will be a heated with two tank 1626 mm automatic rack type dishwasher with 559 mm pre-wash along with a 1219 mm electric blower-dryer; total length of 3403 mm between table connections. The machine will automatically wash and sanitize food service wares when connected to an adequate incoming source of a minimum 54 degrees C. fresh water and boost the final rinse to 81 degree C. This machine shall have a final fresh water consumption rate no greater than 1.661 per rack. The machine will be furnished with two 2 HP wash and a 1 HP prewash pump and a 1/6 HP rack conveyor motor with an anti-jam drive system. The dishwashing machine must be ULC and NSF approved and will carry such labels. The direction of operation will be right to left and voltage will be 208/3 phase. This machine will have electric tank heat with a 21 degree C rise built-in electric booster. The dishwasher will process a minimum NSF rated 277 racks per hour process a maximum 124 GPH water consumption.
- .2 The equipment will have a one piece stainless steel hood and integral tanks mounted on stainless steel rear mounted manifolds. Composite material will not be accepted at any point on the rear manifold. All fresh water connection must be made to copper piping and copper piping is to be supplied to the booster and final rinse system. Stainless steel braided hosing with internal rubber hosing will not be accepted.
- .3 The pre-wash section will have a minimum 393 mm wide door and a 660 mm wide wash/rinse tank door with a double safety catch and "cool" handle, providing access to the interior of the machine. This door shall lift upright in guide channels that will be within the hood without need for external drip troughs. The machine opening will have a minimum 508 mm vertical clearance through the machine to accommodate 457 mm x 660 mm sheet pans. Door safety switches will also be provided.
- .4 The tank bottoms will extend the full width and depth of their spray area. Removable perforated internal scrap basket with two-piece scrap screens with handles will completely cover tank areas. Free access to all parts of each tank will be possible with refuse screens removed. The machine will have door activated drain closures. Stainless steel front and end closure panels will come standard with the machine.
- .5 The machine will have one-piece cast stainless upper and lower spray arm assemblies in the prewash and wash tanks. The spray arm assemblies will be individually removable for ease of cleaning. A thermometer for each tank will be mounted and connected to the top mounted console. Sprays will be controlled by a rack activated switch inter-wired to a water solenoid valve. Stainless steel pumps and impellers will also be provided.

- .6 Fresh water to fill tank will be supplied through an automatic fill feature. Piping to the final rinse will be made of copper piping only and complete with vacuum breaker, line strainer, thermometer, and hot water solenoid valve. The pre-wash section will come with an external tank and removable scrap basket.
- .7 The prewash section shall have an external scrap basket to allow easy removal during pauses in machine operation, without having to open the door and reach into the prewash cavity.
- .8 The rack conveyor system will accept 508 mm x 508 mm racks without need for guide or index strips or chains. Racks will automatically progress through the machine and ejected by a reciprocating stainless steel dual pawl bar. Pawl bar will be driven by a revolving roller crank directly connected to an oil-sealed, adjustable spring loaded clutch. Drive through the overload torque limiter will be from a gear reduction unit driven by a 1/6 HP, 1750 RPM, standard NEMA motor.
- .9 The machine will come equipped with load and unload vent cowls with vent stack and locking dampers.
- .10 Each machine will be supplied with a 1219 mm electric blower dryer tunnel. The equipment will have a stainless steel hood and integral tanks mounted on a full stainless steel base, legs and feet. Stainless steel front and end enclosure panels will come standard with the machine. The blower dryer must be supplied with a minimum of 12 kW heater.
- .11 The machine will have a stainless steel top mounted control panel inter-wired. It will contain an approved magnetic motor starter with automatic resetting overload heater and low voltage protection for each motor. A stainless steel "Piezo" start/stop button and tank heat indicating light will be mounted on front of enclosure. A water tight rocker power switch must be supplied standard. An energy sentinel (idle pump shut off) and final rinse saver device will also be provided. The machine will also come equipped with a vent fan control feature in the top mounted control cabinet.
- .12 The 2184 mm dishwasher shall be supplied with a 90 degree unloading system and 1626 mm unload roller table with flanged feet. This drive unloading system shall be no greater than 1828 mm x 914 mm in size and be supplied with drain. The 1626 mm shall be supplied with secured roller sections and table limit switch.
- .13 All components to be supplied with a maximum security package. Package to include tamper proof screws, locking hasps each door, stainless steel grid over control cabinet, weld-in curtains (non removable), hinged prewash bucket, protective mesh under machine, locking spray arms and exposed metal conduit.
- .14 A two year parts and labour warranty will come with the machine. The electric tank heat/booster dishwasher will come fully equipped with a common hot water connection, a common drain connection and two point electric connection, and a 280/60/3 control circuit.

**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 equipment in accordance with manufacturer's instructions.
- .2        Co-ordinate connection of mechanical and electrical services.
- .3        Adjust equipment for smooth and proper operation.

**3.3                FIELD QUALITY CONTROL**

- .1        Manufacturer's Field Services:
  - .1        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.

**END OF SECTION**

**Part 1 General**

**1.1 REFERENCES**

- .1 American Iron and Steel Institute (AISI)
- .2 ASTM International
  - .1 ASTM A167-99(2009), Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
  - .2 ASTM A240/A240M-11a, Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
  - .3 ASTM A269-10, Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
  - .4 ASTM A480/A480M-11a, Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip.
- .3 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-19.13-M87, Sealing Compound, One Component, Elastomeric, Chemical Curing.
- .4 Green Seal Environmental Standards (GS)
  - .1 GS-36-11, Commercial Adhesives.
- .5 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).
- .6 The Public Health and Safety Company (NSF International)

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's printed product literature and datasheet and include product characteristics, performance criteria, physical size, finish and limitations and the following:
    - .1 Description of equipment giving manufacturers name, type, model, year and capacity.
    - .2 Details of operation, servicing and maintenance.
    - .3 Recommended spare parts list.
- .3 Shop Drawings:
  - .1 Submit drawings in accordance with Section 01 33 00 – Submittal Procedures.
  - .2 Indicate construction details of equipment including materials, components, metal thicknesses, reinforcements, welds and weld types, interior and exterior corner and joint details, anchorages, locations of exposed fasteners, assembly methods, finishes, mechanical and electrical characteristics.
  - .3 Indicate roughing-in service requirements for mechanically or electrically operated equipment.

- .4 Quality control submittals: submit following in accordance with Section 01 45 00 - Quality Control.
  - .1 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, cleaning procedures and maintenance.
- .5 Closeout Submittals:
  - .1 Provide operation and maintenance data for specified equipment for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

### **1.3 QUALITY ASSURANCE**

- .1 Pre-Installation Meetings: convene pre-installation meeting 1 week prior to beginning work of this Section on-site installation, with contractor's representative and Departmental Representative.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Stainless steel sheet: to ASTM A240/A240M, Type 304 with AISI No.4 finish, thicknesses as follows:
  - .1 Exposed frames, uprights angles, reinforcements: 2.0 mm.
  - .2 Table tops, counter tops, drainboards, pot sinks and sinks over 508 mm x 508 mm, splashbacks: 2.0 mm.
  - .3 Shelves, utility sinks 508 mm x 508 mm or smaller, angle slides: 1.6 mm.
  - .4 Exposed bodies of cabinets, casing of exposed electrical outlets, ventilation ducts: 1.3 mm.
  - .5 Interior partitions of cabinets, lining of insulated cabinets, skirting, interior and exterior surfaces of doors and drawers: 1.0 mm.
- .2 Stainless steel tubing: to ASTM A269, Type TP304, commercial grade, seamless and welded with AISI No. 4 finish.
- .3 Hardware and fastenings: stainless steel.
- .4 Nickel/chromium coating: to ASTM B456, Service Condition Number SC 3 bright finish.
- .5 Filler strip: stainless steel, 2.0 mm thick, same finish as surrounding components.
- .6 Sealant: to CAN/CGSB-19.13, non toxic aluminum coloured sealing compound, adhesive/sealant, meeting NSF requirements for direct contact with food and stay flexible during long term exposure to temperatures ranging from minus 73 degrees C to plus 232 degrees C.
  - .1 Maximum VOC limit 250 g/L.

### **2.2 FABRICATION**

- .1 Exposed surfaces: stainless steel unless otherwise indicated.
- .2 Fabricate equipment from stainless steel, to sizes and configurations indicated.
- .3 Fabricate work square, true, straight, to suit installation conditions and as indicated.
  - .1 Design to maximum sanitary conditions in accordance with NSF requirements.

- .4 Fit and shop-assemble equipment ready for installation where possible.
- .5 Deburr, smooth and round off raw edges prior to forming.
- .6 Straight lengths: counter tops, drainboards, shelving.
  - .1 One continuous piece if 3.0 m or less in length.
  - .2 If over 3.0 m, sections to be welded unless otherwise indicated.
- .7 Welding: sound, non-porous, and free from imperfections.
  - .1 Weld metal: colour matched and corrosion-resistant as parent metal.
  - .2 Spot welds: minimum 3.0 mm diameter with full penetration.
  - .3 Grind exposed welds smooth and polish to match parent metal.
  - .4 Grind other welds smooth.
  - .5 Welding and finishing is not to impair corrosion resistance of finished article.
  - .6 Welds, except spot welds: continuous unless otherwise indicated.
- .8 Legs and bracing: demountable, of stainless steel tubing, with 12 mm thick stainless steel mounting plates, welded construction with stainless steel sanitary, flanged feet.
  - .1 Mounting screws: welded to 2.5 mm thick stainless steel leg channels.
  - .2 Legs: 41 mm od tubing 1.6 mm thick stainless steel.
  - .3 Bracing: 30 mm od tubing 1.2 mm thick stainless steel in locations as indicated on drawings..
- .9 Solid undershelf: 2 mm thick stainless steel, edges, backs up 50 mm and folded at walls shelf supports welded to legs and bracing, 255 mm clear of floor at mid-way adjustment of feet.
  - .1 With adjustable shelves, use sanitary type supports.

## **2.3 SOILED DISHTABLE**

- .1 Compartment material: minimum 2 mm thick stainless steel.
- .2 Corners:
  - .1 Horizontal and vertical minimum radius 19 mm on both planes, with coved corners.
  - .2 Corners of tops: outside radius minimum 38 mm, mitred.
- .3 Construction: welded.
- .4 Compartment bottom: slope down towards drain.
- .5 Centre type drain: 38 mm with stainless steel perforated strainer. (Secured by tramper proof screws and removable with the provided tool.
- .6 Where multiple compartments are indicated, space between compartments maximum of 25 mm and minimum of 13 mm.
  - .1 Weld compartments into counter top or drainboards.
- .7 Punch holes for hot and cold water faucets.
- .8 Drainboards: 2 mm thick stainless steel, integral with, and sloping down 2% towards compartments.
- .9 Edges: up and rolled.

- .10 Top of sink edge and drainboard: straight horizontal line.
- .11 Splashback: 2 mm thick stainless steel, 254 mm high, 51 mm depth, 45 degree, integral with sink, drainboard or top.
  - .1 Where countertop or drainboard meets splashback or upturn, cove 19 mm unless otherwise indicated.
  - .2 Horizontal and vertical junctions:
    - .1 Fill in and weld ends of splashback.
    - .2 Transition to dishwasher.
- .12 Legs and bracing: as specified.
- .13 Skirting: 1 mm thick stainless steel on single or multiple compartment sinks.
  - .1 Skirting on exposed external surfaces: extend under sinks 25 mm past bottom radii, be continuously welded under sinks, to follow vertical external radii at extreme ends, or fitted and welded to integral components as appropriate.
  - .2 Space spot welds maximum of 100 mm on centers.

## **2.4 POWER WASH SINK**

- .1 Construction: Type 304 stainless steel, 14 ga. stainless tanks and drain boards, stainless steel legs and cross bracing. Flanged feet for secure attachment.
- .2 38 mm foled front and sides. 281 mm high backsplash with a 45° return.
- .3 Trapezoidal wash tank with angled header wall for maximized draining.
- .4 Pre-rise sink with spray nozzle and perforated strainer basket. Basket to be secured with tamper proof screws and removable with supplied tool.
- .5 Power wash sink with faucet and 3 hp pump motor, stainless steel pump and impeller. 3,000 watt wash tank heater.
- .6 Rinse and sanitizing sinks with shared faucet.
- .7 Stainless steel control cabinet with a single power and heat switch, tamper proof screws.

## **Part 3 Execution**

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

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

### **3.2 INSTALLATION**

- .1 Install food service equipment plumb with cabinets and counters level to 1.5 mm in 3050 mm.
- .2 Level base cabinets by adjusting levelling legs.
- .3 Scribe and fit stainless steel filler strips to irregularities of adjacent surfaces, maximum gap opening 0.5 mm.
- .4 Secure equipment to floor and wall as indicated.
- .5 Fastening: where stationary or fixed and matching items butt against one another, join with concealed stainless steel fasteners.

- .6 Seal joints in accordance with Section 07 92 00 - Joint Sealants.
  - .1 Where joints cannot be sealed with single pass, use stainless steel filler strip in conjunction with sealant.
  - .2 Where items are against or through walls or partitions seal resultant joint.

### **3.3 FIELD QUALITY CONTROL**

- .1 Inspection: Departmental Representative will conduct shop inspections of equipment fabrication prior to delivery to site.
- .2 Manufacturer's Field Services:
  - .1 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.

### **3.4 ADJUSTING**

- .1 After installation, fit and adjust operating hardware.

### **3.5 DEMONSTRATION AND TRAINING**

- .1 Arrange for installer or manufacturer to demonstrate and train owner's personnel in operation and maintenance of equipment in accordance with Section 01 79 00 - Demonstration and Training.
- .2 Manufacturer to demonstrate equipment capabilities, operation, safety and minor user maintenance to approval of Departmental Representative.

### **3.6 SCHEDULE**

- .1 Item: Soiled dishtable.
  - .1 Size: 3850 x 785 mm.
  - .2 Description: Extended countertop for pass-through, countertop waste chute, scrap sink, transition to dishwasher.
- .2 Item: Power wash sink
  - .1 Size: 4355 x 915 mm.
  - .2 Left to right operation: 1060 mm drain board, 610 mm scrap sink, 915 mm wash tank, 610 mm rinse sink, 610 mm sanitizer sink, 550 mm drain board.

**END OF SECTION**



**Part 1        General**

**1.1            INTENT**

- .1      Provide complete, fully tested and operational mechanical systems to meet requirements described herein and in complete accord with applicable codes and ordinances.
- .2      Contract documents of this Division and 300 series Drawings are diagrammatic and approximately to scale unless detailed otherwise. They establish scope, material and installation quality and are not detailed installation instructions.
- .3      Follow manufacturer's recommended installation details and procedures for equipment, supplemented by requirements of Contract Documents.
- .4      Install equipment generally in locations and routes shown, close to building structure with minimum interference with other services or free space. Remove and replace improperly installed equipment to satisfaction of the Engineer at no extra cost.
- .5      Connect to equipment specified in other Sections and to equipment supplied and installed by other Contractors or by the Owner. Uncrate equipment, move in place and install complete; start-up and test.

**1.2            RELATED REQUIREMENTS**

- .1      Submittals: Division 1.
- .2      Contract Acceptance Procedures: Division 1.

**1.3            PRODUCTS SUPPLIED BUT NOT INSTALLED UNDER THIS DIVISION**

- .1      Supply recessed, hinged access doors and panels where required for access to mechanical systems in otherwise inaccessible ceilings, walls and floors.

**1.4            METRIC CONVERSION**

- .1      All units in this division are expressed in SI units.

**1.5 CUTTING AND PATCHING**

- .1 Provide holes and sleeves, cutting and fitting required for mechanical work. Relocate improperly located holes and sleeves.
- .2 Drill for expansion bolts, hanger rods, brackets, and supports.
- .3 Obtain written approval from Engineer before cutting or burning structural members.
- .4 Patch building where damaged from equipment installation, improperly located holes etc. Use matching materials as specified in the respective section.

**1.6 SUBMITTALS**

- .1 Comply with requirements of Division 1.
- .2 Submit manufacturer's product literature and data sheets including product characteristics performance criteria, sizes, finish and limitations.
- .3 Identify materials and equipment by manufacturer, trade name and model number. Include copies of applicable brochure or catalog material. Do not assume applicable catalogues are available in the Engineer's office. Maintenance and operating manuals are not suitable submittal material.
- .4 Clearly mark submittal material using arrows, underlining or circling to show differences from specified, e.g. ratings, capacities and options being proposed. Cross out non-applicable material. Specifically note on the submittal specified features.
- .5 Include dimensional and technical data sufficient to check if equipment meets requirements. Include wiring, piping, and service connection data and motor sizes.
- .6 Installed materials and equipment shall meet specified requirements regardless of whether or not shop drawings are reviewed by Engineer.
- .7 Do not order equipment or material until Engineer has reviewed and returned shop drawing.

**1.7 PRODUCTS OPTIONS AND SUBSTITUTIONS**

- .1 Refer to Division 1 for requirements pertaining to product options and substitutions.

**1.8 PERFORMANCE VERIFICATION OF INSTALLED EQUIPMENT**

- .1 Installed mechanical equipment whose performance is questioned by Engineer, may be subject to performance verification as specified herein.
- .2 When performance verification is requested, equipment shall be tested to determine compliance with specified performance requirements.
- .3 Engineer will determine by whom testing shall be carried out. When requested, arrange for services of an independent testing agency.
- .4 Testing procedures shall be approved by Engineer.
- .5 Maintain building comfort conditions when equipment is removed from service for testing purposes.
- .6 Promptly provide Engineer with all test reports.
- .7 Should test results reveal that originally installed equipment meets specified performance requirements, Owner will pay all costs resulting from performance verification procedure.
- .8 Should test results reveal that equipment does not meet specified performance requirements, equipment will be rejected and the following shall apply:
  - .1 Remove rejected equipment. Replace with equipment which meets requirements of Contract Documents including specified performance requirements.
  - .2 Replacement equipment will be subject to performance verification as well, using same testing procedures on originally installed equipment.
  - .3 Contractor shall pay all costs resulting from performance verification procedure.

**1.9 EQUIPMENT PROTECTION AND CLEAN-UP**

- .1 Protect equipment and materials in storage on site during and after installation until final acceptance. Leave factory covers in place. Take special precautions to prevent entry of foreign material into working parts of piping and duct systems.

- .2 Protect equipment with polyethylene covers and crates.
- .3 Thoroughly clean piping, ducts and equipment of dirt, cuttings and other foreign substances.
- .4 Ensure that existing equipment is carefully dismantled and not damaged or lost. Do not reuse existing materials and equipment unless specifically indicated.

#### **1.10 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements 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 Proceed with installation only after unacceptable conditions have been remedied.

#### **1.11 CLOSEOUT SUBMITTALS**

- .1 Project Record Drawings
  - .1 Maintain and submit record drawings to the engineer prior to final acceptance.
- .2 Submit operation and maintenance data for incorporation into manual.

#### **1.12 REGULATORY REQUIREMENTS**

- .1 Conform to and perform work in accordance with the Alberta Building Codes.
- .2 Contractors shall give notices, obtain and pay all fees so work specified may be carried out. Contractors shall submit permits over to the Owner.

**1.13          WARRANTY**

- .1      Neither the final payment, nor any provision in the Contract Documents shall relieve the Contractor from responsibility for faulty materials or workmanship which appear within a period of **two (2) years** from the date of Interim Acceptance of the work, or such other periods as may be specified for parts of the work, and he shall remedy any defects due thereto and pay for any damage to other work resulting therefrom which appear within such periods.
- .2      The Owner shall give notice of observed defects promptly.

**Part 2          Products**

**2.1          MATERIALS**

- .1      Materials and equipment installed shall be new, full weight and of quality specified. Use same brand or manufacturer for each specific application.
- .2      Each major component of equipment shall bear manufacturer's name, address, catalog and serial number in a conspicuous place.

**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 installations in accordance with manufacturer's written instructions.

**3.2          DEMONSTRATION**

- .1      Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, trouble-shooting and servicing of all systems and equipment during regular work hours, prior to acceptance.

**3.3          CLEANING**

- .1      Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1      Leave Work area clean at end of each day.

- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
  - .1 Clean interior and exterior of all systems including vacuum interior of ductwork.

### **3.4 PROTECTION**

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

**END OF SECTION**

## **1.1 REFERENCE DOCUMENTS**

- .1 Pipe supports shall meet the requirements of ANSI/ASME B31.1, power piping.
- .5 Duct hangers shall follow the recommendations of the SMACNA Duct Manuals.

## **1.2 GENERAL REQUIREMENTS**

- .1 Provide hangers and supports to secure equipment in place, prevent vibration, maintain grade, provide for expansion and contraction and to accommodate insulation; provide insulation protection saddles.
- .2 Install supports of strength and rigidity to suit loading without unduly stressing building. Locate adjacent to equipment to prevent undue stresses in piping and equipment.
- .3 Select hangers and supports for the service and in accordance with the manufacturer's recommended maximum loading. Hangers shall have a safety factor of 5 to 1.
- .4 Fasten hangers and supports to building steel or inserts in concrete construction.
- .5 Dielectrically isolate dissimilar metals.

## **1.3 APPROVALS**

- .1 Obtain approval from the Engineer prior to drilling for inserts and supports for piping systems.
- .2 Obtain approval from the Engineer prior to using percussion type fastenings.
- .3 Use of existing piping or equipment for hanger supports is not permitted.
- .4 Use of perforated band iron, wire or chain as hangers is not permitted.

## **2. Products**

### **2.1 PIPE HANGERS AND SUPPORTS**

- .1 Hangers: Pipe sizes 15 mm to 40 mm: Adjustable wrought steel ring.
- .2 Hangers: Pipe sizes 50 mm to 100 mm and Cold Pipe Sizes 150 mm Over: Adjustable wrought steel clevis.
- .3 Wall Support: Pipe Sizes to 80 mm: Cast iron hook.
- .4 Wall Support: Pipe Sizes 100 mm and Over: Welded steel bracket and wrought steel clamp, adjustable steel yoke.

- .5 Vertical Support: Steel riser clamp.
- .6 Floor Support: Pipe Sizes to 100 mm and All Cold Pipe Sizes: Cast iron adjustable pipe saddle, locknut nipple, floor flange and concrete pier to steel support.
- .7 Design hangers so they cannot become disengaged by movements of supported pipe.
- .8 Provide copper plated hangers and supports for copper piping.

## 2.2 HANGER RODS

- .1 Provide steel hanger rods, threaded both ends, threaded one end, or continuous threaded.

## 2.3 DUCT HANGERS AND SUPPORTS

- .1 Hangers: Galvanized steel band iron or rolled angle and 10 mm rods.
- .2 Wall Supports: Galvanized steel band iron or fabricated angle bracket.
- .3 Vertical Support at Floor: Rolled angle.

## 2.4 FINISHES ON HANGER RODS, HANGERS AND SUPPORTS

- .1 All steel hanger rods, hangers and supports shall be galvanized or factory primed with alkyd red oxide primer to CAN/CGSB-1.40-M89.

## 3. Execution

### 3.1 PIPE HANGERS AND SUPPORTS

- .1 Support horizontal steel and copper piping as follows:

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Nominal Pipe Size	Distance Between Supports	Hanger Rod Diameter
15 mm	1.8 m	10 mm
20 mm to 40 mm	1.8 m	10 mm
50 mm & 65 mm	3 m	10 mm
80 mm & 100 mm	3.6 m	16 mm

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- .2 Install hangers to provide minimum 12 mm clear space between finished covering and adjacent work.
- .3 Place a hanger within 300 mm of each horizontal elbow.

- .4 Use hangers which are vertically adjustable 40 mm minimum after piping is erected.
- .5 Where practical, support riser piping independently of connected horizontal piping.

### **3.2 LOW VELOCITY DUCT HANGERS AND SUPPORTS**

- .1 Hanger Minimum Sizes:
  - .1 Up to 750 mm wide: 25 x 1.6 mm at 3 m spacing.

**END OF SECTION**



**Part 1 General**

**1.1 RELATED REQUIREMENTS**

- .1 Section 23 05 05 – Installation of Pipework.

**1.2 REFERENCES**

- .1 American National Standards Institute (ANSI)/American Society of Mechanical Engineers International (ASME)
  - .1 ANSI/ASME B16.15-06, Cast Bronze Threaded Fittings, Classes 125 and 250.
  - .2 ANSI/ASME B16.18-01, Cast Copper Alloy Solder Joint Pressure Fittings.
  - .3 ANSI/ASME B16.22-01, Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
- .2 ASTM International Inc.
  - .1 ASTM B88M-05, Standard Specification for Seamless Copper Water Tube (Metric).

**1.3 SUBMITTALS**

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

**1.4 GENERAL REQUIREMENTS**

- .1 All components shall be lead-free and comply with safe drinking water act and ASME A112.18/CSAB125.1.
  - .1 Weighted average lead content be not greater than 0.25% when evaluated in accordance with test method in BSF/ANSI 372.

**Part 2 Products**

**2.1 COPPER PIPE COMPONENTS**

- .1 Pipe
  - .1 Above ground: copper tube, hard drawn, type L to ASTM B88.
- .2 Joint and fitting components.
  - .1 Wrought copper and copper alloy, solder type: to ANSI/ASME B16.22.
  - .2 Cast copper, solder type: to ANSI/ASME B16.18.
  - .3 Solder: 95/5 tin copper alloy, to ASTM B32.
  - .4 Teflon tape: for threaded joints.

- .5 Dielectric connections between dissimilar metals: dielectric fitting, complete with thermoplastic liner.

## **2.2 FOOD GRADE RUBBER DISCHARGE HOSE**

- .1 Pipe.
  - .1 Food grade, heavy duty, rubber, portable water discharge hose with FDA (Canadian – Food Inspection Agency) approved neoprene rubber inner tube, weather and abrasion resistant EPDM (Ethylene Propylene Diene Monomer) cover, reinforced.
  - .2 FDA 21 CFR 177.2600
  - .3 Microbe and bacteria resistant.
  - .4 Will not impart taste or odor.
  - .5 Temperature: -28°C to 82°C.
- .2 Fittings.
  - .1 Cast brass fittings: ANSI/ASME B16.15

## **2.3 BALL VALVES**

- .1 NPS 2 and under, soldered:
  - .1 To ANSI/ASME B16.18, Class 150.
  - .2 Bronze body, chrome plated brass stainless steel ball, PTFE adjustable packing, brass gland and PTFE Bunan seat, steel lever handle, with NPT to copper adaptors as specified Section 23 05 23.01 - Valves - Bronze.

## **Part 3 Execution**

### **3.1 APPLICATION**

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

### **3.2 INSTALLATION**

- .1 Install in accordance to National Building Code of Canada 2006, National Plumbing Code of Canada 2010 and Alberta Regulation 119/2007 – Plumbing Code Regulation.
- .2 Install pipe work in accordance with Section 23 05 05 - Installation of Pipework, supplemented as specified herein.
- .3 Assemble piping using fittings manufactured to ANSI standards.
- .4 Connect to fixtures and equipment in accordance with manufacturer's written instructions unless otherwise indicated.

### **3.3 VALVES**

- .1 Isolate equipment, fixtures and branches with valves.

### **3.4 PRESSURE TESTS**

- .1 Conform to requirements of Section 21 05 01 - Common Work Results for Mechanical.
- .2 Test pressure: greater of 1 times maximum system operating pressure or 860 kPa.

### **3.5 FLUSHING AND CLEANING**

- .1 Flush and disinfect new piping installation for 8 h. Let stand for 24 hours, draw sample and submit to testing laboratory to verify that system is clean to Provincial potable water guidelines.

### **3.6 PRE-START-UP INSPECTIONS**

- .1 Systems to be complete, prior to flushing, testing and start-up.
- .2 Verify that system can be completely drained.
- .3 Ensure that pressure booster systems are operating properly.
- .4 Ensure that air chambers, expansion compensators are installed properly.

### **3.7 PERFORMANCE VERIFICATION**

- .1 Scheduling:
  - .1 Verify system performance after pressure and leakage tests and disinfection are completed, and Certificate of Completion has been issued by authority having jurisdiction.
- .2 Procedures:
  - .1 Verify proper flow rate and pressure.
  - .2 Verify compliance with safety and health requirements.
  - .3 Check for proper operation of water hammer arrestors.
  - .4 Confirm water quality consistent with supply standards, and ensure no residuals remain as result of flushing or cleaning.
- .3 Reports:
  - .1 In accordance with Section 01 91 13 - General Commissioning (Cx) Requirements: Reports, using report forms as specified in Section 01 91 13 - General Commissioning (Cx) Requirements: Report Forms and Schematics.
  - .2 Include certificate of pressure tests conducted demonstrating adequacy of flow and pressure.

.3 Include certificate of laboratory test.

**3.8 CLEANING**

.1 Clean in accordance with Section 01 74 11 – Cleaning.

**3.9 PIPE SCHEDULE**

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System	Pipe	Fitting	Joint
Domestic water above grade, indoors	Copper water tube type L drawn temper	Wrought copper	Soldered 95-5 tin-antimony
Domestic Water above grade, outdoors	Food grade rubber discharge hose	Cast brass barb threaded	Clamped screwed

**END OF SECTION**

**Part 1 General**

**1.1 RELATED REQUIREMENTS**

- .1 Section 23 05 05 – Installation of Pipework.

**1.2 REFERENCES**

- .1 ASTM International Inc.
  - .1 ASTM B32-08, Standard Specification for Solder Metal.
  - .2 ASTM B306-02, Standard Specification for Copper Drainage Tube (DWV).
  - .3 ASTM C564-03a, Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
- .2 Canadian Standards Association (CSA International).
  - .1 CSA B67-1972(R1996), Lead Service Pipe, Waste Pipe, Traps, Bends and Accessories.
  - .2 CAN/CSA-B70-06, Cast Iron Soil Pipe, Fittings and Means of Joining.
  - .3 CAN/CSA-B125.3-05, Plumbing Fittings.

**Part 2 Products**

**2.1 COPPER TUBE AND FITTINGS**

- .1 Above ground sanitary and vent Type DWV to: ASTM B306.
  - .1 Fittings.
    - .1 Cast brass: to CAN/CSA-B125.3.
    - .2 Wrought copper: to CAN/CSA-B125.3.
  - .2 Solder: lead free, tin antimony 95:5.

**2.2 CAST IRON PIPING AND FITTINGS**

- .1 Buried sanitary and vent minimum NPS 3, to: CAN/CSA-B70, with epoxy layer of protective coating.
  - .1 Joints:
    - .1 Mechanical joints:
      - .1 Neoprene or butyl rubber compression gaskets: to CAN/CSA-B70.
    - .2 Hub and spigot:
      - .1 Caulking lead: to CSA B67.
      - .2 Cold caulking compounds.

- .2 Above ground sanitary and vent: to CAN/CSA-B70.
  - .1 Joints:
    - .1 Hub and spigot:
      - .1 Caulking lead: to CSA B67.
    - .2 Mechanical joints:
      - .1 Neoprene or butyl rubber compression gaskets with stainless steel clamps.

### **Part 3 Execution**

#### **3.1 APPLICATION**

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

#### **3.2 INSTALLATION**

- .1 In accordance with Section 23 05 05 - Installation of Pipework.
- .2 Install in accordance to National Building Code of Canada 2006, National Plumbing Code of Canada 2010 and Alberta Regulation 119/2007 – Plumbing Code Regulation.

#### **3.3 TESTING**

- .1 Test buried systems before backfilling.
- .2 Hydraulically test to verify grades and freedom from obstructions.

#### **3.4 PERFORMANCE VERIFICATION**

- .1 Cleanouts:
  - .1 Ensure accessible and that access doors are correctly located.
  - .2 Open, cover with linseed oil and re-seal.
  - .3 Verify that cleanout rods can probe as far as the next cleanout, at least.
- .2 Test to ensure traps are fully and permanently primed.
- .3 Ensure that fixtures are properly anchored, connected to system and effectively vented.

#### **3.5 CLEANING**

- .1 Clean in accordance with Section 01 74 11 - Cleaning.

**END OF SECTION**

**Part 1 General**

**1.1 ACTION AND INFORMATIONAL SUBMITTALS**

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

**Part 2 Products**

**2.1 PIPING**

- .1 Sanitary drainage, temporary use for portable dishwash unit (trailer), outdoor use.]
  - .1 General purpose, heavy duty, reinforced rubber discharge hose.
  - .2 Temperature: -32°C to 93°C.
- .2 Fittings
  - .1 Cast brass fittings: ANSI/ASME B16.15 with barbed/clamped and threaded/screwed connections to suit.

**Part 3 Execution**

**3.1 APPLICATION**

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

**3.2 INSTALLATION**

- .1 In accordance with Section 23 05 05 - Installation of Pipework.
- .2 Install in accordance to the National Building Code of Canada 2006, National Plumbing Code of Canada 2010 and Alberta Regulation 119/2007 – Plumbing Code Regulation.

**3.3 TESTING**

- .1 Hydraulically test to verify grades and freedom from obstructions.

**END OF SECTION**



**Part 1        General**

**1.1           REFERENCES**

- .1    ASTM International
  - .1        ASTM B62-09, Standard Specification for Composition Bronze or Ounce Metal Castings.
- .2    CSA International
  - .1        CSA-B64 Series-11, Backflow Preventers and Vacuum Breakers.
  - .2        CSA B79-08, Commercial and Residential Drains and Cleanouts.
  - .3        CAN/CSA-B356-10, Water Pressure Reducing Valves for Domestic Water Supply Systems.
- .3    Plumbing and Drainage Institute (PDI)
  - .1        PDI-G101-R2010, Testing and Rating Procedure for Grease Interceptors with Appendix of Installation and Maintenance.
  - .2        PDI-WH201-R2010, Water Hammer Arresters Standard.

**1.2           ACTION AND INFORMATIONAL SUBMITTALS**

- .1    Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2    Product Data:
  - .1        Submit manufacturer's instructions, printed product literature, data sheets and installation instructions for plumbing products and include product characteristics, performance criteria, physical size, finish and limitations.
- .3    Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

**1.3           CLOSEOUT SUBMITTALS**

- .1    Submit in accordance with Section 01 78 00 - Closeout Submittals.

**1.4           DELIVERY, STORAGE AND HANDLING**

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

**Part 2 Products**

**2.1 FLOOR DRAINS**

- .1 Floor drains shall have lacquered cast iron body with double drainage flange, weep holes combined two piece body reversible clamping device and deep seal "P" traps.
- .2 Type FD-1: general duty; cast iron body round, adjustable head, nickel bronze strainer.
- .3 Type HD – 1: Hub drain, cast iron body, bottom outlet.

**2.2 CLEANOUTS**

- .1 Cleanout Plugs: heavy cast iron male ferrule with brass screws and threaded brass or bronze plug. Sealing-caulked lead seat or neoprene gasket.
- .2 Access Covers:
  - .1 Wall Access: face or wall type, polished nickel bronze square cover with flush head securing screws, bevelled edge frame complete with anchoring lugs.
  - .2 Floor Access: round, cast iron body and frame with adjustable secured nickel bronze top cast box with anchor lugs and:
    - .1 Plugs: bolted bronze with neoprene gasket.

**2.3 WATER HAMMER ARRESTORS**

- .1 Copper construction, piston type: to ASSE-1010.

**2.4 PRESSURE REGULATORS**

- .1 Up to NPS 1-1/2 bronze bodies, screwed: to ASTM B62.
- .2 NPS 2 and over, semi-steel bodies, Class 125, flanged: to ASTM A126, Class B.
- .3 Semi-steel spring chambers with bronze trim.

**2.5 GREASE INTERCEPTORS**

- .1 Floor mounted low profile acid resistant grease interceptor STAINLESS STEEL (304) construction, PDI Certified (Plumbing and Drainage Institute) internal air relief-bypass, clean-out plug and trap seal with removable combination pressure equalizing/flow diffusing baffles, gasketed non-skid, secured cover complete with flow control fitting. Furnished with a low rough-in inlet and outlet no-hub connection.
- .2 Flow Rate: 189 LPM (50 GPM)  
45 kg (100 lbs), grease  
40 kg (151 lbs), water

**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 plumbing specialties and accessories installation in accordance with manufacturer's written instructions.

**3.2 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.

**3.3 INSTALLATION**

- .1 Install in accordance with National Plumbing Code of Canada, provincial codes, local authority having jurisdiction.
- .2 Install in accordance with manufacturer's instructions and as specified.

**3.4 CLEANOUTS**

- .1 Install cleanouts at base of soil and waste stacks, and rainwater leaders, at locations required code, and as indicated.
- .2 Bring cleanouts to wall or finished floor unless serviceable from below floor.
- .3 Building drain cleanout and stack base cleanouts: line size to maximum NPS 4.

**3.5 WATER HAMMER ARRESTORS**

- .1 Install on supplies to automatic dishwasher. Arrestor supplied with dishwasher unit by equipment manufacturer.
- .2 Install on branch supplies to fixtures or group of fixtures and where indicated.

**3.6 BACK FLOW PREVENTERS**

- .1 Install in accordance with CSA-B64 Series, where indicated and elsewhere as required by code.

**3.7 GREASE INTERCEPTOR**

- .1 Floor mount.
- .2 Installation shall comply with the manufacturer's instructions.
- .3 Install with sufficient space, as indicated, for maintenance.

**3.8 START-UP**

- .1 General:
  - .1 In accordance with Section 01 91 13 - General Commissioning (Cx)  
Requirements: General Requirements, supplemented as specified herein.

- .2 Timing: start-up only after:
  - .1 Pressure tests have been completed.
  - .2 Disinfection procedures have been completed.
  - .3 Certificate of static completion has been issued.

### **3.9 TESTING AND ADJUSTING**

- .1 General:
  - .1 Test and adjust plumbing specialties and accessories in accordance with Section 01 91 13- General Commissioning (Cx) Requirements : General Requirements, supplemented as specified.
- .2 Timing:
  - .1 After start-up deficiencies rectified.
  - .2 After certificate of completion has been issued by authority having jurisdiction.
- .3 Application tolerances:
  - .1 Pressure at fixtures: +/- 70 kPa.
  - .2 Flow rate at fixtures: +/- 20%.
- .4 Adjustments:
  - .1 Verify that flow rate and pressure meet design criteria.
  - .2 Make adjustments while flow rate or withdrawal is (1) maximum and (2) 25% of maximum and while pressure is (1) maximum and (2) minimum.
- .5 Water hammer arrestors:
  - .1 Verify proper installation of correct type of water hammer arrester.
- .6 Grease interceptors:
  - .1 Activate, using manufacturer's recommended procedures and materials.

### **3.10 PROTECTION**

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by plumbing specialties and accessories installation.

**END OF SECTION**

**Part 1 General**

**1.1 RELATED REQUIREMENTS**

- .1 Section 22 11 16 – Domestic Water Piping.
- .2 Section 22 13 17 – Drainage Waste and Vent Piping – Cast Iron and Copper.
- .3 Section 22 13 19 – Drainage Waste – Rubber Hose.

**1.2 REFERENCES**

- .1 National Fire Code of Canada (NFCC 2005)

**1.3 SUBMITTALS**

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

**1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
  - .1 Delivery and Acceptance Requirements: Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

**Part 2 Products**

**2.1 MATERIAL**

- .1 Fire Stopping: in accordance with Section 07 84 00 - Fire Stopping.

**Part 3 Execution**

**3.1 APPLICATION**

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

**3.2 CONNECTIONS TO EQUIPMENT**

- .1 In accordance with manufacturer's instructions unless otherwise indicated.

- .2 Use valves and either unions or flanges for isolation and ease of maintenance and assembly.
- .3 Use double swing joints when equipment mounted on vibration isolation and when piping subject to movement.

### **3.3 CLEARANCES**

- .1 Provide clearance around systems, equipment and components for observation of operation, inspection, servicing, maintenance and as recommended by
- .2 Provide space for disassembly, removal of equipment and components as recommended by manufacturer without interrupting operation of other system, equipment, components.

### **3.4 DIELECTRIC COUPLINGS**

- .1 General: compatible with system, to suit pressure rating of system.
- .2 Locations: where dissimilar metals are joined.
- .3 NPS 2 and under: isolating unions or bronze valves.
- .4 Over NPS 2: isolating flanges.

### **3.5 PIPEWORK INSTALLATION**

- .1 Install pipework to CSA B139.
- .2 Screwed fittings jointed with Teflon tape.
- .3 Protect openings against entry of foreign material.
- .4 Install to isolate equipment and allow removal without interrupting operation of other equipment or systems.
- .5 Assemble piping using fittings manufactured to ANSI standards.
- .6 Install exposed piping, equipment, rectangular cleanouts and similar items parallel or perpendicular to building lines.
- .7 Install concealed pipework to minimize furring space, maximize headroom, conserve space.
- .8 Slope piping, except where indicated, in direction of flow for positive drainage and venting.
- .9 Install, except where indicated, to permit separate thermal insulation of each pipe.
- .10 Group piping wherever possible.
- .11 Ream pipes, remove scale and other foreign material before assembly.
- .12 Use eccentric reducers at pipe size changes to ensure positive drainage and venting.
- .13 Provide for thermal expansion as indicated.

- .14 Valves:
  - .1 Install in accessible locations.
  - .2 Remove interior parts before soldering.
  - .3 Install with stems above horizontal position unless indicated.
  - .4 Valves accessible for maintenance without removing adjacent piping.
  - .5 Install globe valves in bypass around control valves.
  - .6 Use ball valves at branch take-offs for isolating purposes except where specified.
- .15 Piping systems located outdoors for temporary use serving portable dishwash unit (trailer) to be insulated with 50 mm thick fibre insulation and covered with weather proof tape. Provide and install self regulating electric heat cable for freeze protection.

### **3.6 PREPARATION FOR FIRE STOPPING**

- .1 All piping, tubing, ducts, 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 Provincial Building Code.
- .2 Insulated pipes and ducts: ensure integrity of insulation and vapour barriers.
- .3 Uninsulated heated pipes subject to movement: wrap with non-combustible smooth material to permit pipe movement without damaging fires topping material or installation.
- .4 Uninsulated unheated pipes not subject to movement: no special preparation.

### **3.7 FLUSHING OUT OF PIPING SYSTEMS**

- .1 Flush and disinfect new piping installation for 8 h. Let stand for 24 hours, draw sample and submit to testing laboratory to verify that system is clean to Provincial potable water guidelines.
- .2 Before start-up, clean interior of piping systems in accordance with requirements of Section 01 74 11 - Cleaning supplemented as specified in relevant mechanical sections.
- .3 Preparatory to acceptance, clean and refurbish equipment and leave in operating condition.

### **3.8 PRESSURE TESTING OF EQUIPMENT AND PIPEWORK**

- .1 Advise Departmental Representative 48 hours minimum prior to performance of pressure tests.
- .2 Pipework: test as specified in relevant work.

- .3 Maintain specified test pressure without loss for 4 hours minimum unless specified for longer period of time in relevant mechanical sections.
- .4 Prior to tests, isolate equipment and other parts which are not designed to withstand test pressure or media.
- .5 Conduct tests in presence of Departmental Representative.
- .6 Pay costs for repairs or replacement, retesting, and making good. Departmental Representative to determine whether repair or replacement is appropriate.
- .7 Insulate or conceal work only after approval and certification of tests by Departmental Representative.

### **3.9 EXISTING SYSTEMS**

- .1 Connect into existing piping systems at times approved by Departmental Representative.
- .2 Request written approval by Departmental Representative 3 days minimum, prior to commencement of work.
- .3 Be responsible for damage to existing by this work.

### **3.10 CLEANING**

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

**END OF SECTION**

**Part 1 General**

**1.1 RELATED REQUIREMENTS**

- .1 Mechanical General Requirements 21 05 01.

**1.2 SUBMITTALS**

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit manufacturer's printed product literature, specifications and datasheet.

**1.3 QUALITY ASSURANCE**

- .1 Qualifications:
- .2 Installer: specialist in performing work of this Section, and have at least 3 years successful experience in this size and type of project.

**1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Packing, shipping, handling and unloading:
  - .1 Deliver, store and handle in accordance with manufacturer's written instructions.
  - .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

**Part 2 Products**

**2.1 COLD PIPE INSULATION**

- .1 Material: Mineral fibre blanket/wrap to CAN/ULC-S702 ASTM C 547.
- .2 Thermal conductivity ("k" factor) not to exceed specified values at 24 degrees C mean temperature when tested in accordance with ASTM C335. Maximum 0.035 W/m°C at 24°C CAN/ULC-S702.

**2.2 JACKET-OUTDOOR**

- .1 SBS rubberized with Polyethylene film.
  - .1 Self-adhering membrane consisting of an SBS rubberized asphalt compound laminated to polyethylene film.
  - .2 Provide air, vapour and water barrier.
  - .3 Service Temperatures
    - .1 minimum: -40° C
    - .2 maximum: 70°C

**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              PRE-INSTALLATION REQUIREMENT**

- .1      Pressure testing of piping systems and adjacent equipment to be complete, witnessed and certified.
- .2      Surfaces clean, dry, free from foreign material.

**3.3              INSTALLATION**

- .1      Apply materials in accordance with manufacturer's instructions and this specification.
- .2      Insulation to remain dry. Overlaps to manufacturer's instructions. Ensure tight joints.
- .3      Stagger butt joints where multi-layered insulation is used.
- .4      Maintain uninterrupted continuity and integrity of jacket.

**3.4              CLEANING**

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

**END OF SECTION**

**1. General**

**1.1 ALTERNATIVES**

- .1 Size round ducts installed in place of rectangular ducts indicated from ASHRAE table of equivalent rectangular and round ducts. No variation of duct configuration or sizes permitted except by written permission.

**1.2 DEFINITIONS**

- .1 Low Pressure: Static pressure in duct less than 0.5 kPa and velocities less than 10 m/s.
- .2 Duct Sizes: Inside clear dimensions. For acoustically lined or internally insulated ducts, maintain sizes inside ducts.

**1.4 SUBMITTALS**

- .1 Submit shop drawings in accordance with Section 20 05 01 – Mechanical General Requirements.

**1.5 QUALITY ASSURANCE**

- .1 Ductwork shall meet the requirements of NFPA 90A, Air Conditioning and Ventilating Systems and NFPA No. 90B, Standard for the Installation of Warm Air Heating and Air Conditioning Systems.
- .2 Fabricate in accordance with SMACNA duct manuals and ASHRAE handbooks.

**2. Products**

**2.1 MATERIALS**

- .1 Ducts: Galvanized steel lock forming quality, having galvanized coating to ASTM A653M, G90 designation for both sides.
- .2 Exposed Exhaust Ducts: 1.2 mm stainless steel.
- .3 Fasteners: Use rivets and bolts throughout; sheet metal screws accepted on low pressure ducts.
- .4 Sealant: Water resistant, fire resistive, compatible with mating materials.

**2.2 FABRICATION**

- .1 Complete metal ducts with themselves with no single partition between ducts. Where width of duct exceeds 450 mm cross break for rigidity. Open corners are not acceptable.

- .2 Lap metal ducts in direction of air flow. Hammer down edges and slips to leave smooth duct interior.
- .3 Construct tees, bends, and elbows with radius of not less than 1 1/2 times width of duct on centre line. Where not possible and where rectangular elbows used, provide approved type air foil turning vanes. Where acoustical lining is provided, provide turning vanes of perforated metal type with fibreglass inside.
- .4 Increase duct sizes gradually, not exceeding 15 degree divergence wherever possible. Maximum divergence upstream of equipment to be 30 degree and 45 degree convergence downstream.
- .5 Rigidly construct metal ducts with joints mechanically tight, substantially airtight, braced and stiffened so as not to breathe, rattle, vibrate or sag. Caulk duct joints and connections with sealant as ducts are being assembled.

### **3. Execution**

#### **3.1 INSTALLATION**

- .1 Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
- .2 Slope exhaust air ductwork to kitchen equipment/inlets at 2 mm per meter.
- .3 Clean duct systems and force air at high velocity through duct to remove accumulated dust. To obtain sufficient air, clean half the system at a time. Protect equipment which may be harmed by excessive dirt with filters, or bypass during cleaning.

#### **3.2 LOW PRESSURE DUCT THICKNESSES (MINIMUM)**

.1	Rectangular Ducts	
	Maximum Width	mm
	Up to 300 mm	0.6
	330 mm to 760 mm	0.8
	790 mm to 1370 mm	0.8
	1400 mm to 2130 mm	1.0
	2160 mm and Over	1.2

.2	Round Ducts	
	Duct Diameter	mm
	Up to 330 mm	0.6
	350 mm to 550 mm	0.8
	580 mm to 1270 mm	0.8
	890 mm to 910 mm	1.0
	1300 mm to 1520 mm	1.2
	1550 mm to 2130 mm	1.6
.3	Exposed exhaust ducts: 1.2 mm stainless steel.	

**END OF SECTION**



**Part 1 General**

**1.1 QUALITY ASSURANCE**

- .1 Air flow tests and sound level measurement shall be made in accordance with applicable ADC equipment test codes and ASHRAE standards.
- .2 Unit ratings shall be approved by ADC.
- .3 Manufacturer shall certify catalogued performance and ensure correct application of air outlet types.

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for diffusers, registers and grilles and include product characteristics, performance criteria, physical size, finish and limitations.
  - .2 Indicate following:
    - .1 Capacity.
    - .2 Throw and terminal velocity.
    - .3 Noise criteria.
    - .4 Pressure drop.
    - .5 Neck velocity.

**1.3 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 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 diffuser, registers and grilles from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.

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**Part 2            Products**

**2.1            GENERAL**

- .1      Base air outlet application on space noise level of NC 35 maximum.
- .2      Provide supply outlets with sponge rubber seal around the edge.
- .3      Provide baffles to direct air away from walls, columns or other obstructions within the radius of diffuser operation.
- .4      Provide plaster frame for diffusers located in plaster surfaces.

**2.2            SYSTEM DESCRIPTION**

- .1      Performance Requirements:
  - .1      Catalogued or published ratings for manufactured items: obtained from tests carried out by manufacturer or those ordered by manufacturer from independent testing agency signifying adherence to codes and standards.

**2.3            GENERAL**

- .1      Frames:
  - .1      Full perimeter gaskets.
  - .2      Concealed fasteners.
- .2      Concealed manual volume control damper operators.

**2.4            RECTANGULAR SUPPLY DIFFUSER – SECURITY TYPE**

- .1      Stainless steel security supply diffuser, 12 Ga. with 21 x 21 mm square holes and 5 mm frets. Face plate attached with temper proof screws in counter sunk screw holes. 4-way air pattern.
- .2      Diffusers shall have rear angle frame with weld nuts and tamper-proof bolts.
- .3      Fabricate of stainless steel (304).

**2.5            EXHAUST GRILLES – SECURITY TYPE**

- .1      Stainless steel security exhaust grille, 12Ga. with 21 x 21 mm square holes and 5 mm frets. Tamperproof screws in counter sunk screw holes.
- .2      Fabricate of stainless steel (304).

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**2.6 MANUFACTURED UNITS**

- .3 Grilles, registers and diffusers of same generic type, products of one manufacturer.

**Part 3 Execution**

**3.1 INSTALLATION**

- .1 Positions indicated on drawings are approximate only. Check location of outlets and make necessary adjustments in position to conform with architectural features, symmetry and lighting arrangement.
- .2 Install in accordance with manufacturer's instructions.
- .3 Install with stainless steel security type screws in countersunk holes where fastenings are visible.

**3.2 EXAMINATION**

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for diffuser, register and grille installation in accordance with manufacturer's written instructions.

**3.3 CLEANING**

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

**3.4 AIR OUTLET SCHEDULE**

.1 Supply Air Outlet:

<b>Type</b>	1.1
<b>Description</b>	Supply air rectangular security lattice face diffuser, 4-way air pattern, stainless steel.
<b>Diffuser Face Size (mm)</b>	451 x 451
<b>Duct Size (mm)</b>	305 x 305
<b>Mounting</b>	Ceiling, rear angle frame with weld nuts and temper proof bolts.

.2 Exhaust Air Inlet:

<b>Type</b>	2.1
<b>Description</b>	Exhaust rectangular security lattice face grille, stainless steel.
<b>Grille Face Size (mm)</b>	356 x 356
<b>Duct Size (mm)</b>	305 x 305
<b>Mounting</b>	Ceiling, countersunk, tamper proof screws.

**END OF SECTION**

**Part 1 General**

**1.1 REFERENCES**

- .1 Definitions:
  - .1 Electrical and electronic terms: unless otherwise specified or indicated, terms used in these specifications, and on drawings, are those defined by IEEE SP1122.
  - .2 CSA Group
    - .1 CSA C22.1-12, Canadian Electrical Code, Part 1 (22nd Edition), Safety Standard for Electrical Installations.
  - .3 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 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for equipment and fixtures and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop drawings:
  - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Alberta, Canada.
  - .2 Submit wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure co-ordinated installation.
  - .3 Identify on wiring diagrams circuit terminals and indicate internal wiring for each item of equipment and interconnection between each item of equipment.
  - .4 Indicate of drawings clearances for operation, maintenance, and replacement of operating equipment devices.
  - .5 If changes are required, notify Consultant of these changes before they are made.
- .4 Certificates:
  - .1 Provide CSA certified equipment and material.
  - .2 Where CSA certified equipment material is not available, submit such equipment material to authority having jurisdiction inspection authorities for special approval before delivery to site.
  - .3 Submit test results of installed electrical systems and instrumentation.
  - .4 Permits and fees: in accordance with General Conditions of contract.
  - .5 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to Consultant.

### **1.3 CLOSEOUT SUBMITTALS**

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

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

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 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 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.

- .3 Language operating requirements: provide identification nameplates for control items in English.

## 2.2 MATERIALS AND EQUIPMENT

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

## 2.3 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS

- .1 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 as shown on mechanical drawings.

## 2.4 WIRING TERMINATIONS

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

## 2.5 EQUIPMENT IDENTIFICATION

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

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

- .2 Labels: embossed plastic labels with 6 mm high letters unless specified otherwise.
- .3 Wording on nameplates and labels to be approved by Departmental Representative prior to manufacture.
- .4 Allow for minimum of twenty-five (25) letters per nameplate or label.
- .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.

## 2.6 WIRING IDENTIFICATION

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

## 2.7 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.

Prime	Auxiliary	
up to 250 V	Yellow	
up to 600 V	Yellow	Green
up to 5 kV	Yellow	Blue
up to 15 kV	Yellow	Red
Telephone	Green	
Other Communication Systems	Green	Blue
Fire Alarm	Red	
Emergency Voice	Red	Blue
Other Security Systems	Red	Yellow

## 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 Consultant 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 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.

### 3.3 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 plastic sheet metal, 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 Panelboards: 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.

### **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 SYSTEM STARTUP**

- .1 Coordinate with the General Contractor the energizing, start-up and testing of the new kitchen equipment.

### **3.9 CLEANING**

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

**END OF SECTION**

**Part 1 General**

**1.1 RELATED REQUIREMENTS**

- .1 Section 26 05 21
- .2 Section 26 05 32

**1.2 REFERENCES**

- .1 CSA International
  - .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 (1200 Ampere Maximum Rating).
- .3 National Electrical Manufacturers Association (NEMA)

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

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

**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 to consist of:
  - .1 Connector body and stud clamp for stranded copper conductors.
  - .2 Clamp for stranded copper conductors.
  - .3 Stud clamp bolts.
  - .4 Bolts for copper conductors.
  - .5 Sized for conductors as indicated.
- .4 Clamps or connectors for armoured cable, TECK cable and aluminum sheathed cable, as required to: CAN/CSA-C22.2 No.18.

**Part 3            Execution**

**3.1                INSTALLATION**

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

**END OF SECTION**

**Part 1 General**

**1.1 PRODUCT DATA**

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

**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 600 V insulation of cross-linked thermosetting polyethylene material rated, RW90 XLPE.

**2.2 TECK 90 CABLE**

- .1 Cable: in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Conductors:
  - .1 Grounding conductor: copper.
  - .2 Circuit conductors: copper, size as indicated.
- .3 Insulation:
  - .1 Cross-linked polyethylene XLPE.
  - .2 Rating: RW90, 600 V.
- .4 Inner jacket: polyvinyl chloride material.
- .5 Armour: aluminum.
- .6 Overall covering: thermoplastic polyvinyl chloride, compliant to applicable Building Code classification for this project.
- .7 Fastenings:
  - .1 One galvanized 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 3000 mm centers.
  - .3 Threaded rods: 6 mm diameter to support suspended channels.
- .8 Connectors:
  - .1 Watertight approved for TECK cable.

**2.3 ALUMINUM SHEATHED CABLE**

- .1 Conductors: copper size as indicated.
- .2 Insulation: cross linked polyethylene type RA90 rated 600 V.
- .3 Sheath: aluminum applied to form continuous corrugated sheath.
- .4 Outer jacket: thermoplastic applied over sheath and to be compliant to applicable Building Code classification for this project, wet locations.

- .5 Fastenings for aluminum sheathed cable:
  - .1 One hole aluminum straps to secure surface cables 25 mm and smaller. Two hole steel straps for cables larger than 25 mm. Use aluminum strap only with single conductor cable.

### **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 before energizing electrical system.

#### **3.2 GENERAL CABLE INSTALLATION**

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

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

- .1 Install wiring as follows:
  - .1 In conduit systems in accordance with Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

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

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

#### **3.5 INSTALLATION OF ARMOURED CABLES**

- .1 Group cables wherever possible on channels.

#### **3.6 INSTALLATION OF ALUMINUM SHEATHED CABLE**

- .1 Group cables wherever possible on channels.

**END OF SECTION**

**Part 1            General**

**Part 2            Products**

**2.1                EQUIPMENT**

- .1        Grounding conductors: bare stranded copper, soft annealed, size as indicated.
- .2        Insulated grounding conductors: green, copper conductors, size as indicated.
- .3        Non-corroding accessories necessary for grounding system, type, size, material as indicated, including but not necessarily limited to:
  - .1        Grounding and bonding bushings.
  - .2        Protective type clamps.
  - .3        Bolted type conductor connectors.
  - .4        Bonding jumpers, straps.
  - .5        Pressure wire connectors.

**Part 3            Execution**

**3.1                INSTALLATION GENERAL**

- .1        Install complete permanent, continuous grounding system including, electrodes, conductors, connectors, accessories. Where EMT is used, run ground wire in conduit.
- .2        Install connectors in accordance with manufacturer's instructions.
- .3        Protect exposed grounding conductors from mechanical injury.
- .4        Use mechanical connectors for grounding connections to equipment provided with lugs.
- .5        Soldered joints not permitted.
- .6        Install bonding wire for flexible conduit, connected at both ends to grounding bushing, solderless lug, clamp or cup washer and screw. Neatly cleat bonding wire to exterior of flexible conduit.
- .7        Install flexible ground straps for bus duct enclosure joints, where such bonding is not inherently provided with equipment.

**3.2                EQUIPMENT GROUNDING**

- .1        Install grounding connections to all equipment, fixtures and outlets.

**END OF SECTION**



**Part 1            General**

**1.1               RELATED REQUIREMENTS**

- .1        Section 26 05 32.

**Part 2            Products**

**2.1               SUPPORT CHANNELS**

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

**Part 3            Execution**

**3.1               INSTALLATION**

- .1        Secure equipment to hollow 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 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 dia threaded rods and spring clips.
  - .2        Support 2 or more cables or conduits on channels supported by 6 mm dia threaded rod hangers where direct fastening to building construction is impractical.
- .8        For surface mounting of two or more conduits use channels at 3 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 Consultant.
- .13 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

**END OF SECTION**

**Part 1            General**

**1.1                REFERENCES**

- .1 Canadian Standards Association (CSA International)
  - .1 CSA C22.1-06, Canadian Electrical Code, Part 1, 20th Edition.

**1.2                ACTION AND INFORMATIONAL SUBMITTALS**

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

**1.3                DELIVERY, STORAGE AND HANDLING**

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

**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 Single and multi 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 tile walls.

**2.3                MASONRY BOXES**

- .1 Electro-galvanized steel masonry single and multi gang boxes for devices flush mounted in exposed block walls.

**2.4 CONCRETE BOXES**

- .1 Electro-galvanized sheet steel concrete type boxes for flush mount in concrete with matching extension and plaster rings as required.

**2.5 CONDUIT BOXES**

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

**2.6 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               RELATED REQUIREMENTS**

- .1        Section 26 05 29.
- .2        Section 26 05 32.

**1.2               REFERENCES**

- .1        Canadian Standards Association (CSA International)
  - .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.

**1.3               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.

**Part 2            Products**

**2.1               CONDUITS**

- .1        Rigid metal conduit: to CSA C22.2 No. 45, galvanized steel threaded.
- .2        Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with couplings.
- .3        Rigid pvc conduit: to CSA C22.2 No. 211.2.
- .4        Flexible metal conduit: to CSA C22.2 No. 56, liquid-tight flexible metal and aluminum.

**2.2               CONDUIT FASTENINGS**

- .1        One hole malleable iron 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 3 m on centre.
- .4 Threaded rods, 6 mm diameter, to support suspended channels.

### **2.3 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.
  - .1 Set-screws are not acceptable.

### **2.4 FISH CORD**

- .1 Polypropylene.

## **Part 3 Execution**

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

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

### **3.2 INSTALLATION**

- .1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.
- .2 Conceal conduits except in mechanical and electrical service rooms.
- .3 Use electrical metallic tubing (EMT) except in cast concrete.
- .4 Use rigid pvc conduit underground.
- .5 Use flexible metal conduit for connection to motors in dry areas, connection to surface or recessed LED fixtures.
- .6 Use liquid tight flexible metal conduit for connection to equipment in damp or wet locations.
- .7 Minimum conduit size for lighting and power circuits: 19 mm.
- .8 Bend conduit cold:
  - .1 Replace conduit if kinked or flattened more than 1/10th of its original diameter.
- .9 Mechanically bend steel conduit over 19 mm diameter.
- .10 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.
- .11 Install fish cord in empty conduits.

- .12 Remove and replace blocked conduit sections.
  - .1 Do not use liquids to clean out conduits.
- .13 Dry conduits out before installing wire.

### **3.3 SURFACE CONDUITS**

- .1 Run parallel or perpendicular to building lines.
- .2 Locate conduits behind infrared or gas fired heaters with 1.5 m clearance.
- .3 Run conduits in flanged portion of structural steel.
- .4 Group conduits wherever possible on suspended and 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 IN CAST-IN-PLACE SLABS ON GRADE**

- .1 Run conduits 25 mm and larger below slab and encase in 75 mm concrete envelope.
  - .1 Provide 50 mm of sand over concrete envelope below floor slab.

### **3.6 CLEANING**

- .1 Proceed in accordance with Section 01 74 11 - Cleaning.
- .2 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 REFERENCES**

- .1 CSA International
- .1 CSA C22.2 No.29-11, Panelboards and Enclosed Panelboards.

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

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

**Part 2 Products**

**2.1 PANELBOARDS**

- .1 Existing Federal Pioneer (FPE) to be utilized.

**2.2 BREAKERS**

- .1 Breakers: to Section 26 28 16.02 - Moulded Case Circuit Breakers.
- .2 Breakers with thermal and magnetic tripping in panelboards except as indicated otherwise.

**2.3 EQUIPMENT IDENTIFICATION**

- .1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Complete circuit directory with typewritten legend showing location and load of each circuit, mounted in plastic envelope at inside of panel door.

**Part 3 Execution**

**3.1 PROTECTION**

- .1 Protect installed products and components from damage during construction.

**END OF SECTION**



**Part 1 General**

**1.1 RELATED REQUIREMENTS**

- .1 Section 26 24 16 (01)

**1.2 REFERENCES**

- .1 CSA International
  - .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).

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for circuit breakers and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Certificates:
  - .1 Prior to installation of circuit breakers in either new or existing installation, Contractor must submit 3 copies of a production certificate of origin from the manufacturer. Production certificate of origin must be duly signed by factory and local manufacturer's representative certifying that circuit breakers come from this manufacturer and are new and meet standards and regulations.
    - .1 Production certificate of origin must be submitted to Consultant for approval.
  - .2 Delay in submitting production of certificate of origin will not justify any extension of contract and additional compensation.
  - .3 Any work of manufacturing, assembly or installation to begin only after acceptance of production certificate of origin by Consultant. Unless complying with this requirement, Consultant reserves the right to mandate manufacturer listed on circuit breakers to authenticate new circuit breakers under the contract, and to Contractor's expense.
  - .4 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.

## **Part 2 Products**

### **2.1 BREAKERS GENERAL**

- .1 Moulded-case circuit breakers: to CSA C22.2 No. 5
- .2 Bolt-on moulded case circuit breaker: quick- make, quick-break type, for manual and automatic operation.
- .3 Plug-in moulded case circuit breakers: quick- make, quick-break type, for manual and automatic operation .
- .4 Common-trip breakers: with single handle for multi-pole applications.
- .5 Circuit breakers to have minimum 22,000 A symmetrical rms interrupting capacity rating.

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

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

## **Part 3 Execution**

### **3.1 INSTALLATION**

- .1 Install circuit breakers as indicated into existing pabelboards.

**END OF SECTION**

**Part 1 General**

**1.1 REFERENCES**

- .1 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.
- .2 Canadian Standards Association (CSA International)
- .3 ICES-005-07, Radio Frequency Lighting Devices.
- .4 Underwriters' Laboratories of Canada (ULC)

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
  - .2 Provide samples as indicated. Install sample fixtures, design in mock-up ceiling. Do not include cost of mock-up in project price. Locate mock-up on site.

**Part 2 Products**

**2.1 LAMPS AND DRIVERS**

- .1 Replaceable high brightness LED array 4000 K color temperature, 80 CRI minimum.
- .2 120 VAC high power factor, constant current driver.

**2.2 FINISHES**

- .1 Light fixture finish and construction to meet ULC listings and CSA certifications related to intended installation.
- .2 16 gauge stainless steel with bushed finish.

**2.3 OPTICAL CONTROL DEVICES**

- .1 As indicated in luminaire schedule.

**2.4 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 conduit for luminaires as indicated and connect into existing lighting branch circuits.

**3.3                LUMINAIRE SUPPORTS**

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

**3.4                LUMINAIRE ALIGNMENT**

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

**3.5                CLEANING**

- .1      Clean in accordance with Section 01 74 11 - Cleaning.

**END OF SECTION**