SPECIFICATIONS

HARRY HACHEY CONFERENCE CENTRE

St. Andrews, New Brunswick

June 2017

Architect:
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END

PART 1 - GENERAL

1.1 General

.1 The General Conditions governing this work shall be those specified in CCDC Document #2 plus the following amendments and supplements to those provisions, and shall apply to all sections of this specification.

.2 Where any article or portion of article conflicts with the laws of the Province concerned, such article or portion of the article is hereby stricken.

1.2 Definitions

.1 Item "Time", of said General Conditions is hereby amended and supplements as follows: Reasonable Time is defined as seven (7) days unless otherwise defined.

1.3 Documents

.1 The Contractor shall receive up to ten (10)sets of drawings and specifications from the Architect. Additional sets of drawings will be supplied at cost of reproduction. The above covers the requirements of all sub-trades.

1.4 Progress Payment

.1 Article GC 5.3.2 of said General Conditions is amended and supplemented as follows: The Owner shall pay the Contractor within thirty (30) days after the date of a Certificate for Payment issued by the Architect.

1.5 Valuation and Cetification of Changes in the Work

.1 Article GC 6.2 is amended and supplemented as follows:
.1 Change orders calling for normal changes or additions to the work will be priced in detail giving actual material trade prices (not list prices) and actual labour costs (including Employment Insurance, Worker's Compensation, holiday pay) and actual equipment rental. To these prices the contractor will add:
.2 For work involving the General Contractor only, the Contractor adds 15% to his cost.
.3 For work involving a Sub-Contractor only, the Sub-Contractor adds 15% to his cost, submits this price to the General Contractor who adds 5%.
.4 For work involving a General Contractor, and a Sub-Contractor, the Sub-Contractor adds 15% to his cost, submits this price to the General Contractor who adds 5%; to

this amount the General Contractor adds the cost of his own work plus 15% of the cost of his own work only.

.1 The General Contractor does not add a further 5% to the cost of his own work.

.5 Deletions to Contract: A mark-up shall not be charged nor credited on a credit portion of a change order.

.6 Supervision, administration, insurance and bonding costs relating to Change Orders shall be considered as included in the allowable mark-up, and shall not be included in the labour charges for a Change Order.

1.6 Insurance

.1 Article GC 11 of said General Conditions is amended and supplemented as follows: The Contractor shall provide a Builder's Risk Policy with Extended Coverage Endorsement, in the amount of $2,000,000 and is to include materials stored on site. Deductible will be $2,500.00 payable by Contractor making a claim.

.2 Article GC 11 Insurance is hereby amended and supplemented as follows: The amount of Liability Insurance shall be five million dollars ($5,000,000) for this project.

1.7 Labour and Products

.1 Article GC 3.9 is hereby amended and supplemented as follows: All manufactured articles, materials and equipment shall be applied, installed, connected, erected, used, cleaned, and conditioned as directed by the manufacturer unless specified to the contrary.

1.8 Standards

.1 Any material specified by reference to the number, symbol or title of a specific standard such as a Commercial Standard, a Federal Specification, a Trade Association Standard or other similar standard, shall comply with the requirements in the latest revision thereof and any amendment or supplement thereto, in effect on the date of Invitation to Bids.

.2 The standards referred to, except as modified in the specifications, shall have full force and effect as though printed in the specifications. These standards are not furnished to bidders for the reason that the manufactures and trades involved are assumed to be familiar with their requirements. The Architect will furnish, upon request, information as to how copies of the standards referred to may be obtained.

1.9 Measurements

.1 Before ordering any materials or doing any work, the Contractor shall verify all measurements and shall be responsible for correctness of same. No extra charge or compensation will be allowed on account of differences between actual dimensions and the measurements indicated on the drawings. Any difference which may be found shall be submitted to the Architect for consideration before proceeding with the work.

1.10 General Contractor's Responsibilities and Control of the Work

.1 The General Contractor shall be responsible for coordinating all aspects of the work with the sub-contractors, and remaining responsible for assisting and cooperating in scheduling the activities of all trades, controlling the access of any trade to specific areas of the work and implementing security measures required to protect the work. Install Owner's supplied equipment with the assistance from the Supplier/Owner. The General Contractor is responsible for coordinating the installation and delivery date schedule.

PART 2 - PRODUCTS

2.1 Products

.1 Not used.

PART 3 - EXECUTION

3.1 Execution

.1 Not used.

END

PART 1 - GENERAL

1.1 Scope of Work

.1 The Contractor is to provide each item, and properly execute all work as specified herein, indicated by drawings, addenda, or change orders issued with respect to this project.

.2 The Contractor shall coordinate, administer, and supervise all work, material acquisition and labour.

.3 Contractor shall coordinate with Owner and facilitate installation of Owner provided equipment.

1.2 Execution

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

1.3 Documents

.1 The Contract Documents are complementary and what is called for by any one shall be as binding as if called for by all.

.2 Descriptions of materials or work which have well known technical or trade meanings shall be held to refer to such recognized standards.

.3 Should the specifications conflict with the drawings, the specifications shall govern.

.4 In the case of discrepancies between drawings, those of larger scale, or if the scale are the same, those of later date shall govern.

.5 All drawings and specifications shall be interpreted in conformity with the agreement.

1.4 Communication

.1 All submissions and inquiries shall be directed to the consultant BGHJ Architects for review.

.2 All direction will be transmitted to the Contractor by the. Consultant.

1.5 Documents Required

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

1.6 Codes and Regulations

.1 Perform work in accordance with the 2010 edition of the National Building Code of Canada (NBC) and any other code of provincial or local application, provided that in any case of conflict or discrepancy the more stringent requirements shall apply.

.2 Meet or exceed requirements of contract documents and specified standards.

.3 References to standards, including manufacturer's direction for installation shall be the latest edition.

.4 All materials, components and equipment as well as construction methods shall comply with the latest edition of the National Building Code and all other applicable Provincial codes or regulations.

.5 The latest editions of the Canadian Codes shall govern all work.

.6 All equipment supplied or installed shall be CSA approved for the intended use.

.7 The latest edition of the New Brunswick Occupational Health and Safety Act and Regulations shall govern safe construction practices.

.8 Provide a copy of all certificates of acceptance issued by Provincial or local authorities.

1.7 Work Schedule and Progress Reports

.1 Provide updated schedule information from time to time as the progress of the work or Owner may require.

1.8 Trade Contractor's Use of Site

.1 Do not unreasonably encumber site with materials or equipment, follow direction received from Owner related to site organization and storage.

.2 Move stored products or equipment, which interfere with operations of Owner.

.3 Obtain and pay for use of additional off site storage or work areas needed for operations.

1.9 Project Meetings

.1 Coordinate and head project meetings at the site, and at a time approved by all parties.

.2 The Contractor will record minutes of meetings and distribute to all parties within three (3) days of meeting.

.3 A representative of the Contractor qualified and authorized to make decisions on site shall attend job meetings.

1.10 Site Inspector

.1 No work is to be covered without having received approval from the Consultant. The Consultant will have the authority to cause any part of the work to cease, should, in his or her opinion, there be cause to do so.

.2 This work shall be examined by the Consultant and approval granted to resume when a satisfactory solution has been found out.

.3 The fact that the Consultant does not reject any work shall not remove the responsibility for completing all work as specified from the Contractor.

1.11 Setting Out of Work

.1 Assume full responsibility for and execute complete layout of work to locations, lines and elevations.

.2 Provide all equipment, materials and devices needed to lay out and construct work.

.3 Supply such devices as straight edges and templates required to facilitate inspection of work.

1.12 Location of Equipment and Fixtures

.1 Location of equipment, fixtures and outlets indicated or specified are to be considered as approximate.

.2 Locate equipment, fixtures and distribution systems to provide minimum interference and maximum usable space and in accordance with manufacturer's recommendations for safety, access and maintenance.

.3 Inform Consultant of impending installation and obtain his approval for actual location.

.4 Submit field drawings to indicate relative position of various services and equipment when required.

1.13 Cutting, Fitting and Patching

.1 Execute cutting, core drilling, fitting and patching, required to install and make new work under this contract fit properly.
.1 Includes all cutting and patching in building for. this trade package.
.2 Contractors are responsible for their Own cutting and patching unless noted otherwise.

.2 Make cuts with clean, true, smooth edges. Make patches inconspicuous in final assembly.

1.14 Blocking and Backing

.1 Provide all blocking, backing, hangers, etc. used for support of all built-in work.

1.15 Existing Services

.1 Before commencing work, establish the location and extent of service lines and notify Consultant of findings if in conflict with information or intent shown.

.2 Where unknown services are encountered, immediately advise Consultant and confirm findings in writing.

.3 Contractor shall pay for any or all repairs to existing services that have been damaged due to the Trade Contractor's negligence in the course of his work.

.4 Notify Consultant and utilities of intended interruption of services and obtain permission.

.5 Where Work involves breaking into or connecting to existing services, give Consultant 24 hours notice for necessary interruption. Minimize duration of interruptions. Carry out Work at times as directed by governing authorities or Owner with minimum disturbance.

.6 Provide temporary services when directed to maintain critical building and tenant systems.

.7 Provide adequate bridging over trenches which cross sidewalks or roads to permit normal traffic.

.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.

1.16 Additional Drawings

.1 The Consultant may furnish as necessary for the execution of the work, additional instructions, by means of drawings or otherwise. All such additional instructions shall be consistent with the contract documents. In giving such additional instructions the Consultant shall have authority to make minor changes in the work, not inconsistent with the contract.

PART 2 - PRODUCTS

2.1 Not Used

.1 Not Used

PART 3 - EXECUTION

3.1 Not Used

.1 Not Used

END

PART 1 - GENERAL

1.1 WORK COVERED BY CONTRACT DOCUMENTS

.1 Work of this Contract comprises of interior office fit-up for Harry Hachey Conference Centre located at DFO - 531 Brandy Cove Road, St. Andrews, NB E5B 2L9.

1.2 WORK SEQUENCE

.1 Maintain fire access/control.

1.3 CONTRACTOR USE OF PREMISES

.1 Co-ordinate use of premises under direction of Architect.

.2 Obtain and pay for use of additional storage or work areas needed for operations under this Contract.

.3 Remove or alter existing work to prevent injury or damage to portions of existing work which remain.

.4 Repair or replace portions of existing work which have been altered during construction operations to match existing or adjoining work.

.5 At completion of operations condition of existing work: equal to or better than that which existed before new work started.

1.4 OWNER FURNISHED ITEMS

.1 Owner Responsibilities:
.1 Arrange for delivery of shop drawings, product data, samples, manufacturer's instructions, and certificates to Contractor.
.2 Deliver supplier's bill of materials to Contractor.
.3 Arrange and pay for delivery to site in accordance with Progress Schedule.
.4 Inspect deliveries jointly with Contractor.
.5 Submit claims for transportation damage.
.6 Arrange for replacement of damaged, defective or missing items.
.7 Arrange for manufacturer's field services; arrange for and deliver manufacturer's warranties and bonds to Contractor.

.2 Contractor Responsibilities:
.1 Designate submittals and delivery date for each product in progress schedule.
.2 Review shop drawings, product data, samples, and other submittals. Submit to Architect notification of observed

discrepancies or problems anticipated due to non-conformance with Contract Documents.
.3 Receive and unload products at site.
.4 Inspect deliveries jointly with Owner; record shortages, and damaged or defective items.
.5 Handle products at site, including uncrating and storage.
.6 Protect products from damage, and from exposure to elements.
.7 Assemble, install, connect, adjust, and finish products.
.8 Provide installation inspections required by public authorities.
.9 Repair or replace items damaged by Contractor or subcontractor on site.

1.5 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 Owner and Architect to facilitate execution of work.

1.6 EXISTING SERVICES

.1 Notify, Owner, Architect and utility companies of intended interruption of services and obtain required permission.

.2 Where Work involves breaking into or connecting to existing services, give 48 hours notice for necessary interruption of mechanical or electrical service throughout course of work. Minimize duration of interruptions. Carry out work at times as directed by governing authorities with minimum disturbance to tenant operations.

.3 Provide alternative routes for personnel traffic.

.4 Establish location and extent of service lines in area of work before starting Work. Notify Architect of findings.

.5 Submit schedule to and obtain approval from Architect 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 Architect to maintain critical building and tenant systems.

.7 Where unknown services are encountered, immediately advise Architect 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.

1.7 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 Interior Fit-up Scope of Work includes, but is not limited to:
.1 The intent of this package is to complete all work in the Specifications and Drawings.
.1 Interior demolition.
.2 Miscellaneous removals of existing walls and systems to facilitate new construction.
.3 Rough carpentry, finish carpentry and millwork as described in drawings.
.4 Doors, frames and hardware.
.5 All floor, wall and ceiling material finishes as noted on drawings and finish schedules.
.6 Relocate/reorient existing furniture (by owner).
.7 Mechanical/electrical/sprinkler as described in drawings.

END

PART 1 - GENERAL

1.1 REFERENCES

.1 Owner/Contractor Agreement.

.2 Canadian Construction Documents Committee (CCDC)
.1 CCDC 2-1994, Stipulated Price Contract.

1.2 APPLICATIONS FOR PROGRESS PAYMENT

.1 Refer to CCDC 2.

1.3 SCHEDULE OF VALUES

.1 Refer to CCDC 2.

1.4 PROGRESS PAYMENT

.1 Refer to CCDC 2.

1.5 SUBSTANTIAL PERFORMANCE OF WORK

.1 Refer to CCDC 2.

1.6 PAYMENT OF HOLDBACK UPON SUBSTANTIAL PERFORMANCE OF WORK

.1 Refer to CCDC 2.

1.7 PROGRESSIVE RELEASE OF HOLDBACK

.1 Refer to CCDC 2.

1.8 FINAL PAYMENT

.1 Refer to CCDC 2, GC 5.7.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

.1 Not Used.

END

PART 1 - GENERAL

1.1 Section Includes

.1 Coordination between mechanical and electrical work, and work of other affected Sections.

1.2 Related Work

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 41 00 - Regulatory Requirements.

.3 Section 01 61 00 - Common Product Requirements.

.4 Section 01 77 00 - Closeout Procedures.

.5 Section 01 79 00 - Demonstration and Training.

1.3 Mechanical and Electrical Work Coordinator

.1 Assign a person technically qualified and approved by the Consultant and experienced in field coordination of mechanical and electrical work for this project, for the duration of the construction work. The mechanical and electrical coordinator is to work under direction of the General Contractor and have other responsibilities on site.

1.4 Submittals

.1 The General Contractor shall submit coordination drawings and schedules prior to shop drawings, product data, and samples.

1.5 Coordination

.1 The mechanical and electrical coordinator is to coordinate Mechanical and Electrical and Sprinkler with all trades.

.2 The mechanical and electrical coordinator is to coordinate Progress Schedules, including dates for submittals and for delivery of products.

.3 The mechanical and electrical coordinator is to conduct conferences among Subcontractors, separate Subcontractors, and other concerned entities as necessary to establish and maintain coordination and schedules, and to olve matters in dispute.

.4 The mechanical and electrical coordinator is to participate in progress meetings. Report on progress of work to be adjusted

under coordination requirements, and any needed changes in schedules.

.5 The mechanical and electrical coordinator is to transmit minutes of meetings to concerned entities.

1.6 Coordination Documents

.1 Shop drawings to be reviewed and signed by mechanical and electrical Coordinator prior to submitting to Consultant.

.2 Receive coordination and interference drawings from Division 15 - Mechanical and Division 16 - Electrical and review for accuracy, conflicts and efficiencies between trades.

.3 Assemble shop drawings and associated documents from other sections specifying technical systems requiring coordination with Mechanical and Electrical systems.

.4 Prepare a master set of coordination and interference drawings in Autocad format of installation for efficient use of available space, for proper sequence of installation and maintenance and to anticipate and to resolve conflicts.

.5 Prepare master schedule on Microsoft Project Management Software to record responsibilities under each section of Divisions 1 through 16 of specifications for actions which directly relate to mechanical and electrical work, including submittals and temporary utilities; record electrical power characteristics and control wiring for each item of equipment. Scheduling system to be integrated in General Contractors schedule.

.6 Maintain documents throughout construction period, recording changes due to modifications and adjustments.

.7 After acceptance of original and revised documents, reproduce and distribute copies to each concerned entity. Provide digital copy to Consultant.

1.7 COORDINATION OF SUBMITTALS

.1 Review shop drawings, product data, and samples for compliance with Construction Documents and for coordination among work of various sections. Transmit to Subcontractor for review then transmit to Consultant and Owner.

.2 Check field dimensions and clearances, relation to available spaces, and anchor bolt settings.

.3 Check compatibility with equipment and work of other sections, electrical characteristics, and control requirements.

.4 Check motor voltages and control characteristics.

.5 Coordinate controls and interlocks, voltages and wiring of pneumatic switches and relays.

.6 Coordinate wiring and control diagrams.

.7 Review effect of any changes on work of other sections.

.8 Verify and coordinate maintenance of Record Documents.

1.8 COORDINATION OF SUBSTITUTIONS AND MODIFICATIONS

.1 Review proposals and requests from Subcontractors. Check for compliance of substitutions with Contract Documents and for compatibility with work and equipment of other sections.

.2 Submit to Subcontractors recommendation for action.

1.9 OBSERVATION OF WORK

.1 Observe work for compliance with Contractor documents.

.2 Maintain a list of observed deficiencies and defects; promptly submit to sub-contractors.

1.10 DOCUMENTATION

.1 Observe and maintain a digital record of tests, recording:
- .1 Specifications section number, product or equipment, and name of Subcontractor and Contractor.
- .2 Testing agency and name of inspector.
- .3 Name of manufacturer's representative present.
- .4 Date, time and duration of tests.
- .5 Date, time and duration of tests.
- .6 Retesting required.

.2 Assemble documentation for handling of disputes and claims.

.3 Submit hard copies and digital copies of documentation to Consultant upon request.

1.11 EQUIPMENT START-UP

.1 Verify utilities, connections and controls are complete and equipment is start-up operable condition.

.2 Observe start-up and adjustments; record time and date of start-up and

.3 Observe equipment demonstrations to Owner; record time and record additional information required in Operation and Maintenance Manuals.

1.12 COMMISSIONING

.1 The mechanical and electrical coordinator to cooperate and work closely with trades during commissioning to observe testing procedures and results.

.2 The mechanical and electrical coordinator to facilitate inspections and procedures by planning and scheduling work to allow for efficient and timely observation by the Consultant.

1.13 INSPECTION AND ACCEPTAANCE OF EQUIPMENT

.1 Prior to inspection, verify, in writing to Consultant, that equipment is operational, clen and in specified condition.

.2 Assist the Consultant's inspection; prepare list of items to be completed or recorded.

PART 2 - PRODUCTS

2.1 Products

.1 Not used.

PART 3 - EXECUTION

3.1 Execution

.1 Not used.

END

PART 1 - GENERAL

1.1 ADMINISTRATIVE

.1 Submit to Architect 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 Metric units.

.4 Where items or information is produced in SI Imperial units converted values are acceptable.

.5 Review submittals prior to submission to Architect. 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 Architect, 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 Architect's review of submittals.

.9 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Architect's review.

.10 Keep one reviewed copy of each submission on site.

1.2 SHOP DRAWINGS AND PRODUCT DATA

.1 This project will utilize RForm web based contract management software. Information regarding this software may be found at www.rform.ca, there is no software cost to the contractor.

.2 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.

.3 Submit shop drawings bearing stamp and signature of qualified professional engineer registered or licensed in Province of New Brunswick, Canada.

.4 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.

.5 Allow 5 days for Architect's review of each submission.

.6 Adjustments made on shop drawings by Architect are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Architect prior to proceeding with Work.

.7 Make changes in shop drawings as Architect may require, consistent with Contract Documents. When resubmitting, notify Architect in writing of revisions other than those requested.

.8 Accompany submissions with transmittal letter, in duplicate, 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.

.9 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.

.10 After Architect review, distribute copies.

.11 Submit electronic copy of shop drawings for each requirement requested in specification Sections and as Architect may reasonably request.

.12 Submit electronic copies of product data sheets or brochures for requirements requested in specification Sections and as requested by Architect where shop drawings will not be prepared due to standardized manufacture of product.

.13 Submit electronic copies of test reports for requirements requested in specification Sections and as requested by Architect.
.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.

.14 Submit electronic copies of certificates for requirements requested in specification Sections and as requested by Architect.
.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.

.15 Submit electronic copies of manufacturers instructions for requirements requested in specification Sections and as requested by Architect.
.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.

.16 Submit electronic copies of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Architect.
.1 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 Architect.

.18 Delete information not applicable to project.

.19 Supplement standard information to provide details applicable to project.

.20 If upon review by Architect, 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 the Architect is for sole purpose of ascertaining conformance with general concept.
.1 This review shall not mean that the Architect 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 Architect's business address.

.3 Notify Architect 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 Architect are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Architect prior to proceeding with Work.

.6 Make changes in samples which Architect 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 CERTIFICATES AND TRANSCRIPTS

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

.2 Submit transcription of insurance immediately after award of Contract.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

END

PART 1 - GENERAL

1.1 SECTION INCLUDES

.1 Health and safety considerations required to ensure that the Contractor shows due diligence towards health and safety on construction sites.

1.2 REFERENCES

.1 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations

.2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
.1 Material Safety Data Sheets (MSDS).

.3 Province of New Brunswick
.1 Occupational Health and Safety Act, including all amendments.

1.3 SUBMITTALS

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

.2 Submit site-specific Health and Safety Plan: Within 7 days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include:
.1 Results of site specific safety hazard assessment.
.2 Results of safety and health risk or hazard analysis for site tasks and operation found in work plan.

.3 Submit 2 copies of Contractor's authorized representative's work site health and safety inspection reports to Architect and/or authority having jurisdiction, bi-weekly.

.4 Submit copies of reports or directions issued by Federal, Provincial and Territorial health and safety inspectors.

.5 Submit copies of incident and accident reports.

.6 Architect will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within 15 days after receipt of plan. Revise plan as appropriate and resubmit plan to Departmental Representative within 5 days after receipt of comments from Architect.

.7 Architect's review of Contractor's final Health and Safety plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction Health and Safety.

.8 Medical Surveillance: where prescribed by legislation, regulation or safety program, submit certification of medical surveillance for site personnel prior to commencement of Work, and submit additional certifications for any new site personnel to Architect .

.9 On-site Contingency and Emergency Response Plan: address standard operating procedures to be implemented during emergency situations.

1.4 FILING OF NOTICE

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

1.5 SAFETY ASSESSMENT

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

1.6 MEETINGS

.1 Schedule and administer Health and Safety meeting with Architect prior to commencement of Work.

1.7 REGULATORY REQUIREMENTS

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

1.8 GENERAL REQUIREMENTS

.1 Develop written site-specific Health and Safety Plan based on hazard assessment prior to beginning site Work and continue to implement, maintain, and enforce plan until final demobilization from site. Health and Safety Plan must address project specifications.

.2 Architect may respond in writing, where deficiencies or concerns are noted and may request re-submission with correction of deficiencies or concerns.

1.9 RESPONSIBILITY

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

.2 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

1.10 COMPLIANCE REQUIREMENTS

.1 Comply with Occupational Health and Safety Act, Occupational Health Safety Act Regulations, NB.

.2 Comply with Canada Labour Code, Canada Occupational Safety and Health Regulations made under Part II of the Canada Labour Code.

.3 In the event of conflict between any provisions of above authorities the most stringent provision will apply. Should a dispute arise in determining the most stringent requirement, Architect will advise of the course of action to be followed.

.4 Maintain workers Compensation Coverage for duration of Contract. Submit letter of good standing to Architect upon request.

.5 Observe and enforce construction safety measures required by:
.1 2010 National Building Code of Canada, Part 8;
.2 Provincial Worker's Compensation Board.
.3 Municipal statutes and ordinances.

.6 A copy of the Canada Labour Code Part II may be obtained by contacting:

Canadian Government Publishing
Public Works & Government Services Canada
Ottawa, Ontario K1A 0S9
Telephone: (819) 965-4800 (1-800-635-7943
Publication No: L31085/2000 E or F.

1.11 UNFORSEEN HAZARDS

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

1.12 POSTING OF DOCUMENTS

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

1.13 CORRECTION OF NON-COMPLIANCE

.1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by Architect .

.2 Provide Architect with written report of action taken to correct non-compliance of health and safety issues identified.

.3 Architect may stop Work if non-compliance of health and safety regulations is not corrected.

1.14 POWDER ACTUATED DEVICES

.1 Use powder actuated devices only after receipt of written permission from Architect.

1.15 WORK STOPPAGE

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

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not used.

END

PART 1 - GENERAL

1.1 Fires

.1 Fires and burning of rubbish on site are not permitted.

1.2 Disposal of Wastes

.1 Do not bury rubbish and waste materials on site.

.2 Do not dispose of waste or volatile materials, such as mineral spirits, oil or paint thinner into waterways, storm or sanitary sewers.

1.3 Drainage

.1 Provide temporary drainage and pumping as necessary to keep excavations and site free from water.

.2 Do not pump water containing suspended materials into waterways, sewer or drainage systems.

.3 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements.

1.4 Smoking Restrictions

.1 Smoking is not permitted inside, or within 4.6m of the building at any time or at any stage of construction.

1.5 Environmental Permit Approval

.1 Comply with requirements contained in the Environment and Local Government Division environmental approval permit for the project.

PART 2 - PRODUCTS

2.1 Not Used

.1 Not Used

PART 3 - EXECUTION

3.1 Not Used

.1 Not Used

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 01 35 29.06 - Health and Safety Requirements.

1.2 REFERENCES AND CODES

.1 Perform Work in accordance with the latest edition of the 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.

1.3 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

.1 Not Used.

END

PART 1 - GENERAL

1.1 INSPECTION

.1 Allow Architect 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 Architect 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 Architect will order part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction.

1.2 INDEPENDENT INSPECTION AGENCIES

.1 Independent Inspection/Testing Agencies may be engaged by Architect for purpose of inspecting and/or testing portions of Work. Cost of such services will be borne by Owner.

.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 Architect at no cost to Owner 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 Architect 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 Architect as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.

.2 Make good other Contractor's work damaged by such removals or replacements promptly.

.3 If in opinion of Architect it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, Owner will deduct from Contract Price difference in value between Work performed and that called for by Contract Documents, amount of which will be determined by Architect.

1.6 REPORTS

.1 Submit 4 copies of inspection and test reports to Architect.

.2 Provide copies to subcontractor of work being inspected or tested.

1.7 TESTS AND MIX DESIGNS

.1 Furnish test results and mix designs as requested.

.2 Cost of tests and mix designs beyond those called for in Contract Documents or beyond those required by law of Place of Work will be appraised by Architect 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

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

1.2 SUBMITTALS

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

1.3 INSTALLATION AND REMOVAL

.1 Provide temporary utilities controls in order to execute work expeditiously.

.2 Remove from site all such work after use.

1.4 WATER SUPPLY

.1 Owner will provide continuous supply of potable water for construction use.

1.5 TEMPORARY VENTILATION

.1 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.

.2 Permanent heating system of building, to be used when available. Be responsible for damage to heating system if use is permitted.

.3 On completion of Work for which permanent heating system is used, replace filters, clean ductwork.

.4 Ensure Date of Substantial Performance and Warranties for HVAC system does not commence until entire system is in as near original condition as possible and is certified by Architect.

.5 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.

.6 Be responsible for damage to Work due to failure in providing adequate heat and protection during construction.

1.6 TEMPORARY POWER AND LIGHT

.1 600 V, 3 phase, 60 Hz is available and will be provided for construction use at no cost . Connect to existing power supply in accordance with Canadian Electrical Code.

1.7 FIRE PROTECTION

.1 Provide and maintain temporary fire protection equipment during performance of Work required by insurance companies having jurisdiction and 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.

3.1 NOT USED

.1 Nor Used.

END

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)
.1 CAN/CSA-S269.2-M1987(R2003), Access Scaffolding for Construction Purposes.
.2 CAN/CSA-Z321-96(R2001), Signs and Symbols for the Occupational Environment.

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

1.3 SUBMITTALS

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

1.4 INSTALLATION AND REMOVAL

.1 Provide construction facilities in order to execute work expeditiously.

.2 Remove from site all such work after use.

1.5 SCAFFOLDING

.1 Scaffolding in accordance with CAN/CSA-S269.2.

.2 Provide and maintain scaffolding, ladders, swing staging and platforms.

1.6 SITE STORAGE/LOADING

.1 Do not load or permit to load any part of Work with weight or force that will endanger Work.

1.7 CONSTRUCTION PARKING

.1 Parking will be permitted on site provided it does not disrupt performance of Work.

.2 Provide and maintain adequate access to project site.

.3 Clean runways and taxi areas where used by Contractor's equipment.

1.8 SECURITY

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

1.9 OFFICES

.1 Provide marked and fully stocked first-aid case in a readily available location.

1.10 EQUIPMENT, TOOL AND MATERIALS STORAGE

.1 Provide and maintain, in clean and orderly condition, lockable weatherproof sheds for storage of tools, equipment and materials.

.2 Locate materials not required to be stored in weatherproof sheds on site in manner to cause least interference with work activities.

1.11 CONSTRUCTION SIGNAGE

.1 No signs or advertisements, other than warning signs, are permitted on site.

.2 Direct requests for approval to erect Contractor signboard to Architect. For consideration general appearance of Contractor signboard must conform to project identification site sign. Wording in both official languages.

.3 Signs and notices for safety and instruction in both official languages Graphic symbols to CAN/CSA-Z321.

.4 Maintain approved signs and notices in good condition for duration of project, and dispose of off site on completion of project or earlier if directed by Architect.

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.

END

PART 1 - GENERAL

1.1 General

.1 Use new material and equipment unless otherwise specified.

.2 Within 7 days of written request by Consultant, submit following information for materials and products proposed for supply:
- .1 Name and address of manufacturer.
- .2 Trade name, model and catalog number.
- .3 Performance, descriptive and test data.
- .4 Manufacturer's installation or application instructions.
- .5 Evidence of arrangements to procure.

.3 Use products of one manufacturer for equipment or material of same type or classification unless otherwise specified.

1.2 Manufacturer's Instructions

.1 Unless otherwise specified, comply with manufacturer's latest printed instructions for materials and installation methods.

.2 Notify Consultant in writing of any conflict between these specifications and manufacturer's instructions. Consultant will designate which document is to be followed.

1.3 Fastenings - General

.1 Provide metal fastenings and accessories in same texture, colour and finish as base metal in which they occur.

.2 Prevent electrolytic action between dissimilar metals.

.3 Use non-corrosive fasteners, anchors and spacers for securing exterior work.

.4 Space anchors within limits of load bearing or shear capacity and ensure that they provide positive permanent anchorage. Wood plugs not acceptable.

.5 Keep exposed fastenings to minimum, space evenly and lay out neatly.

.6 Fastenings which cause spalling or cracking are not acceptable.

.7 Obtain Consultant's approval before using explosive actuated fastening devices. If approval is obtained comply with CSA Z166-1975, and observe restrictions in Section 01 35 29.06 - Health and Safety Requirements.

1.4 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.

.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 and resilient washers with stainless steel.

1.5 Conformance

.1 When material or equipment is specified by standard or performance specifications, upon request of Consultant, obtain from manufacturer an independent testing laboratory report, stating that material or equipment meets or exceeds specified requirements.

1.6 Substitution of Material

.1 Proposals for substitution may be submitted only after award of Contract. Such requests must include statements of respective costs of items originally specified and proposed substitutions.

.2 Proposals will be considered by Consultant if:
.1 Products selected by tenderer from those specified, are not available, or
.2 Delivery date of products selected from those specified would unduly delay completion of Contract, or
.3 Alternative products to those specified, which are brought to attention of, and considered by Consultant as equivalent to those specified and will result in credit to Contract amount.
.4 Should proposed substitution be accepted either in part or in whole, assume full responsibility and costs when substitution affects other work on project. Pay for design or drawing changes required as a result of substitution.
.5 Amounts of all credits arising from approval of substitutions will be determined by Consultant and Contract price will be reduced accordingly. No substitutions will be permitted without prior written approval of Consultant.

1.7 Construction Equipment and Plant

.1 On request, prove to the satisfaction of Consultant that the construction equipment and plant are adequate to manufacture, transport, place and finish work to quality and production rates specified. If inadequate, replace or provide additional equipment or plant as directed.

.2 Maintain construction equipment and plant in good operating order.

PART 2 - PRODUCTS

2.1 Not Used

.1 Not Used

PART 3 - EXECUTION

3.1 Not Used

.1 Not Used

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, Architect reserves right to have such products or systems tested to prove or disprove conformance.

.4 Cost for such testing will be born by Owner 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 Architect 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 Architect 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 Architect at commencement of Work and should it subsequently appear that Work may be delayed for such reason, Architect reserves right to substitute more readily available products of similar character, at no increase in Contract Price or Contract Time.

1.4 STORAGE, HANDLING AND PROTECTION

.1 Handle and store products in manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions when applicable.

.2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work.

.3 Store products subject to damage from weather in weatherproof enclosures.

.4 Store cementitious products clear of earth or concrete floors, and away from walls.

.5 Keep sand, when used for grout or mortar materials, clean and dry. Store sand on wooden platforms and cover with waterproof tarpaulins during inclement weather.

.6 Store sheet materials, lumber and equipment 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 Architect.

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

1.5 TRANSPORTATION

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

.2 Transportation cost of products supplied by Owner will be paid for by Owner. Unload, handle and store such products.

1.6 MANUFACTURER'S INSTRUCTIONS

.1 Unless otherwise indicated in specifications, install or erect products in accordance with manufacturer's instructions. Do not rely on labels or enclosures provided with products. Obtain written instructions directly from manufacturers.

.2 Notify Architect in writing, of conflicts between specifications and manufacturer's instructions, so that Architect will establish course of action.

.3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes Architect 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 Architect if required Work is such as to make it impractical to produce required results.

.2 Do not employ anyone unskilled in their required duties. Architect 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 Architect, whose decision is final.

1.8 CO-ORDINATION

.1 Ensure co-operation of workers in laying out Work. Maintain efficient and continuous supervision.

.2 Be responsible for coordination and placement of openings, sleeves and accessories.

1.9 CONCEALMENT

.1 In finished areas conceal pipes, ducts and wiring in floors, walls and ceilings, except where indicated otherwise.

.2 Before installation inform Architect if there is interference. Install as directed by Architect.

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 Architect 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.

.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 with written approval of Architect.

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 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

PART 1 - GENERAL

1.1 PROJECT CLEANLINESS

.1 Maintain Work in tidy condition, free from accumulation of waste products and debris, including that caused by Owner or other Contractors.

.2 Remove waste materials from site at daily regularly scheduled times or dispose of as directed by Architect. Do not burn waste materials on site, unless approved by Architect.

.3 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.

.4 Provide on-site containers for collection of waste materials and debris.

.5 Provide and use marked separate bins for recycling.

.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. Protect modular furniture from dust accumulation.

.8 Store volatile waste in covered metal containers, and remove from premises at end of each working day.

.9 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.

.10 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.

.11 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

1.2 FINAL CLEANING

.1 When Work is Substantially Performed remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.

.2 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.

.3 Prior to final review remove surplus products, tools, construction machinery and equipment.

.4 Remove waste materials from site at regularly scheduled times. Do not burn waste materials on site.

.5 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.

.6 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.

.7 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, walls, and floors.

.8 Clean lighting reflectors, lenses, and other lighting surfaces.

.9 Vacuum clean and dust building interiors, behind grilles, louvres and screens.

.10 Wax, seal, shampoo or prepare floor finishes, as recommended by manufacturer.

.11 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.

.12 Clean equipment and fixtures to sanitary condition; clean or replace filters of mechanical equipment.

.13 Remove debris and surplus materials from crawl areas and other accessible concealed spaces.

1.3 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 01 74 11 - Cleaning.

1.2 INSPECTION AND DECLARATION

.1 Contractor's Inspection: Contractor and Subcontractors: conduct inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents.
.1 Notify Architect in writing of satisfactory completion of Contractor's Inspection and that corrections have been made.
.2 Request Architect's Inspection.

.2 Architect's Inspection: Architect and Contractor will perform inspection of Work to identify obvious defects or deficiencies. Contractor to correct Work accordingly.

.3 Completion: submit written certificate that following have been performed:
.1 Work has been completed and inspected for compliance with Contract Documents.
.2 Defects have been corrected and deficiencies have been completed.
.3 Equipment and systems have been tested, adjusted and balanced and are fully operational.
.4 Certificates required by Fire Commissioner have been submitted.
.5 Operation of systems have been demonstrated to Owner's personnel.
.6 Work is complete and ready for final inspection.

.4 Final Inspection: when items noted above are completed, request final inspection of Work by Owner's Representative, Architect, and Contractor. If Work is deemed incomplete by Architect, complete outstanding items and request reinspection.

.5 Declaration of Substantial Performance: when Owner, Architect, Consultant consider deficiencies and defects have been corrected and it appears requirements of Contract have been 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 shall 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: when Owner, Architect and Consultant consider final deficiencies and defects have been corrected and it appears requirements of Contract have been totally performed,

make application for final payment. If Work is deemed incomplete by Architect , complete outstanding items and request reinspection.

.8 Payment of Holdback: after issuance of certificate of Substantial Performance of Work, submit an application for payment of holdback.

1.3 CLEANING

.1 In accordance with Section 01 74 11 - Cleaning.

.2 Remove waste and surplus materials, rubbish and construction facilities from the site.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

END

PART 1 - GENERAL

1.1 Certificate

CONTRACTOR: _____

PROJECT: _____

DATE OF SUBSTANTIAL PERFORMANCE _____

.1 Substantial Performance Inspection for above described work

was carried out _____(date) by:

.2 For:
.1 Owner _____
.2 Consultant _____
.3 Contractor _____

.3 The items which are not in accordance with the Plans and Specifications and require correction under the Conditions of the Contract Agreement are listed as an attachment to this Document.

Contractor's Certification

I hereby Certify that the work has been executed in accordance with the Plans and Specifications with the exception of deficiencies listed herewith. The undersigned hereby agrees that notwithstanding the generality of the foregoing, the acceptance of the works shall not prejudice any rights of the Owner or affect any liabilities of the undersigned Contractor pursuant to the provisions of the Contract.

_____

Contractor Date

Owner's Acceptance

I hereby accept the work on behalf of the Owner providing that the deficiencies listed herewith are completed. This acceptance is not to be construed as relieving the Contractor from the responsibility to correct other defects in the work, whether latent or patent, as may become apparent within the guarantee/warranty period. This acceptance is made without prejudice to the rights of the Owner or to the liabilities of the Contractor which may arise and/or continue after acceptance of the work.

_____

Owner Date

Contractor's Certification

Consultant's Declaration

Based on periodic visits to the jobsite and general familiarity with the progress of the work, I declare that, to the best of my knowledge, information and belief, construction is proceeding in accordance with the intent of the design and in general compliance with the plans and specifications, with the exception of the deficiencies listed herewith.

_____

Consultant Date

The following is a list of deficiencies to be corrected. This acceptance is not to be constructed as relieving the Contractor from the responsibility of correcting other defects in the work as may become apparent during the Guarantee/Warranty Period.

PART 2 - PRODUCTS

2.1 Not Used

.1 Not Used

PART 3 - EXECUTION

3.1 Not Used

.1 Not Used

PART 1 - GENERAL

1.1 SUBMITTALS

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

.2 Prepare instructions and data using personnel experienced in maintenance and operation of described products.

.3 Copy will be returned after final inspection, with Architect's comments.

.4 Revise content of documents as required prior to final submittal.

.5 Two weeks prior to Substantial Performance of the Work, submit to the Architect, two final copies of operating and maintenance manuals in English.

.6 Ensure spare parts, maintenance materials and special tools provided are new, undamaged or defective, and of same quality and manufacture as products provided in Work.

.7 Furnish evidence, if requested, for type, source and quality of products provided.

.8 Defective products will be rejected, regardless of previous inspections. Replace products at own expense.

.9 Pay costs of transportation.

1.2 FORMAT

.1 Organize data as instructional manual.

.2 Binders: vinyl, hard covered, 3 'D' ring, loose leaf 219 x 279 mm (8-1/2" x 11") with spine and face pockets.

.3 When multiple binders are used correlate data into related consistent groupings. Identify contents of each binder on spine.

.4 Cover: identify each binder with type or printed title '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. Bind in with text; fold larger drawings to size of text pages.

.9 Provide 1:1 scaled CAD files in dwg format on diskettes, CD or flash drive.

1.3 CONTENTS - EACH VOLUME

.1 Table of Contents: provide title of project;
.1 Date of submission; names.
.2 Addresses, and telephone numbers of Architect 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. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 01 45 00 - Quality Control.

.6 Training:Provide training to occupants of all systems and equipment prior to completion of project.

1.4 AS-BUILTS AND SAMPLES

.1 Maintain,in addition to requirements in General Conditions, at site for Architect 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. 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. Label each document "PROJECT RECORD" in neat, large, printed letters.

.4 Maintain record documents in clean, dry and legible condition. Do not use record documents for construction purposes.

.5 Keep record documents and samples available for inspection by Architect.

.6 At project close, submit two copies of as-built drawings to Architect.

1.5 RECORDING ACTUAL SITE CONDITIONS

.1 Record information on set of black line opaque drawings, provided by Contractor.

.2 Provide felt tip marking pens, maintaining separate colours for each major system, for recording information.

.3 Record information concurrently with construction progress. 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.

1.6 EQUIPMENT AND SYSTEMS

.1 Each Item of Equipment and Each System: include description of unit or system, and component parts. Give function, normal operation characteristics, and limiting conditions. 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. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.

.5 Maintenance Requirements: include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

.6 Provide servicing and lubrication schedule, and list of lubricants required.

.7 Include manufacturer's printed operation and maintenance instructions.

.8 Include sequence of operation by controls manufacturer.

.9 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

.10 Provide installed control diagrams by controls manufacturer.

.11 Provide Contractor's co-ordination drawings, with installed colour coded piping diagrams.

.12 Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

.13 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

.14 Include test and balancing reports as specified in Section 01 45 00 - Quality Control and 01 91 13 - General Commissioning (Cx) Requirements.

.15 Additional requirements: as specified in individual specification sections.

1.7 MATERIALS AND FINISHES

.1 Building Products, Applied Materials, and Finishes: include product data, with catalogue number, size, composition, and colour and texture designations. 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.

1.8 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 location as directed; place and store.

.4 Receive and catalogue items. Submit inventory listing to Architect. Include approved listings in Maintenance Manual.

.5 Obtain receipt for delivered products and submit prior to final payment.

1.9 MAINTENANCE 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. Submit inventory listing to Architect. Include approved listings in Maintenance Manual.

.5 Obtain receipt for delivered products and submit prior to final payment.

1.10 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 location as directed; place and store.

.4 Receive and catalogue items. Submit inventory listing to Architect. Include approved listings in Maintenance Manual.

1.11 STORAGE, HANDLING AND PROTECTION

.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 to satisfaction of Architect.

1.12 WARRANTIES AND BONDS

.1 Develop warranty management plan to contain information relevant to Warranties.

.2 Submit warranty management plan, 30 days before planned pre-warranty conference, to Architect approval.

.3 Warranty management plan to include required actions and documents to assure that Owner 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 Architect for approval prior to each monthly pay estimate.

.6 Assemble approved information in binder and submit upon acceptance of work. 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 12 month warranty inspection, measured from time of acceptance, by Architect.

.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 HVAC balancing, pumps, motors, transformers, and commissioned systems such as fire protection, alarm systems, sprinkler systems, lightning protection systems,.
.3 Provide list for each warranted equipment, item, feature of construction or system indicating:
.1 Name of item.
.2 Model and serial numbers.
.3 Location where installed.
.4 Name and phone numbers of manufacturers or suppliers.
.5 Names, addresses and telephone numbers of sources of spare parts.
.6 Warranties and terms of warranty: include one-year overall warranty of construction. Indicate items that have extended warranties and show separate warranty expiration dates.
.7 Cross-reference to warranty certificates as applicable.
.8 Starting point and duration of warranty period.
.9 Summary of maintenance procedures required to continue warranty in force.
.10 Cross-Reference to specific pertinent Operation and Maintenance manuals.
.11 Organization, names and phone numbers of persons to call for warranty service.

.12 Typical response time and repair time expected for various warranted equipment.

.4 Contractor's plans for attendance at 12 month post-construction warranty inspection.

.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 a timely manner to oral or written notification of required construction warranty repair work.

.11 Written verification will follow oral instructions. Failure to respond will be cause for the Architect to proceed with action against Contractor.

1.13 PRE-WARRANTY CONFERENCE

.1 Meet with Architect, to develop understanding of requirements of this section. Schedule meeting prior to contract completion, and at time designated by Architect.

.2 Architect will establish communication procedures for:
.1 Notification of construction warranty defects.
.2 Determine priorities for type of defect.
.3 Determine reasonable time for response.

.3 Provide name, telephone number and address of licensed and bonded company that is authorized to initiate and pursue 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.

1.14 WARRANTY TAGS

.1 Tag, at time of installation, each warranted item. Provide durable, oil and water resistant tag approved by Architect.

.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

.2 Not Used.

PART 1 - GENERAL

1.1 Related Section

.1 Section 01 91 31 - Commissioning.

1.2 Description

.1 Demonstrate scheduled operation and maintenance of equipment and systems to Owner's personnel two weeks prior to date of final inspection.

.2 Owner will provide list of personnel to receive instructions, and will co-ordinate their attendance at agreed-upon times.

1.3 Quality Control

.1 When specified in individual Sections require manufacturer to provide authorized representative to demonstrate operation of equipment and systems, instruct Owner's personnel, and provide written report that demonstration and instructions have been completed.

1.4 Submittals

.1 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 Consultant's approval.

.3 Submit reports within one week after completion of demonstration, that demonstration and instructions have been satisfactorily completed.

.4 Record signatures of all attendees.

.5 Give time and date of each demonstration, with list of persons present.

.6 The Contractor is to videotape all demonstrations in DVD format and submit (2)two copies to the Owner with the application for Substantial Completion.

1.5 Conditions for Demonstration

.1 Equipment has been inspected and put into operation in accordance with respective applicable Sections.

.2 Testing, adjusting, and balancing has been performed in accordance with Section 01 91 31 - Commissioning (Cx) Requirements and equipment and systems are fully operational.

.3 Provide copies of completed operation and maintenance manuals for use in demonstrations and instructions.

1.6 Preparation

.1 Verify that conditions for demonstration and instructions comply with requirements.

.2 Verify that designated personnel are present.

1.7 Demonstration and Instructions

.1 Demonstrate start-up, operation, control, adjustment, trouble-shooting, sequencing, winter/summer operating, 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 need for additional data becomes apparent during instructions.

PART 2 - PRODUCTS

2.1 Not Used

.1 Not Used

PART 3 - EXECUTION

3.1 Not Used

.1 Not Used

END

PART 1 - GENERAL

1.1 Related Sections

.1 Operations and Maintenance Manuals: Section 01 78 00.

.2 Demonstration and Training: Section 01 79 00.

1.2 Commissioning Objective

.1 Perform commissioning activities in order to achieve the following objectives:
.1 Collect data on equipment and systems supplied; and to document their installation;
.2 Conduct checks and tests on fully installed building component, equipment, systems and integrated systems to:
.1 Verify whether they operate in accordance with requirements of Contract Documents;
.2 Verify performance against design criteria and user requirements and measure peak capacities;
.3 Prepare a Building Management Manual (BMM) which contains operations and maintenance data, as-built record documents, commissioning reports, training data and other critical information for future use by Facility operational staff;
.4 Ensure transfer of knowledge on the operations, maintenance and management of the Facility to Tenant and Operational personnel by means of appropriate training.

.2 Commissioning activities conducted by Owner and/or Consultant does not replace checks, tests, adjustments, balancing and other performance verification responsibilities to be performed by Contractor as part of the work and as specified in sections of the Specifications.

1.3 Definitions

.1 For the purpose of this contract, the following terms, used in this section, as they relate directly or indirectly to the commissioning process, shall be deemed to have the meaning as defined hereafter.

.2 Commissioning Process: a planned program of tasks, activities and procedures carried out systematically during the Construction and Occupancy Stages in accordance with the commissioning objectives, specified in clause 1.2 above, to:
.1 Verify whether the fully installed equipment, systems and integrated systems operate in accordance with contract documents and design criteria and;
.2 Ensure that appropriate documentation is compiled to effectively train Operation and Maintenance staff and prepare a comprehensive Building Management Manual (BMM).

.3 Commission (ie: to commission a building component or system): tests and checks conducted on all systems and integrated systems of Facility; carried out only after they are fully installed, functional and Contractor's Performance Verification responsibilities have been completed and approved.
.1 Contractor provides assistance during this process by operating equipment and systems, by troubleshooting and making adjustments as may be required.
.2 Systems are run under their full operation and under various modes to determine if they function correctly, consistently, at peak efficiency and interactively with each other as intended in accordance with Contract Documents and design criteria.
.3 During these checks, adjustments may be made enhancing performance to meet environmental or user requirements.

.4 Contractor: means the Contractor, however it also refers to any personnel from Subcontractors, including the controls subcontractors, suppliers and manufacturer representatives with whom the Contractor contracts or obtains services for the performance of work and designated commissioning duties.

.5 Consultant: persons from the civil, architectural, mechanical and electrical design disciplines of the consultant firm(s) engaged by Owner to prepare the final design and contract documents.

.6 Design Criteria: All those factors included in the design of a Facility prescribed by the tenant needs or as determined by Consultant as necessary in order to meet all Facility functional and user operational requirements

.7 Installation/Start-up Checks:(sometimes referred to as pre-functional checks). Checks and inspections to be performed by Contractor during the pre-start-up and start-up of a particular equipment or system component.
.1 Checklist sheets are produced which include the following data:
.1 Product manufacturer's installation instructions and recommended checks and;
.2 Special procedures as specified in relevant sections of Specifications;
.3 Other items considered good installation and engineering industry practices deemed appropriate for proper and efficient operation.
.2 Standard Installation/Start-up Checklist sheets prepared by equipment manufacturer are acceptable for use. Supplement with additional data representative of specific project conditions as deemed required by Consultant.
.3 Use Checklist sheets for all equipment installation. Document in writing on checklist the various checks made, deficiencies noted and corrective action taken.
.4 Installing Sub-Contractor to sign Checklist sheets upon completion, certifying that stated checks and inspections have been performed.

.8 Performance Verification: (sometimes referred to Functional Testing) checks, running dynamic tests and adjustments carried out by Contractor on equipment and systems, upon their installation, to ensure they operate correctly, efficiently and function independently and interactively with other systems as intended in accordance with contract documents and manufacturer's recommendations.

.1 Performance Verification shall not be considered part of the commissioning process. It is however considered an essential and integral part of Contractor's responsibilities in the equipment installation process which must be stringently conducted, successfully completed and approved by Owner before a piece of equipment or system is considered fully installed and functional.

.2 Facility components and systems will not be commissioned until performance verification has been completed and approved.

.9 Product Information (PI Data): a compilation of data gathered on a particular piece of equipment, typically produced by manufacturer, which includes nameplate information, installation/startup instructions, parts list, operating instructions, maintenance guidelines and other pertinent technical data and recommended checks that is necessary to prepare for start-up and functional testing and used during operation and maintenance of such equipment. This documentation is included in the Building Management Manual(BMM) at completion of work.

1.4 Contractor's Commissioning Responsibilities

.1 General:

.1 Coordinate the participation of the various subcontractors, their specialists and manufacturer's representatives in providing the commissioning activities described below.

.2 Ensure that workers and manufacturer's personnel are knowledgeable and qualified to interpret system functions and intended design criteria.

.3 Develop a commissioning schedule.

.4 Notify Consultant in writing when Facility is ready for be commissioned. Give 14 calendar day notice.

.5 Commissioning of Facility and designated systems will only commence once that required documentation has been received and all installed equipment and systems have undergone successful performance verification.

.6 Be aware that inspection certificate will only be issued by Consultant when:

.1 All commissioning documentation has been received, reviewed for suitability and approved by Consultant;

.2 Designated facility components and systems have been commissioned and;

.3 Training has been completed.

.7 Non-Conformance of Performance Verification Requirements:
.1 Should incorrectly installed or malfunctioning equipment, system components or associated controls be found while Facility is being commissioned, Contractor shall be required to re-verify 100% of all equipment and components within the non functional system, including other related system as deemed required by Consultant, to correct deficiencies and ensure effective performance.
.2 Costs to correct work and any additional tests or inspections, as deemed required by Consultant, to determine acceptability and proper performance of such items to be paid for by Contractor.
.1 Above costs held against Contractor will be as financial penalties in the form of progress payment reductions or holdback assessments.

.2 Prior to Facility being Commissioned:
.1 Submit commissioning documentation as specified in clause 1.8 for use during commissioning.
.2 Carryout pre-start-up and start-up of equipment.
.3 Conduct performance verification on all installed equipment and systems. Ensure they are fully functional.
.4 Address deficiencies in Work identified during performance verification of equipment and systems. Conduct additional performance verification checks and tests to ensure acceptability of Work.
.5 Arrange for special tools and devices, identified at commissioning meeting(s), as deemed required to assist with commissioning.
.6 Provide access ladders, two way radios and other equipment required by Team when facility will be commissioned.

.3 When Facility is being Commissioned:
.1 Provide qualified tradespersons to be present at site to assist commissioning activity.
.2 Assist in commissioning architectural and structural building component, and mechanical, electrical and civil systems specified and as follows:
.1 Operate designated building component, mechanical/electrical equipment and system under all modes of operation and conduct checks and tests as directed by Consultant.
.2 Check and verify that building component, equipment, systems and integrated systems, including their controls, are functioning and responding correctly and interactively with each other.
.3 Test systems independently and then in unison with other related systems.
.4 Conduct all Commissioning checks and tests in presence of and witnessed by Consultant.
.3 Specific procedures used to commission Facility may be provided by Consultant which includes:
.1 Sequential order of building component and system to be tested.

.2 Running systems under various anticipated modes and demands (example: high and low cooling or heating loads, duplicating outside temperature conditions, fire alarm and power failure conditions etc...).
.3 Running building controls through all sequences of operation to verify and confirm that equipment and systems are responding as designed and intended.
.4 Operating designated equipment at peak capacities, recording output data against design criteria.

.4 Run component or systems as long as necessary to effectively commission all items as deemed required by Consultant.
.5 Monitor equipment and system responses.
.6 Record test results, measurements and other data.
.7 Assist in analyzing results. Identify system deficiencies and components not responding as intended.
.8 Correct deficiencies and system non-conformance issues. Adjust, calibrate or fine tune system components as required. Debug system software as may be required.
.9 Retest systems when directed to confirm compliance.

.4 Upon completion of Facility Commissioning:
.1 Provide training to Maintenance & Operational personnel as specified in clause 1.7 below.
.2 Turn over any filled-in checks sheets or reports resulting from commissioning.

.5 During Warranty period at Occupancy Stage:
.1 Fine tune components, systems and integrated systems and continue system debugging to optimize Facility performance.
.2 Rectify warranty issues.
.3 Submit written report to Consultant.
.1 Indicate results noted and corrective action taken.
.2 Note improvements made to operating parameters and control settings. Recommend modifications deemed advisable to improve performance, environmental conditions, energy consumptions and other issues.
.4 Consultant to be present during such work.

1.5 Commissioning Meetings

.1 Convene commissioning meetings: as required through the project to coordinate commissioning requirements.

.2 Purpose: to resolve issues, monitor progress, identify deficiencies, relating to commissioning.

.3 Continue commissioning meetings on regular basis until commissioning deliverables have been addressed.

.4 At 60% construction completion stage, the Contractor is to call a separate commissioning scope meeting to review progress including consultant, discuss schedule of equipment start-up

activities and prepare for commissioning . 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 commissioning meetings to be held until project completion and as required during equipment start-up and functional testing period.

.6 Meeting will be chaired by Contractor, who will record and distribute minutes within 3 business days.

.7 Ensure Sub-Contractors and relevant manufacturer representatives are present at subsequent commissioning meetings and as required.

1.6 Commissioning Schedule

.1 Address commissioning activities within the construction work schedule. Clearly identify allocated time period for commissioning and training activities.

.2 Provide a commissioning schedule at the 60% construction stage in order that specific issues and individual details of commissioning can be reviewed, discussed and dealt with from that period onward to project completion. Submit updates thereafter,

.3 Indicate allocated time period and anticipated dates for:
.1 Submission of commissioning documentation, including O&M Manuals.
.2 Equipment and system start-up and performance verification, making them ready to be commissioned.
.3 Allocated period to commission designated building components and systems.
.4 Training period.
.5 Work during Warranty period.

.4 Submit schedule to Consultant for review.

1.7 Training

.1 Commence process of familiarizing O&M personnel in the early stages of work on purpose and operation of various equipment and systems. Continue process throughout the entire construction duration.
.1 Provide informal briefings during occasional site visits, at planned commissioning meetings and during the final commissioning site activities.

.2 Conduct formal demonstration and training sessions only after all identified systems have been commissioned and Consultant has given approval to proceed with the training process.

.3 Provide training and demonstration on equipment, sub-systems, systems and integrated systems.

.4 Carryout training in accordance with requirements of section 01 79 00.

.5 Submit written agenda of training session(s) 4 weeks before hand for review by Consultant.

.6 Submit training manuals for review 2 weeks prior to actual training.

.7 Ensure required tools and O&M Manuals are on site for training and system demonstration.

.8 As a minimum, the training sessions to cover the following information:
.1 Introduction.
.2 Description of the system with factory personnel being involved at appropriate times.
.3 Instructions on start-up procedures including seasonal procedures, system check-lists and emergency procedures.
.4 Operational procedures, including occupancy considerations, seasonal change-over, manual and automatic operations and emergency modes.
.5 Instruction on system shutdowns, including checklists.
.6 Instructions on all aspects of system maintenance, including routine servicing, lubrication, overhaul and factory servicing.
.7 Information concerning the scope of warranties and their use.
.8 A description of spare parts in stock and their service.
.9 A description of normal tools required for servicing the systems/equipment.

.9 Submit typewritten record of training sessions given and list of attendees. Use forms of format approved by Consultant.

1.8 Commissioning Documentation

.1 Submit the following documentation for use during commissioning and for incorporation thereafter into a Building Management Manual (BMM):
.1 Operations and Maintenance Manuals, Project Record Documents and other data as specified in Section 01 78 00. Data to include:

.1 Equipment Product Information (PI Data) complete with:
.1 Nameplate info,
.2 Installation instructions,
.3 Operating procedures and
.4 Maintenance guidelines.
.2 Reviewed shop drawings,
.3 As-built record drawings and Specifications.
.2 Completed Installation/Start-up Checklist sheets used.
.3 Copy of any static and dynamic test and reports conducted.
.4 Reports as specified.

.2 Documentation to include detailed information and number of copies as specified for maintenance manuals of section 01 78 00.

PART 2 - PRODUCTS

2.1 Not Used

.1 Not Used

PART 3 - EXECUTION

3.1 Not Used

.1 Not Used

END

PART 1 - GENERAL

1.1 SUMMARY

.1 Section Includes:
.1 Commissioning forms to be completed for equipment, system and integrated system.

.2 Related Sections:
.1 Section 01 91 31 - General Commissioning.

1.2 INSTALLATION/START- UP CHECK LISTS

.1 Include the following data:
.1 Product manufacturer's installation instructions and recommended checks.
.2 Special procedures as specified in relevant technical sections.
.3 Items considered good installation and engineering industry practices deemed appropriate for proper and efficient operation.

.2 Equipment manufacturer's installation/start-up check lists are acceptable for use. As deemed necessary by Consultant 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. Check lists will be required during Commissioning and will be included in Building Maintenance Manual (BMM) at completion of project.

.5 Use of check lists will not be considered part of commissioning process but will be stringently used for equipment pre-start and start-up procedures.

1.3 PRODUCT INFORMATION (PI) REPORT FORMS

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

.2 Prior to Performance Verification (PV) of systems complete items on PI forms related to systems.

1.4 PERFORMANCE VERIFICATION (PV) FORMS

.1 PV forms to be used for checks, running dynamic tests and adjustments carried out on equipment and systems to ensure correct operation, efficiently and function independently and interactively with other systems as intended with project requirements.

.2 PV report forms include those developed by Contractor records measured data and readings taken during functional testing and Performance Verification procedures.

.3 Prior to PV of integrated system, complete PV forms of related systems.

1.5 COMMISSIONING FORMS

.1 Use Commissioning forms to verify installation and record performance when starting equipment and systems.

.2 Strategy for Use:
.1 Contractor will provide 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.
.9 Submit immediately after tests are performed.
.10 Reported results in true measured SI unit values.
.11 Maintain copy on site during start-up, testing and commissioning period.
.12 Forms to be both hard copy and electronic format with typed written results in Building Management Manual.

1.6 LANGUAGE

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

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

END

PART 1 - GENERAL

1.1 Summary

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

1.2 Trainees

.1 Trainees: personnel selected for operating and maintaining this facility. Includes Owner's Property Manager, building operators, maintenance staff, security staff, and technical specialists as required.

.2 Trainees will be available for training during later stages of construction for purposes of familiarization with systems.

1.3 Instructors

.1 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.

.2 Contractor and equipment manufacturer to provide instruction on:
.1 Start-up, operation, maintenance and shut-down of equipment they have certified installation, started up and carried out PV tests.

1.4 Training Objectives

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

1.5 Training Materials

.1 Contractors 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 Testing, Adjusting and Balancing and Performance Verification Reports.

.3 Training materials to be in a format that permits future training procedures to same degree of detail.

.4 Supplement training materials:
- .1 Transparencies for overhead projectors.
- .2 Multimedia presentations.
- .3 Manufacturer's training videos.
- .4 Equipment models.

1.6 Scheduling

.1 Include in Commissioning Schedule time for training.

.2 Deliver training during regular working hours, training sessions to be maximum 3 hours in length.

.3 Training to be completed prior to acceptance of facility.

1.7 Responspibilities

.1 Be responsible for:
- .1 Implementation of training activities,
- .2 Coordination among instructors,
- .3 Quality of training, training materials,

.2 Consultant will evaluate training and materials.

.3 Upon completion of training, provide written report, signed by Instructors, witnessed by Consultant.
- .1 Report to include a list of all attendees.

1.8 Training Content

.1 Training to include demonstrations by Instructors using the installed equipment and systems.

.2 Content includes:
- .1 Review of facility and occupancy profile.
- .2 Functional requirements.

.3 System philosophy, limitations of systems and emergency procedures.
.4 Review of system layout, equipment, components and controls.
.5 Equipment and system start-up, operation, monitoring, servicing, maintenance and shut-down procedures.
.6 System operating sequences, including step-by-step directions for starting up, shut-down, operation of valves, dampers, switches, adjustment of control settings and emergency procedures.
.7 Maintenance and servicing.
.8 Trouble-shooting diagnosis.
.9 Inter-Action among systems during integrated operation.
.10 Review of O&M documentation.

.3 Provide specialized training as specified in relevant Technical Sections of the construction specifications.

1.9 Video-Based Training

.1 Manufacturer's videotapes to be used as training tool with Consultant's review and written approval 3 months prior to commencement of scheduled training.

.2 On-Site training videos:
.1 Videotape training sessions for use during future training.
.2 To be performed after systems are fully commissioned.
.3 Organize into several short modules to permit incorporation of changes.

.3 Production methods to be professional quality.

PART 2 - PRODUCTS

2.1 Not Used

.1 Not Used

PART 3 - EXECUTION

3.1 Not Used

.1 Not Used

END

PART 1 - GENERAL

1.1 Summary

.1 Section Includes:
.1 This section is limited to portions of the Building Management Manual (BMM) provided to Consultant by Contractor.

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

1.2 General Requirements

.1 Standard letter size paper 216 mm x 279 mm.

.2 Methodology used to facilitate updating.

.3 Drawings, diagrams and schematics to be professionally developed.

.4 Electronic copy of data to be in a format accepted and approved by Consultant.

1.3 Approvals

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

1.4 General Information

.1 On completion of the project submit to Consultant two (2) copies of Building Management Manual including:
.1 Complete list of names, addresses, telephone and fax numbers of Contractor, Sub-Contractors that participated in delivery of project.
.2 Summary of architectural, structural, fire protection, mechanical and electrical systems installed and commissioned.
.1 Including sequence of operation as finalized after commissioning is complete.
.3 Description of building operation under conditions of heightened security and emergencies.
.4 System, equipment and components Maintenance Management System (MMS) identification.
.5 Information on operation and maintenance of architectural systems and equipment installed and commissioned.

.6 Information on operation and maintenance of fire protection and life safety systems and equipment installed and commissioned.
.7 Information on operation and maintenance of mechanical systems and equipment installed and commissioned.
.8 Operating and maintenance manual.
.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 Consultant.
.13 Commissioning reports.

1.5 Contents of Operating and Maintenance Manual

.1 For detailed requirements refer to Section 01 78 00 - Closeout Submittals.

.2 Consultant to review and approve format and organization within 12 weeks of award of contract.

.3 Include original manufactures brochures and written information on products and equipment installed on this project.

.4 Record and organize for easy access and retrieval of information contained in BMM.

.5 Include completed PI report forms, data and information from other sources as required.

.6 Inventory directory relating to information on installed systems, equipment and components.

.7 Approved project shop-drawings, product and maintenance data.

.8 Manufacturer's data and recommendations relating: manufacturing process, installation, commissioning, start-up, O&M, shutdown and training materials.

.9 Inventory and location of spare parts, special tools and maintenance materials.

.10 Warranty information.

.11 Sample Warranty Form as indicated in Section 01 33 00.

.12 Inspection certificates with expiration dates, which require on-going re-certification inspections.

.13 Maintenance program supporting information including:
.1 Recommended maintenance procedures and schedule.
.2 Information on removal and replacement of equipment including, required equipment, points of lift and means of entry and egress.

1.6 Supporting Documentation for Insertion into Supporting Appendices

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

1.7 Language

.1 English.

1.8 Use of Current Technology

.1 Use current technology for production of documentation. Emphasis on ease of accessibility at all times, maintain in up-to-date state, compatibility with user's requirements.

.2 Obtain Consultant'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

PART 1 - GENERAL

1.1 REFERENCES

.1 Canadian Standards Association (CSA International)
.1 CSA S350-M1980(R1998), Code of Practice for Safety in Demolition of Structures.

1.2 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with Provincial and Municipla by-laws.

1.3 SITE CONDITIONS

.1 Should material resembling spray or trowel-applied asbestos or other designated substance listed as hazardous be encountered, stop work, take preventative measures, and notify Consultant immediately.
.1 Do not proceed until written instructions have been received from Departmental Representative.

.2 Notify Departmental Representative before disrupting building access or services.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not used.

PART 3 - EXECUTION

3.1 PREPARATION

.1 Inspect building 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 Immediately notify Departmental Representative concerned in case of damage to any utility or service, designated to remain in place.
.1 Immediately notify the Departmental Representative should uncharted utility or service be encountered, and await instruction in writing regarding remedial action.

3.2 PROTECTION

.1 Prevent movement, settlement, or damage to adjacent utilities, and parts of building to remain in place.

.2 Keep noise, dust, and inconvenience to occupants to minimum.

.3 Protect building systems, services and equipment.

.4 Provide temporary dust screens, covers, railings, supports and other protection as required.

.5 Do Work in accordance with Section 01 35 29.06 - Health and Safety Requirements.

3.3 SALVAGE

.1 Refer to demolition drawings and specifications for items to be salvaged for reuse.

.2 Remove items to be reused, store as directed by Departmental Representative, and re-install under appropriate section of specification.

3.4 DEMOLITION

.1 Remove parts of existing building to permit new construction. Sort materials into appropriate piles for reuse and recycling.

.2 Trim edges of partially demolished building elements to tolerances as defined by Consultant to suit future use.

3.5 DISPOSAL

.1 Dispose of removed materials, to appropriate recycling facilities except where specified otherwise, in accordance with authority having jurisdiction.

END

PART 1 - GENERAL

1.1 References

.1 NFC-1995 - National Fire Code of Canada 1995.

.2 CLC-Part IV - Canada Labour Code.

.3 WHIMIS-Workplace Hazardous Materials Information System (Federal Legislation Bill C-70).

.4 Hazardous Products Act.

.5 Hazardous Materials Information Review Act.

.6 Occupational Health and Safety Regulations of New Brunswick.

.7 Regulations and standards currently in force for products not covered under WHMIS legislation, designed for the regulation of specific categories of products such as but not limited to:
.1 Explosives Act
.2 Atomic Energy Control Act.

1.2 Definitions

.1 Dangerous Goods: Product, substance, or organism that is specifically listed or meets the hazard criteria established in Transportation of Dangerous Goods Regulations.

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

.3 Hazardous Waste: Any hazardous material that is no longer used for its original purpose and that is intended for recycling, treatment or disposal.

.4 Workplace Hazardous Materials Information System (WHMIS): A Canada-wide system designed to give employers and workers information about hazardous materials used in the workplace. Under WHMIS, information on hazardous materials is to be provided on container labels, material safety data sheets (MSDS), and worker education programs. WHMIS is put into effect by a combination of federal and provincial laws.

1.3 Storage and Handling

.1 Store and handle hazardous materials and wastes in accordance with applicable federal and provincial laws, regulations, codes, and guidelines.

.2 Store and handle flammable and combustible materials in accordance with current National Fire Code of Canada requirements.

.3 Observe smoking regulations at all times. Smoking is prohibited in any area where hazardous materials are stored, used, or handled.

.4 Abide by the following storage requirements for quantities of hazardous materials and wastes in excess of 5 kg for solids, and

5
litres for liquids:
.1 Store hazardous materials and wastes in closed and sealed containers which are in good condition.
.2 Label containers of hazardous materials and wastes in accordance with WHMIS.
.3 Store hazardous materials and wastes in containers compatible with that material or waste.
.4 Segregate incompatible materials and wastes.
.5 Ensure that different hazardous materials or hazardous wastes are not mixed.
.6 Store hazardous materials and wastes in a secure storage area with controlled access.
.7 Maintain a clear egress from storage area.
.8 Store hazardous materials and wastes in a manner and location which will prevent them from spilling into the environment.
.9 Have appropriate emergency spill response equipment available near the storage area, including personal protective equipment.
.10 Maintain an inventory of hazardous materials and wastes, including product name, quantity, and date when storage began.

.5 Ensure personnel have been trained in accordance with Workplace Hazardous Materials Information System (WHMIS) requirements.

.6 Report spills or accidents immediately.

1.4 Transportation

.1 Transport hazardous materials and wastes in accordance with federal Transportation of Dangerous Goods Act, Transportation of Dangerous Goods Regulations, and applicable provincial regulations.

.2 If hazardous waste is generated on site:
.1 Ensure compliance with applicable provincial laws and regulations for generators of hazardous waste.
.2 Use only a licensed carrier authorized by provincial authorities to accept subject material.
.3 Prior to shipping material, obtain written notice from intended hazardous waste treatment or disposal facility that it will accept material and that it is licensed to accept this material.
.4 Label containers with legible, visible safety marks as prescribed by federal and provincial regulations.
.5 Ensure that only trained personnel handle, offer for transport, or transport dangerous goods.
.6 Track receipt of completed manifest from consignee after shipping dangerous goods.
.7 Report any discharge, emission, or escape of hazardous materials immediately to provincial authority. Take reasonable measures to control release.

PART 2 - PRODUCTS

2.1 Materials

.1 Only bring on site the quantity of hazardous materials required to perform work.

.2 Maintain MSDS in proximity to where the materials are being used. Communicate this location to personnel who may have contact with hazardous materials.

PART 3 - EXECUTION

3.1 Disposal

.1 Dispose of hazardous waste materials in accordance with applicable federal and provincial acts, regulations, and guidelines.

.2 Recycle hazardous wastes for which there is an approved, cost effective recycling process available.

.3 Send hazardous wastes only to authorized hazardous waste disposal or treatment facilities.

.4 Burning, diluting, or mixing hazardous wastes for purpose of disposal is prohibited.

.5 Disposal of hazardous materials in waterways, storm or sanitary sewers, or in municipal solid waste landfills is prohibited.

END

PART 1 - GENERAL

1.1 Related Sections

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 06 10 00 - Rough Carpentry.

.3 Section 09 91 99 - Painting.

1.2 References

.1 American Society for Testing and Materials (ASTM)
.1 ASTM A 53/A53M-99b, Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Steamless.
.2 ASTM A 307-97, Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.

.2 Canadian General Standards Board (CGSB)
.1 CAN/CGSB-1.40-97, Anti-corrosive Structural Steel Alkyd Primer.
.2 CAN/CGSB-1.108-M89, Bituminous Solvent Type Paint.
.3 CAN/CGSB-1.181-92, Ready-Mixed, Organic Zinc-Rich Coating.

.3 Canadian Standards Association (CSA)
.1 CAN/CSA-G40.20/G40.21-98, General Requirements for Rolled or Welded Structural Quality Steel.
.2 CAN/CSA-G164-M92(R1998), Hot Dip Galvanizing of Irregularly Shaped Articles.
.3 CAN/CSA-S16.1-94, Limit States Design of Steel Structures.
.4 CSA W59-M1998, Welded Steel Construction (Metal Arc Welding).

1.3 QUALITY ASSURANCE

.1 Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.

.2 Certificates: Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.4 Protection

.1 Cover exposed aluminum and stainless steel surfaces with pressure sensitive heavy protection paper or apply strippable plastic coating, before shipping to job site.

.2 Leave protective covering in place until final cleaning of building. Provide instructions for removal of protective covering.

1.5 SUBMITTALS

.1 Shop Drawings
.1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures .
.2 Indicate construction details, sizes of steel sections and thickness of steel sheet.
.3 Submit shop drawing bearing stamp of a qualified professional engineer registered in New Brunswick, Canada.

PART 2 - PRODUCTS

2.1 Materials

.1 Steel sections and plates: to CAN/CSA-G40.20/G40.21, Type 300W (350W for HSS Sections).

.2 Steel pipe: to ASTM A 53/A53M extra strong black finish.

.3 Welding materials: to CSA W59. Electrodes: E480XX.

.4 Welding electrodes: to CSA W48 Series.

.5 Bolts and anchorbolts: to ASTM A 307.

.6 Grout: non-shrink, non-metallic, flowable, 15 MPa at 24 hours.

.7 Shop coat primer to CISG-CPMS I-73K.

.8 Aluminum Sheet: plain 1.2 mm minimum thickness and mill finish.

.9 Stainless steel tubing and angles to ASTM A269, Type 302 welded with A151 No. 4 finish as indicated.

2.2 Metal Fabrication Schedule

.1 Miscellaneous Metals
.1 In-Wall Counter Supports
.1 HSS50x50x6 welded steel "L" brackets. Vertical leg of bracket to be securely installed within wall system. sizes and locations as per drawings.

2.3 Fabrication

.1 Examine drawings and specifications and furnish miscellaneous metal work items required for the proper execution of this project.

.2 Fabricate items from steel unless otherwise noted.

.3 Fabricate work square, true, straight and accurate to required size, with joints closely fitted and properly secured.

.4 Use self-tapping shake-proof flat headed screws on items requiring assembly by screws or as indicated.

.5 Where possible, fit and shop assemble work, ready for erection.

.6 Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush.

2.4 Finishes

.1 Galvanizing: hot dipped galvanizing with zinc coating 600 g/m^2 to CAN/CSA-G164.

.2 Shop coat primer: to CAN/CGSB-1.40.

.3 Zinc primer: zinc rich, ready mix to CAN/CGSB-1.181.

.4 Bituminous paint: to CAN/CGSB-1.108.

2.5 Isolation Coating

.1 Isolate aluminum from following components, by means of bituminous paint:
.1 Dissimilar metals except stainless steel, zinc, or white bronze of small area.
.2 Concrete, mortar and masonry.
.3 Wood.

2.6 Shop Painting

.1 Apply one shop coat of primer to metal items, with exception of galvanize or concrete encased items.

.2 Use primer unadulterated, as prepared by manufacturer. Paint on dry surfaces, free from rust, scale, grease. Do not paint when temperature is lower than 7°C.

.3 Clean surfaces to be field welded; do not paint.

PART 3 - EXECUTION

3.1 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 Consultant 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 Provide components for building by other sections in accordance with shop drawings and schedule.

.6 Make field connections with high tensile bolts to CAN/CSA-S16.1, or weld to CSA S16 and CSA S1651.

.7 Hand items over for casting into concrete or building into masonry to appropriate trades together with setting templates.

.8 Touch-up rivets, field welds, bolts and burnt or scratched surfaces after completion of erection with primer.

.9 Touch-up galvanized surfaces with zinc rich primer where burned by field welding.

3.2 Metal Brackets

.1 Supply and install miscellaneous steel brackets as indicated on the drawings.

END

PART 1 - GENERAL

1.1 REFERENCES

.1 American National Standards Institute (ANSI)
.1 ANSI/NPA A208.1-1999, Particleboard, Mat Formed Wood.

.2 American Society for Testing and Materials International (ASTM)
.1 ASTM A 653/A 653M-05a, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanealled) by the Hot-Dip Process.
.2 ASTM C 36/C 36M-03, Standard Specification for Gypsum Wallboard.
.3 ASTM C 578-05a, Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.
.4 ASTM C 1289-05a, Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.
.5 ASTM D 1761-88(2000), Standard Test Methods for Mechanical Fasteners in Wood.
.6 ASTM D 5055-05, Standard Specification for Establishing and Monitoring Structural Capacities of Prefabricated Wood I-Joists.
.7 ASTM D 5456-05a, Standard Specification for Evaluation of Structural Composite Lumber Products.

.3 Canadian General Standards Board (CGSB)
.1 CAN/CGSB-11.3-M87, Hardboard.
.2 CAN/CGSB-51.32-M77, Sheathing, Membrane, Breather Type.
.3 CAN/CGSB-51.34-M86, Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
.4 CAN/CGSB-71.26-M88, Adhesive for Field-Gluing Plywood to Lumber Framing for Floor Systems.

.4 Canadian Standards Association (CSA International)
.1 CSA A123.2-03, Asphalt Coated Roofing Sheets.
.2 CAN/CSA-A247-M86, Insulating Fiberboard.
.3 CSA B111-1974(R2003), Wire Nails, Spikes and Staples.
.4 CAN/CSA-G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
.5 CSA O112 Series-M1977(R2006), CSA Standards for Wood Adhesives.
.6 CSA O121-M1978(R2003), Douglas Fir Plywood.
.7 CSA O122-06, Structural Glued-Laminated Timber.
.8 CSA O141-05, Softwood Lumber.
.9 CSA O151-04, Canadian Softwood Plywood.
.10 CSA O153-M1980(R2003), Poplar Plywood.
.11 CAN/CSA-O325.0-92(R2003), Construction Sheathing.
.12 CSA O437 Series-93(R2006), Standards on OSB and Waferboard.

.5 Forest Stewardship Council (FSC)
.1 FSC-STD-01-001-2004, FSC Principle and Criteria for Forest Stewardship.

.2 FSC-STD-20-002-2004, Structure and Content of Forest Stewardship Standards V2-1
.3 FSC Accredited Certified Bodies.

.6 National Lumber Grades Authority (NLGA)
.1 Standard Grading Rules for Canadian Lumber 2005.

.7 South Coast Air Quality Management District (SCAQMD), California State (SCAQMD)
.1 SCAQMD Rule 1113-04, Architectural Coatings.
.2 SCAQMD Rule 1168-05, Adhesives and Sealants Applications.

.8 Truss Design and Procedures for Light Metal Connected Wood Trusses, Truss Plate Institute of Canada.

.9 Underwriters' Laboratories of Canada (ULC)
.1 CAN/ULC-S706-97, Mineral Fibre Thermal Insulation for Buildings.

1.2 SUBMITTALS

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

1.3 QUALITY ASSURANCE

.1 Lumber by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board.

.2 Plywood, particleboard, OS and wood based composite panels in accordance with CSA and ANSI standards.

1.4 DELIVERY, STORAGE, AND HANDLING

.1 Waste Management and Disposal:
.1 Separate waste materials for reuse and recycling in accordance with Municipal and Provincial bylaws.

PART 2 - PRODUCTS

2.1 FRAMING AND STRUCTURAL MATERIALS

.1 Lumber: unless specified otherwise, softwood, S4S, moisture content 19% (S-dry) or less in accordance with following standards:
.1 CSA O141.
.2 NLGA Standard Grading Rules for Canadian Lumber.

.2 Structural Composite Lumber (SCL) in accordance with ASTM D 5456.

.3 Framing and board lumber: in accordance with NBC.

.4 Furring, blocking, nailing strips, grounds, rough bucks, cants, curbs, fascia backing and sleepers:
.1 S2S is acceptable.
.2 Board sizes: "Standard" or better grade.
.3 Dimension sizes: "Standard" light framing or better grade.

2.2 PANEL MATERIALS

.1 Plywood, OSB and wood based composite panels: to CAN/CSA-O325.0.

.2 Douglas fir plywood (DFP): to CSA O121, standard construction.

.3 Canadian softwood plywood (CSP): to CSA O151, standard construction.

.4 Poplar plywood (PP): to CSA O153, standard construction.

.5 Mat-formed structural panelboards (OSB wafer): to CAN3-O437.0.
.1 Exterior wall sheathing paper: to CAN/CGSB-51.32 spunbonded olefin type as indicated.

.6 Except as specified otherwise panels shall be 1200 x 2400mm size, square edge.

2.3 ACCESSORIES

.1 Air seal: closed cell polyurethane or polyethylene.

.2 Sealants: in accordance with Section 07 92 00 - Sealants.
.1 Maximum allowable VOC limit 250 g/L.

.3 Subflooring adhesive: to CGSB-71.26, cartridge loaded.
.1 Maximum allowable VOC limit 30 g/L.

.4 General purpose adhesive: to CSA O112 Series.
.1 Maximum allowable VOC limit 140 g/L.

.5 Nails, spikes and staples: to CSA B111.

.6 Bolts: 12.5 mm diameter unless indicated otherwise, complete with nuts and washers.

.7 Proprietary fasteners: toggle bolts, expansion shields and lag bolts, screws and lead or inorganic fibre plugs, explosive actuated fastening devices, recommended for purpose by manufacturer.

.8 Nailing discs: flat caps, minimum 25 mm diameter, minimum 0.4 mm thick, sheet metal, fibre, formed to prevent dishing. Bell or cup shapes not acceptable.

2.4 FASTENER FINISHES

.1 Galvanizing: to CAN/CSA-G164 ASTM A 653, use galvanized fasteners for exterior work pressure-preservative treated lumber.

2.5 WOOD PRESERVATIVE

.1 Maximum allowable VOC limit 350 g/L.

PART 3 - EXECUTION

3.1 PREPARATION

.1 Store wood products in dry location to maintain specified moisture content.

.2 Treat surfaces of material with wood preservative, before installation.

.3 Apply preservative by dipping, or by brush to completely saturate and maintain wet film on surface for minimum 3 minutes soak on lumber and one minute soak on plywood.

.4 Re-treat surfaces exposed by cutting, trimming or boring with liberal brush application of preservative before installation.

.5 Treat material including, but not limited to:
.1 Wood cants, fascia backing, curbs, nailers, sleepers on roof deck and exterior walls.
.2 All wood products in direct contact with concrete, ground and fill.
.3 Wood blocking fillers and nailing strips at door and window penetrations.

3.2 INSTALLATION

.1 Comply with requirements of latest NBC.

.2 Install members true to line, levels and elevations, square and plumb.

.3 Construct continuous members from pieces of longest practical length.

.4 Install spanning members with "crown-edge" up.

.5 Select exposed framing for appearance. Install lumber and panel materials so that grade-marks and other defacing marks are concealed or are removed by sanding where materials are left exposed.

.6 Install subflooring and combined subfloor and underlay with panel end-joints located on solid bearing, staggered at least 800 mm.

.1 In addition to mechanical fasteners, secure floor subflooring to floor joists using glue. Place continuous adhesive bead in accordance with manufacturer's instructions, single-bead on each joist and double-bead on joists where panel ends butt.

.7 Install furring and blocking as required to space-out and support casework, cabinets, wall and ceiling finishes, facings, fascia, soffit, siding electrical equipment mounting boards, and other work as required. Handrails and wall bumper guards also require blocking support.

.8 Install rough bucks, nailers and linings to rough openings as required to provide backing for frames and other work.

.9 Install furring to support siding applied vertically where there is no blocking and where sheathing is not suitable for direct nailing.

.1 Align and plumb faces of furring and blocking to tolerance of 1:600.

.10 Install wood cants, fascia backing, nailers, curbs and other wood supports as required and secure using galvanized steel fasteners.

.11 Install sleepers as indicated.

.12 Use dust collectors and high quality respirator masks when cutting or sanding wood panels.

3.3 ERECTION

.1 Frame, anchor, fasten, tie and brace members to provide necessary strength and rigidity.

.2 Countersink bolts where necessary to provide clearance for other work.

.3 Use nailing disks for soft sheathing as recommended by sheathing manufacturer.

END

PART 1 - GENERAL

1.2 REFERENCES

.1 ASTM International
.1 ASTM A 653/A 653M-11, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.2 CSA International
.1 CSA B111-74(R2003), Wire Nails, Spikes and Staples.
.2 CAN/CSA O80 Series-08, Wood Preservation.
.3 CSA O86 Consolidation-09, Engineering Design in Wood.
.4 CAN/CSA-Z809-08, Sustainable Forest Management.

.3 Forest Stewardship Council (FSC)
.1 FSC-STD-01-001-2004, FSC Principle and Criteria for Forest Stewardship.

.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 National Lumber Grades Authority (NLGA)
.1 Standard Grading Rules for Canadian Lumber 2010.

.7 Sustainable Forestry Initiative (SFI)
.1 SFI-2010-2014 Standard.

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 wood decking and include product characteristics, performance criteria, physical size, finish and limitations.
.2 Submit two copies of WHMIS MSDS in accordance with Section 01 35 29 - Health and Safety Requirements 01 35 43 - Environmental Procedures.

.3 Shop Drawings:
.1 Submit drawings in accordance with Section 01 33 00 - Submittal Procedures.

1.4 QUALITY ASSURANCE

.1 Lumber identification: by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board.

.2 Sustainable Standards Certification:
.1 Certified Wood: submit listing of wood products and materials used in accordance with FSC.

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 and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect wood decking from nicks, scratches, and blemishes.
.3 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials as specified in in accordance with Section 01 74 22 - Construction/Demolition Waste Management and Disposal.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Wood decking: to NLGA standard Grading Rules for Canadian Lumber select commercial grade Spruce x 32 mm. Kiln dry decking to 15% maximum moisture content following preservative treatment.

.2 Decking lengths: 1.8 to 6 m or longer with a minimum of 90% planks exceeding 3 m. Square end trimmed. For single spans shorter than 3 m use decking of same length as span.

.3 Nails: to CSA B111, stainless steel finish; sizes to CSA O86, ASTM 653/653M. Supply 200 mm spiral spikes for lateral nailing.

.4 Splines: galvanized metal, as recommended by decking manufacturer.

.5 Wood preservative: water borne type to CSA O80 for natural finish, arsenic free.

.6 Adhesive and Sealants: in accordance with Section 07 92 00 - Joint Sealants.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for wood decking 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 Do wood deck work to CSA O86 except where specified otherwise.

.2 Install decking to CSA O86, controlled random pattern.

.3 Supply minimum of 1 bearing support for each plank except extend cantilevers over two supports.

.4 Stagger end joints in adjacent planks minimum of 0.5 m.
.1 Separate joints in same area by at least 2 intervening courses.
.2 Avoid joints in first fifth of end spans.
.3 Minimize joints in middle third of span.

.5 Apply preservative to end cuts of pressure treated lumber.

3.3 FIELD QUALITY CONTROL

.1 Testing:
.1 Testing moisture content of delivered material will be performed by testing laboratory designated by Departmental Representative.
.2 Departmental Representative will pay for costs of testing in accordance with Division 1.
.3 Testing moisture content of delivered material will be by testing laboratory designated by Departmental Representative.

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 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 22 - Construction/Demolition Waste Management and Disposal.
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.5 PROTECTION

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

.2 Repair damage to adjacent materials caused by wood decking installation.

END

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 06 61 16 - Solid Surface Fabrications

1.2 REFERENCES

.1 American National Standards Institute (ANSI)
.1 ANSI A208.1-99, Particleboard.
.2 ANSI A208.2-02, Medium Density Fibreboard (MDF).
.3 ANSI/HPVA HP-1-2004, Standard for Hardwood and Decorative Plywood.

.2 Architectural Woodwork Manufacturers Association of Canada (AWMAC) and Architectural Woodwork Institute (AWI)
.1 Architectural Woodwork Quality Standards Illustrated, 8th edition, Version 1.0 2003.

.3 Canadian General Standards Board (CGSB)
.1 CAN/CGSB-11.3-M87, Hardboard.

.4 Canadian Plywood Association (CanPly)
.1 The Plywood Handbook 2005.

.5 Canadian Standards Association (CSA International)
.1 CSA B111-74(R2003), Wire Nails, Spikes and Staples.
.2 CAN/CSA-G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
.3 CSA O121-M89(R2003), Douglas Fir Plywood.
.4 CAN/CSA O141-91(R1999), Softwood Lumber.
.5 CSA O151-04, Canadian Softwood Plywood.
.6 CSA O153-M1980(R2003), Poplar Plywood.
.7 CSA Z760-94, Life Cycle Assessment.

.6 Forest Stewardship Council (FSC)
.1 FSC-STD-01-001-2004, FSC Principle and Criteria for Forest Stewardship.

.7 Do finish carpentry to Millwork Standards of the Architectural Woodwork Manufacturers Association of Canada (AWMAC), except where specified otherwise.

1.3 General

.1 Millwork shall conform to the Premium Grade Requirements of the Architectural Woodwork Manufacturers' Association of Canada (AWMAC). Quality standards for Architectural Woodwork, latest edition, except where specified otherwise.

.2 Shop drawings:
.1 Submit shop drawings indicating: dimensions, details of construction, materials, thicknesses, finishes, hardware, connections, profiles, joints, method of anchorage, number of anchors, supports, reinforcement, details and accessories and other related details as per requirements of Section 01 33 00 - Submittals.
.2 Provide samples of all casework components (minimum 150mm x 150mm) and finish work for Consultant approval.

.3 Do all cutting and fitting and prepare components to receive and accommodate work of other sections.

.4 Warranty:
.1 Warranty work of this section against de-lamination of finish and warpage of millwork for a period of two (2) years from the date of work is certified.
.2 Make good on all deficiencies which become apparent during warranty period.

1.4 SUBMITTALS

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

1.5 QUALITY ASSURANCE

.1 Lumber by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board.

.2 Plywood, particleboard, OSB and wood based composite panels in accordance with CSA and ANSI standards.

1.6 DELIVERY, STORAGE, AND HANDLING

.1 Deliver, handle, store and protect materials in accordance with Section 01 61 00 - Common Product Requirements.
.1 Protect materials against dampness during and after delivery.
.2 Store materials in ventilated areas, protected from extreme changes of temperature or humidity.

PART 2 - PRODUCTS

2.1 Materials

.1 Softwood lumber: S4S, moisture content 8% or less in accordance with the following standards:
- .1 CAN/CSA-0141-91 (R 1999).
- .2 NLGS Standard Grading Rules 1997.
- .3 aWMAC premium grade, moisture content as specified.

.2 Hardwood lumber: to National Hardwood Lumber Association requirements, moisture content of maximum 7%, Birch species for exposed hardwood and for hardwood to receive stain finish, or as identified on drawings.

.3 Douglas fir plywood to CSA 0121-M 1978 (R 1998).

.4 Canadian softwood plywood (CSP): to CSA O151, standard construction.

.5 Hardwood plywood to CSA 0115-M 982, urea formaldehyde free, in thickness indicated, good two sides. Exposed veneer: Birch.

.6 Hardwood to CAN CGSB 1.3-M87.

.7 Hardboard: to CAN/CGSB-11.3.

.8 Medium density fibreboard MDF to ANSI A208.2-1994 density 769 kg per sq.m.
- .1 Must contain no urea formaldehyde.
- .2 Comprised of 100% pre-consumer recycled material.
- .3 Standard of acceptance: Purekor MDF Plus by Panel Source International Inc.

.9 Thermally-fused saturated melamine compound panel (MCP):
- .1 Thermoset acid resistant melamine impregnated paper, urea formaldehyde free, permanently bonded to 100% recycled particleboard substrate to ASTM FSL-P5084.
- .2 Colour to be selected by Consultant from manufacturer's full range.

.10 Particleboard:
- .1 As per ANSI A208.1 - 1999 M3 and ANSI A20.2 - 2002 Grade 130.
- .2 Less than 0.01ppm for formaldehyde emissions (to ASTM E1333-96).
- .3 Thickness from normal +/-0.008"; thickness from average +/-0.004".
- .4 Internal bond: 65 psi.
- .5 Linear expansion: 0.35%.
- .6 Screw holding: Face/225lbs; Edge/205lbs.
- .7 To thickness noted on drawings.

.11 Thermofoil:
.1 Refer to specification Section 12 35 00 - Thermofoil Cabinets.

2.2 Typical Casework Construction (unless otherwise noted)

.1 Typical Thermofoil Cabinetry (TH-1):
.1 Box: 19mm MCP sides and bottom, 13mm MCP back panel w/ 3mm PVC edging.
.2 Doors and Drawer Fronts: 19mm Thermofoil wrapped MDF.
.3 Drawer Boxes: 13mm Baltic Birch w/ clear lacquer finish.
.4 Exposed Shelves: 19mm thermofoil wrapped MDF.
.5 Concealed Shelves: 19mm MCP with 3mm colour matched PVC edgebanding.
.6 Toe Kicks: 19mm douglas fir plywood covered with base as noted on Section 09 00 00 - Finish Schedule.

2.3 Countertops

.1 Fabricate countertops and splashbacks as indicated.

.2 Fabricate countertop and splashback sections in as long a length as is practicable.

.3 Counter shall be assembled with water-resistant glue and concealed wood dowels.

.4 Cut holes for fixtures, fittings, accessories and equipment.

.5 Round or chamfer exposed edges and corners of cut outs.

.6 Cove internal corners of cut-outs in casework finishes to 13mm radius.

.7 Finish exposed edges and surfaces in same manner as specified for working surface of countertop material.

.8 Make allowances around periphery and where fixed objects pass through or project into countertop material to permit normal movement without restriction.

.9 Joints: Field weld or mechanically watertight.

2.4 Cabinet Doors

.1 All paints and finishes to be shop applied.

2.5 Solid Surface

.1 Refer to Section 06 61 16 - Solid Surface Fabrications for material specification.

2.6 Adhesives

.1 All adhesives used in architectural millwork shall be manufactured to applicable CSA standards and utilized on appropriate substrates as per manufacturer's recommendations.

.2 All adhesives used in architectural millwork must meet requirements of south Coast Air Quality Management district (SCAQMD).

.3 All aerosol adhesives must meet requirements of Green Seal Standards GS-36.

2.7 Wood Door Frames

.1 25mm thick birch hardwood frames in depths to suit thickness of associated wall assembly.

.2 Refer to plans and schedules for locations and finishes.

2.8 Cabinet Hardware

.1 Cabinet and Miscellaneous Hardware
.1 To be heavy duty commercial grade metal hardware, Contractor to submit samples for approval.
.2 Flush overlay doors shall be Blum Model 110 degree concealed eurostyle hinges with screw on hinge crosses as manufactured by Julius Blum Canada Ltd., or alternate approved by Consultant. Use 180 degree hinges where noted on drawings.
.3 Hinge to suit configuration, door sizes, door thicknesses as approved by Consultant.

.2 Drawer slides: All drawers to be fitted with Model No. 4033 (110 lbs.) drawer slides as manufactured by Accuride slides or alternate approved by Consultant. Depth to suit application.

.3 All doors and drawers to be fitted with clear resilient silence pads (felt pads not acceptable).

.4 Pulls:
.1 BP98988010 as manufactured by Richelieu. Ensure all edges are ground smooth and attach as per drawings.

.5 Shelf Supports to be 16mm zinc finish shelf standards: Richelieu 255-10.98. Heavy-duty shelf clips to be Richelieu 102-35.

.6 Hardware Installation:
.1 Install, in-shop, all cabinet hardware in accordance with manufacturer's recommendation. Prepare edges of door to receive specified hinges. Locate hinges 50mm from top and 50mm from bottom of door. Provide three (3) hinges on doors more than 762mm in height. Install shelf standards on gables located at quarter points of shelf depth.
.2 Install drawer pulls on drawers, and latch/catch hardware on all hinged doors and panels. Install pilaster strips and shelf supports for adjustable shelving. Pilaster strips shall be recessed into gables. Install drawer slides for drawers and sliding trays. Provide concealed hinges at maximum 711mm O.C. for all hinged door panels.

2.9 STAIN & CLEAR FINISH

.1 Millwork manufacturer shall ensure compatibility of components. Provide pre-stain conditioner necessary to produce desired results. All millwork and door stains and finishes to be factory applied.
.1 Stain (ST-1): Stain colour to be Clear polyurethene stain.

.2 Provide samples of finishes before undertaking work, to satisfaction of Architect.

.3 Exterior finishes includes all exposed surfaces (including under side of upper cabinets).

2.10 WOOD PRIMER & SEALERS

.1 Materials of approved manufacturer and compatible with finish noted; pigmented sealer for opaque finish, clear non-discolouring sealer for natural and stained finish.

.2 Sealer for cut-outs and veneer/laminate work shall be waterproof sealer recommended by veneer/laminate manufacturer.

.3 All primer and sealers to South Coast Air Quality Management District (SCAQMD)Rule #1113, Architectural Coatings, rules in effect on January 1, 2004.

2.11 Accessories

.1 Nails and staples: to CSA B111; galvanized to CAN/CSA-G164 for exterior work, interior humid areas and for treated lumber; plain finish elsewhere.

.2 Wood screws: plain, type and size to suit application.

.3 Splines: wood.

.4 Adhesive: recommended by manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Do finish carpentry to Premium Standards of the Architectural Woodwork Manufacturers Association of Canada (AWMAC), except where specified otherwise.

.2 Scribe and cut as required, fit to abutting walls, and surfaces, fit properly into recesses and to accommodate piping, columns, fixtures, outlets, or other projecting, intersecting or penetrating objects.

.3 Form joints to conceal shrinkage.

.4 At junction of counter back splash and adjacent wall finish, apply small bead of sealant.

3.2 CONSTRUCTION

.1 Fastening:
.1 Position items of finished carpentry work accurately, level, plumb, true and fasten or anchor securely.
.2 Design and select fasteners to suit size and nature of components being joined. Use proprietary devices as recommended by manufacturer.
.3 Set finishing nails to receive filler. Where screws are used to secure members, countersink screw in round smooth cut hole and plug with wood plug to match material being secured.
.4 Replace items of finish carpentry with damage to wood surfaces including hammer and other bruises.

3.3 ERECTION

.1 Set and secure materials and components in place, rigid, plum and square.

.2 Prepare external exposed and semi-exposed surfaces ready for sealing and painting.

END

Architectural Woodwork Standards

DESIGN IDEAS

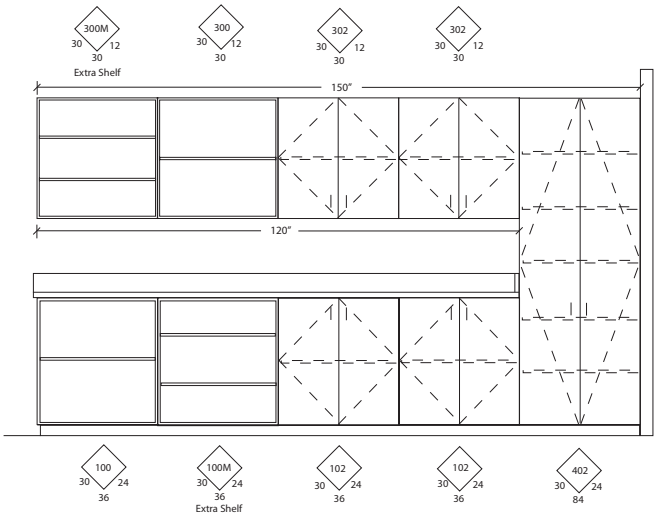
cabinet design series (CDS)

CDS illustrations are provided to assist design professionals and casework users in selecting typical designs. These illustrations are not intended to limit or restrict creativity, or to be all inclusive.

When utilizing the CDS numbering system, it is not necessary to show casework elevations in your contract documents. However, it is necessary to show a plan view with each CDS number indicated along with the width, height, and depth in inches or millimeters (example: 102-36"x 30"x 18" [102-914 mm x 762 mm x 457 mm]). Cabinet dimensions indicate the nominal outside dimension (floor to top of countertop for height and face of finished wall to face of cabinet door for depth). Manufacturers are permitted a tolerance of plus/minus 1/2" (12.7 mm) in width only.

When designs other than those provided for in the CDS system are desired, they may be indicated by selecting the CDS number most closely representing the desired design, followed by the letter "M" and a description or illustration of the design modification (example: 102M - 2 shelves - 36"x 30"x 18" [102M - 2 shelves - 914 mm x 762 mm x 457 mm] or 102M - no shelves -36"x 30"x 18" [102M - no shelves -914 mm x 762 mm x 457 mm]). It is suggested that a standard number/dimension convention similar to that shown below, is used.

If the CDS numbering system is used in conjunction with cabinet elevations on contract documents, the cabinet elevations shall govern on any conflict between the requirements of the elevation and the CDS number.



CDS cabinets are intended for TYPE A construction with integral finished ends and scribes at wall to wall installations not exceeding 1-1/2" (38.1 mm) in width. Hardware and accessories shall be as provided for in these standards.

CDS are subdivided as follows:

- Base Cabinets w/o Drawers 100 Series
- Base Cabinets w/ Drawers 200 Series
- Wall Hung Cabinets 300 Series
- Tall Storage Cabinets 400 Series
- Tall Wardrobe Cabinets 500 Series
- Library Cabinets 600 Series
- Moveable Cabinets 700 Series

GENERAL NOTES:

- 100 or 200 Series cabinets may be converted into moveable cabinets by prefixing a "7" to the number. (Example: 7-102-36"x 30"x 18" [7-102-914 mm x 762 mm x 457 mm]).
- Moveable cabinets shall be equipped with adequate approved casters for the intended load capacity.
- CDS #'s 728, 729, 735, 736, 737, 738, and 739 require metal angle reinforced corners.
- Carts and rolling tall storage cabinets with doors, lacking any horizontal and/or vertical stabilizing dividers, require a diaphragm bottom; specifically CDS #'s 702, 712, 716, 722, 743,744, 746, 747, 750, and 751.
- Wardrobe cabinets (500 Series) with doors require a framed mirror on one door, and cabinets # 533 and 534 require a paper roller/cutter and slide out tilting paper shelves.
- Cart storage cabinets are required to have hardwood side guides, specifically CDS #'s 160, 161, and 162.
- Ceramics drying cabinets are required to have galvanized metal frame shelves with wire mesh, specifically CDS #'s 198 199, and 459.
- File drawers require full extension slides and a file hanging system, specifically CDS #'s 223, 224, 230, 231, 240, 242, 253, 255, 531, 532, and 533.
- Wardrobe cabinets are required to have a shelf, pole, and framed mirror when closed with hinged doors, specifically CDS #'s 501, 511, 512, 522, 530, 531, 532, and 552.

SPECIAL BASE CASEWORK HEIGHTS, the following are recommended for various school grades, subject to ADA requirements:

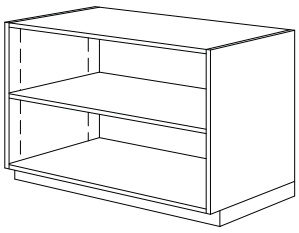
- Kindergarten - Grade 1 24" (610 mm)
- Grades 2 - 3 27" (686 mm)
- Grades 4 - 6 30" (762 mm)
- Grades 7 - 9 33" (838 mm)
- Grades 10 and above 36" (914 mm)

D

DESIGN IDEAS

cabinet design series (CDS)

100 SERIES - BASE CABINETS w/o DRAWERS



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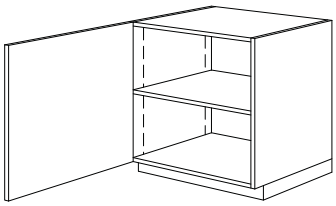

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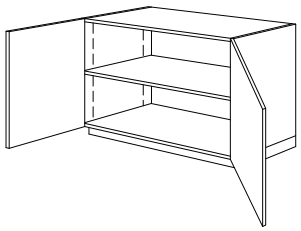

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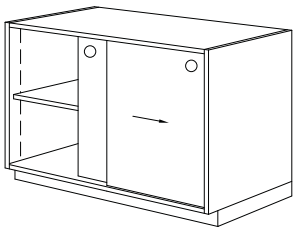

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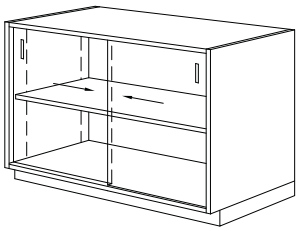

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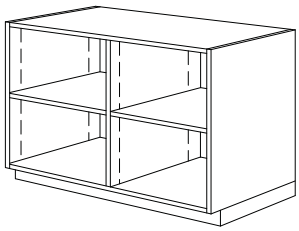

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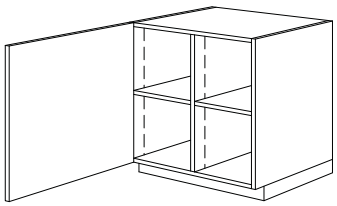

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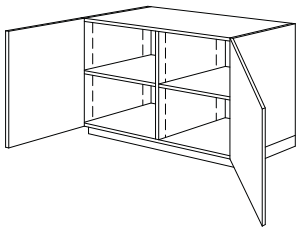

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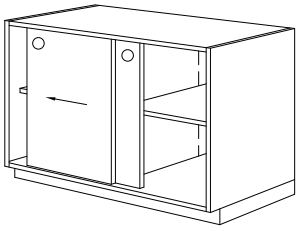

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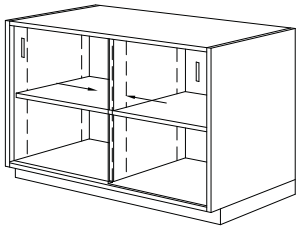

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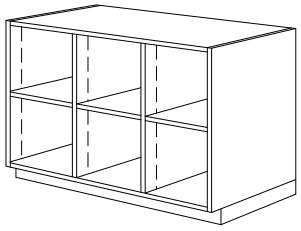

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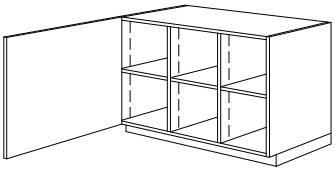

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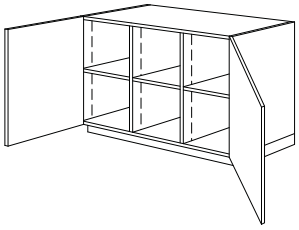

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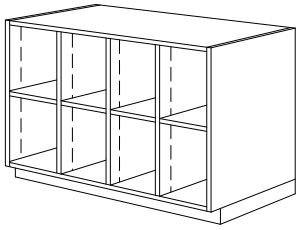

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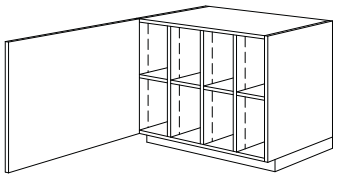

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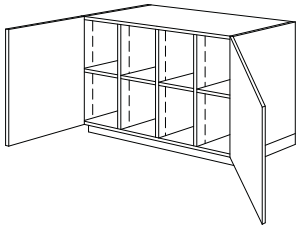

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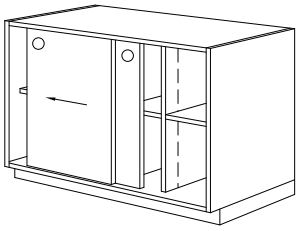

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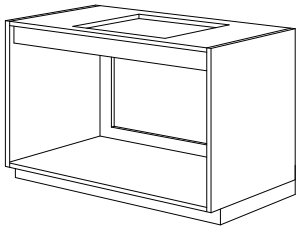
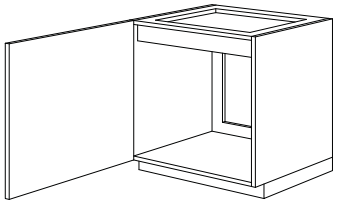


140
Removable Back



141
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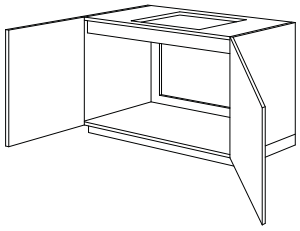


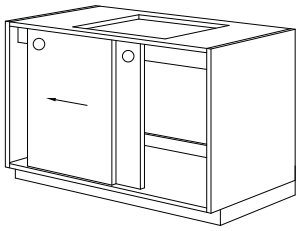
142
Removable Back

D

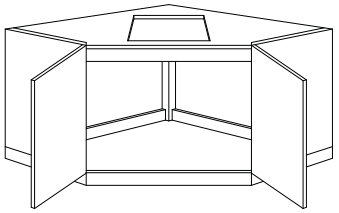
DESIGN IDEAS

cabinet design series (CDS)

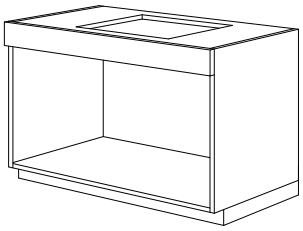
100 SERIES - BASE CABINETS w/o DRAWERS
(continued)



146
Removable Back



148
Removable Back



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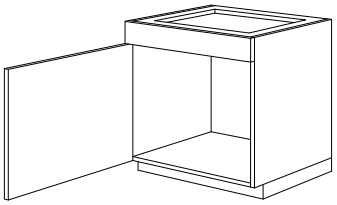

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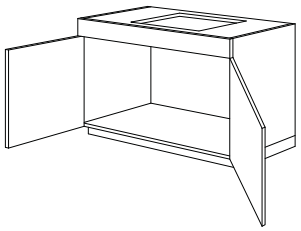

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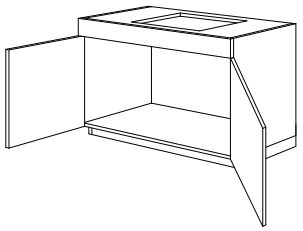
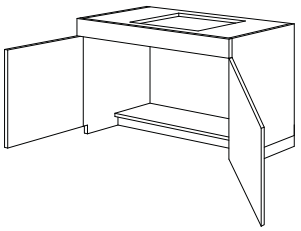


153
Removable Base/Toe



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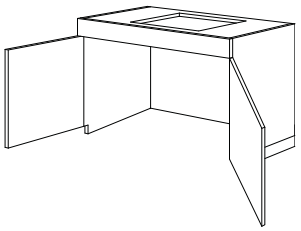

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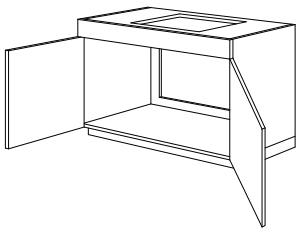
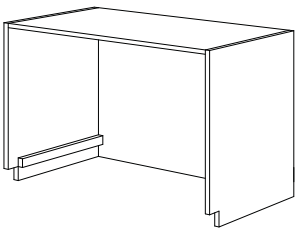
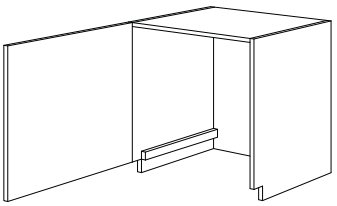


156
Removable Back



160
Cart Storage



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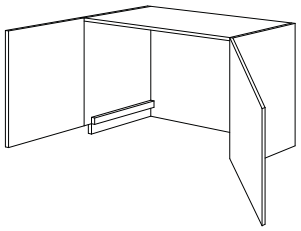
Cart Storage



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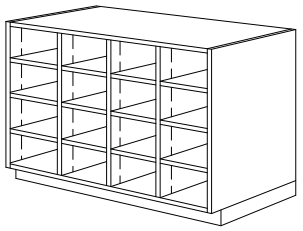

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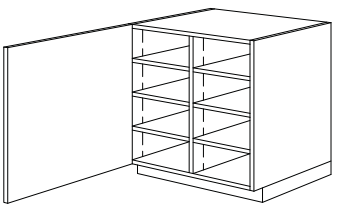

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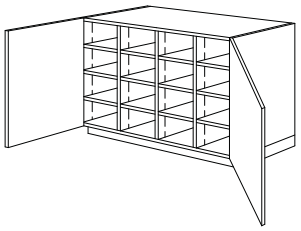

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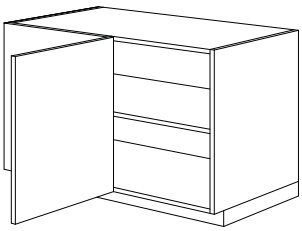

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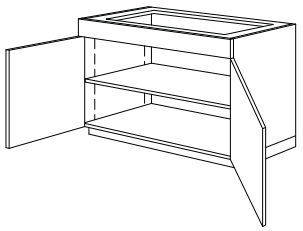

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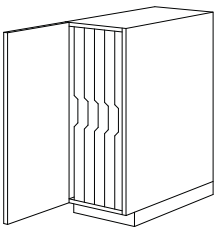

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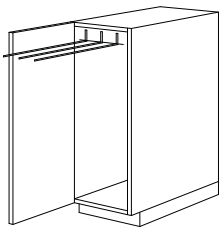


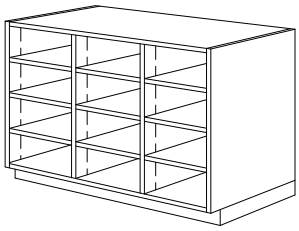
179
Retractable Towel Rack

D

DESIGN IDEAS

cabinet design series (CDS)

100 SERIES - BASE CABINETS w/o DRAWERS
(continued)



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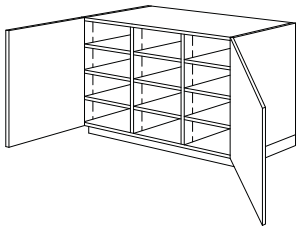

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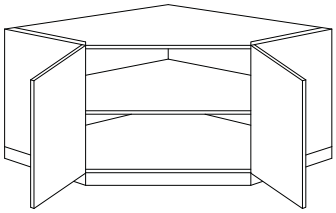

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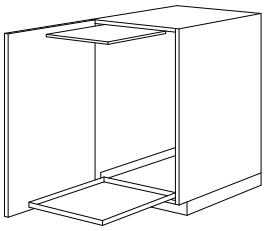
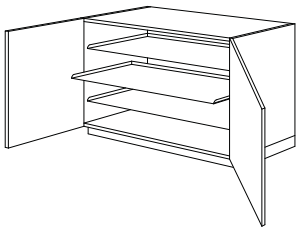


187
Sliding Tray & Lift Shelf



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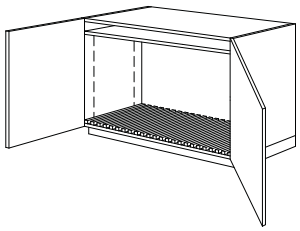
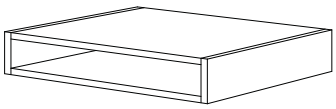


189
Drawing Board Rack



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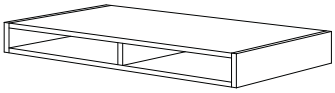

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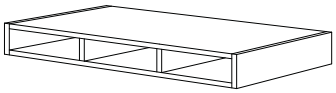

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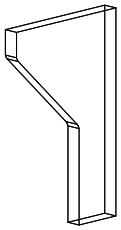

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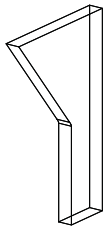

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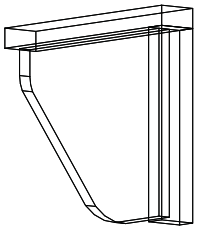

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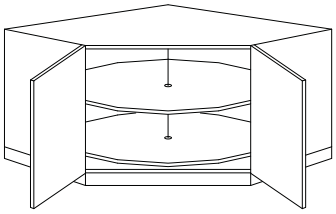

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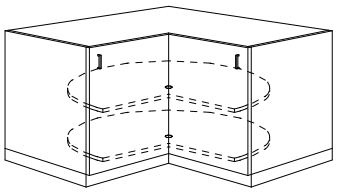

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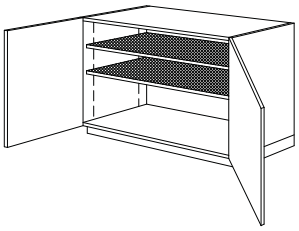

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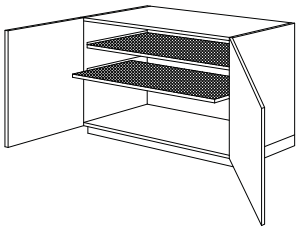
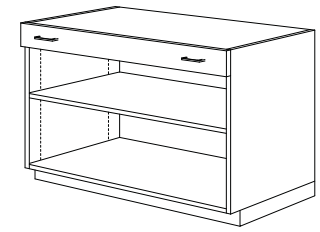


199

D

cabinet design series (CDS)

200 SERIES - BASE CABINETS w/ DRAWERS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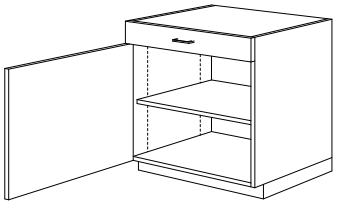
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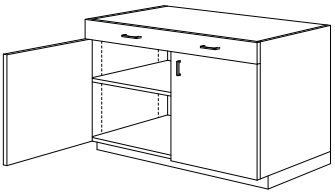
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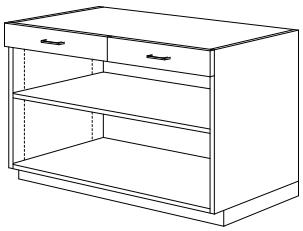
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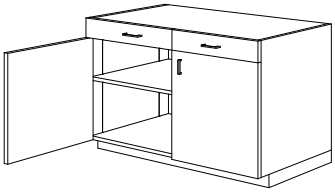
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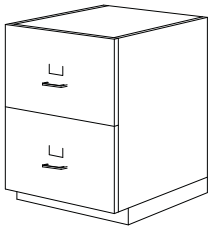
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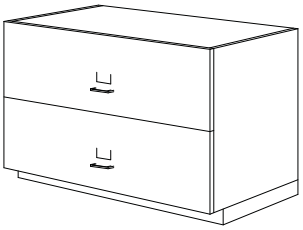
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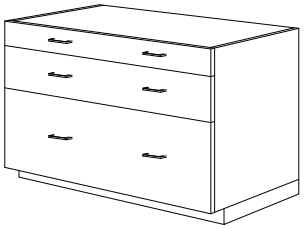
230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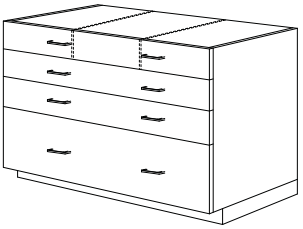
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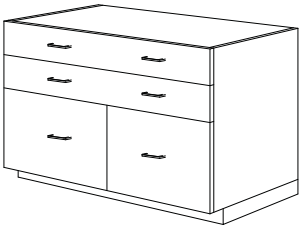
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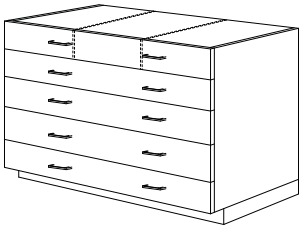
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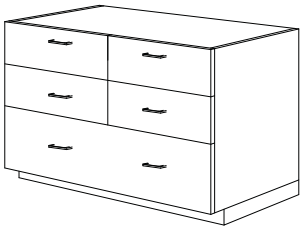
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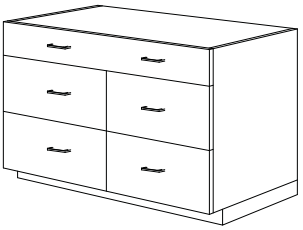
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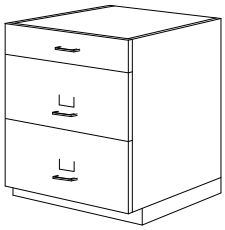
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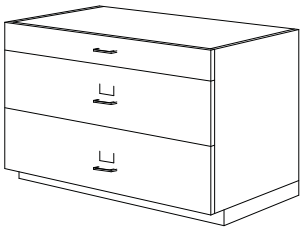
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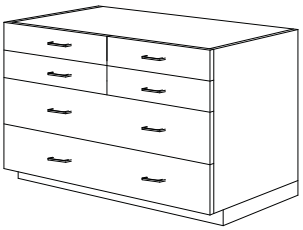
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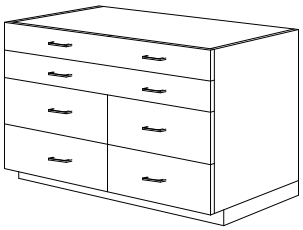
262

D

DESIGN IDEAS

cabinet design series (CDS)

200 SERIES - BASE CABINETS w/ DRAWERS
(continued)

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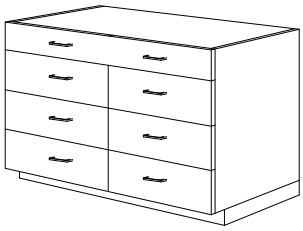
271



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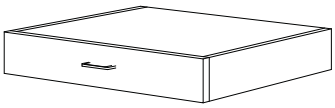

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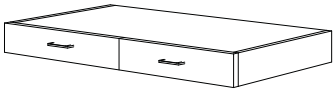

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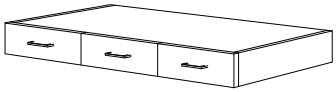

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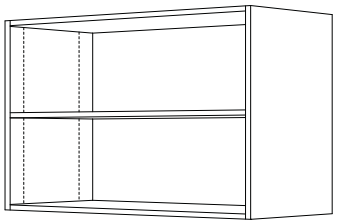
D

DESIGN IDEAS

cabinet design series (CDS)

300 SERIES - WALL HUNG CABINETS



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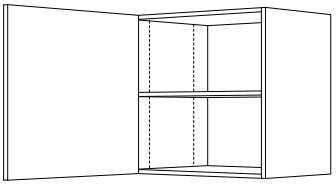

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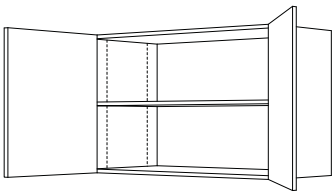

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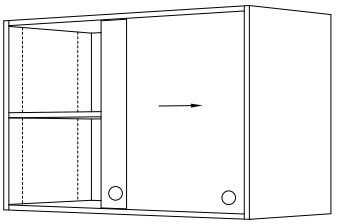

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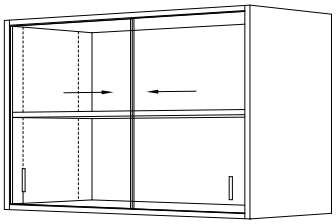

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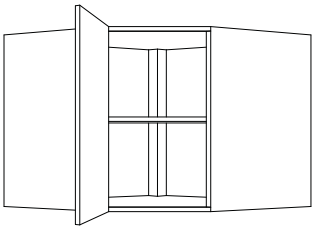

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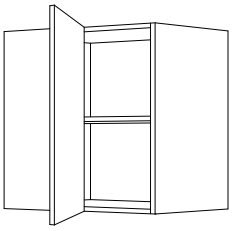
Angle Corner



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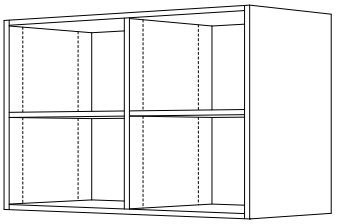
Blind Corner



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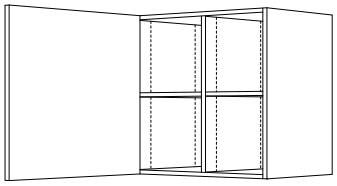

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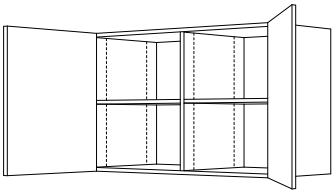

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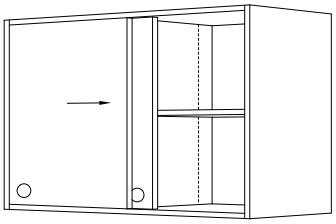

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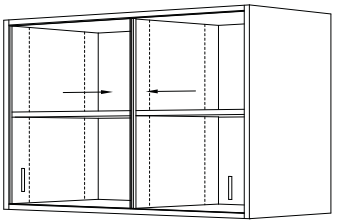

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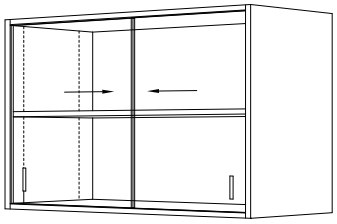

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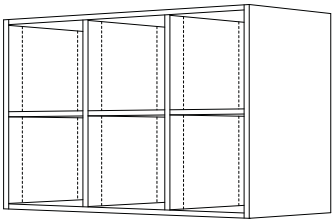

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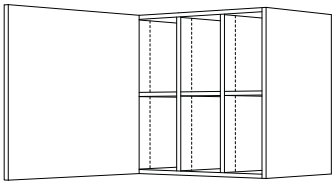

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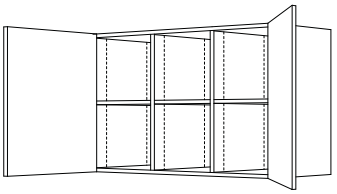

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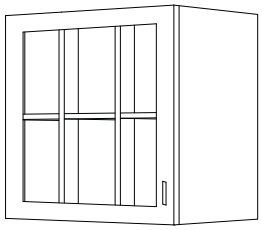

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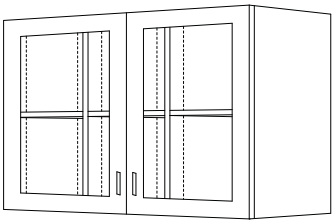

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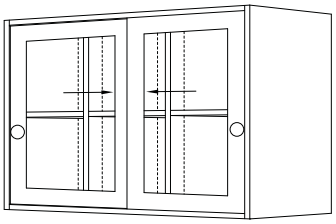

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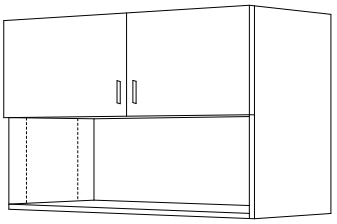

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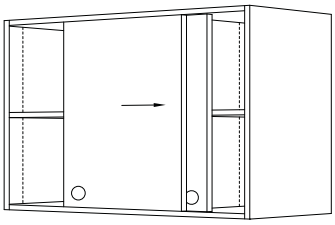
D

DESIGN IDEAS

cabinet design series (CDS)

300 SERIES - WALL HUNG CABINETS
(continued)



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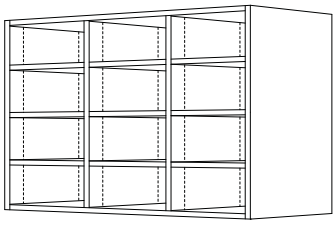

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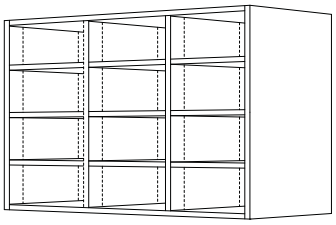

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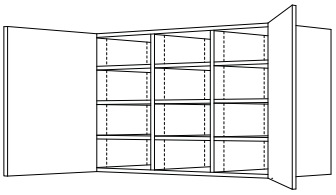

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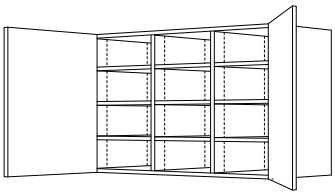

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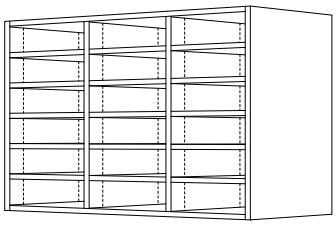

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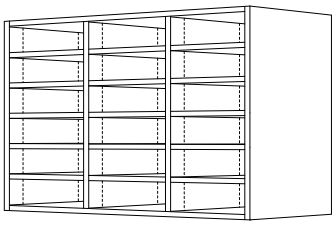

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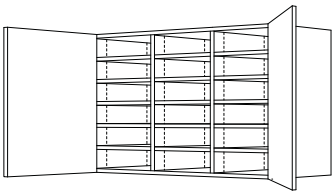

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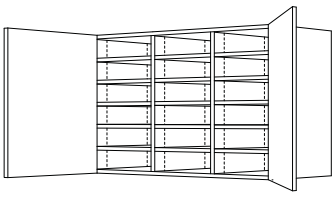

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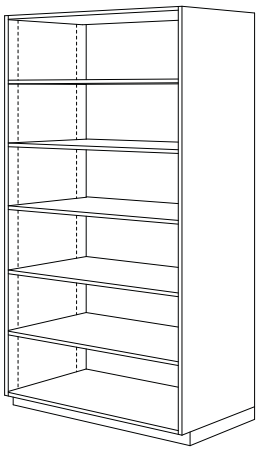
D

DESIGN IDEAS

cabinet design series (CDS)

400 SERIES - TALL STORAGE CABINETS



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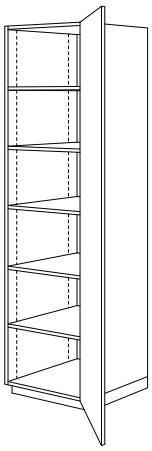

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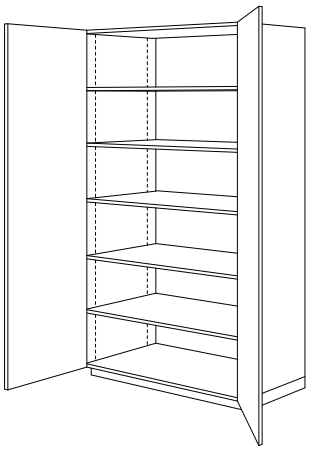

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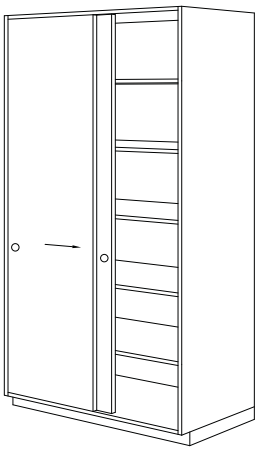

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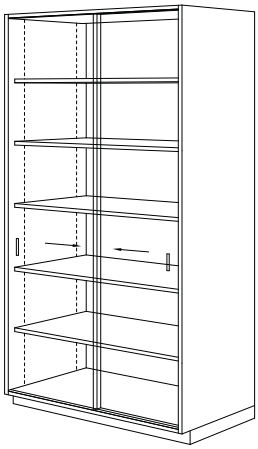

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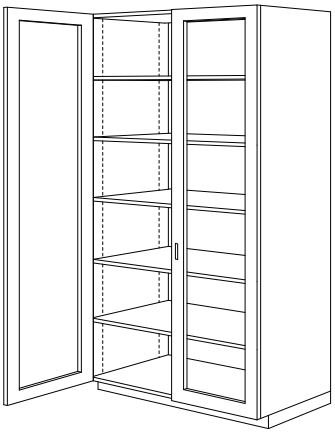

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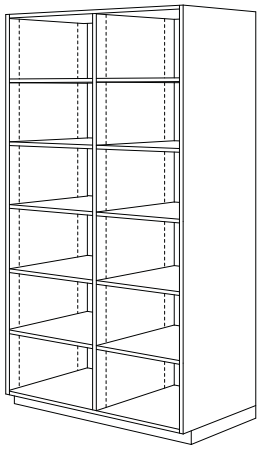

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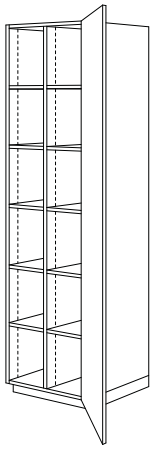

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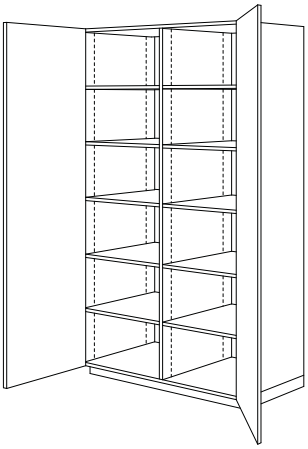

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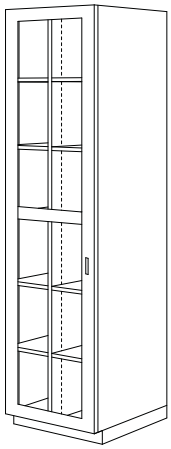

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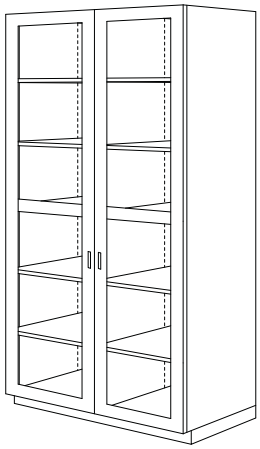

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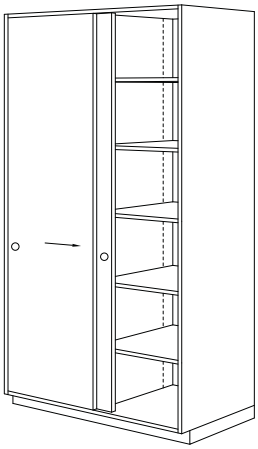

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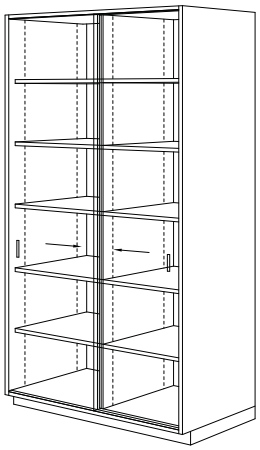
D

DESIGN IDEAS

cabinet design series (CDS)

400 SERIES - TALL STORAGE CABINETS
(continued)



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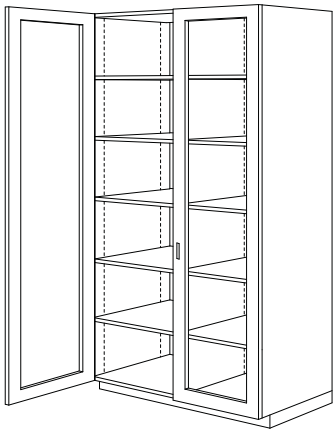

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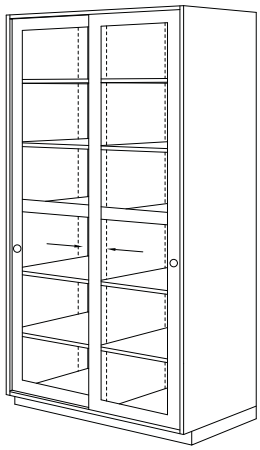

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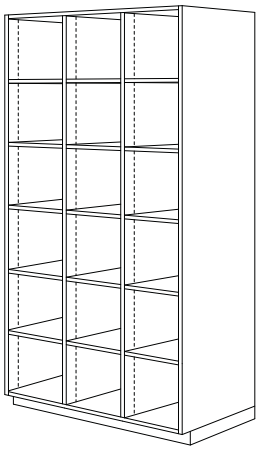

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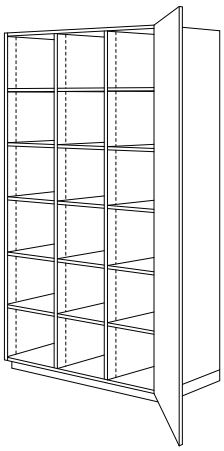

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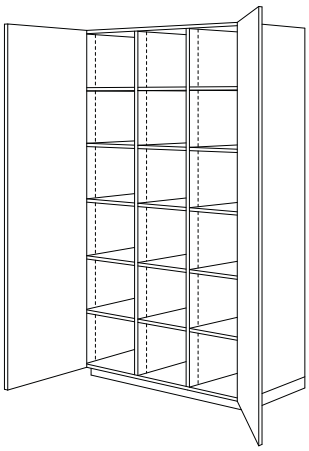

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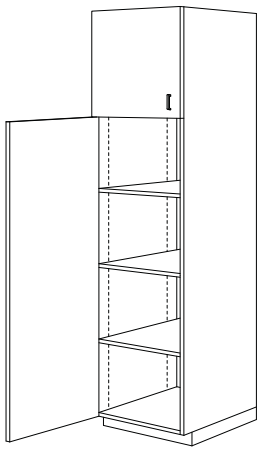

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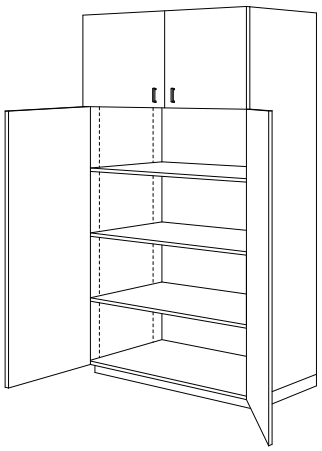

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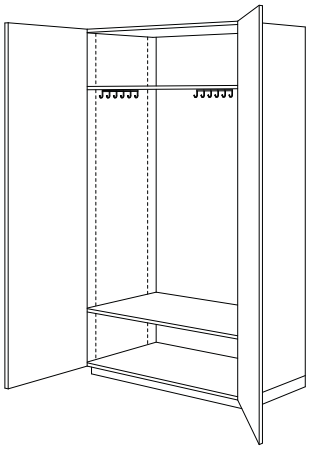
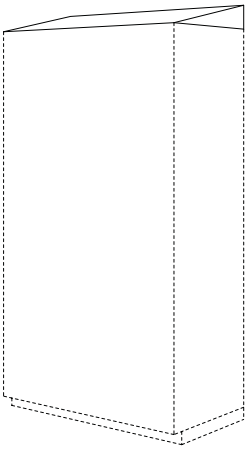


425
Dust Panel, Integral or Separate



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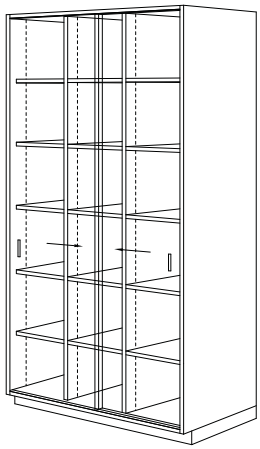

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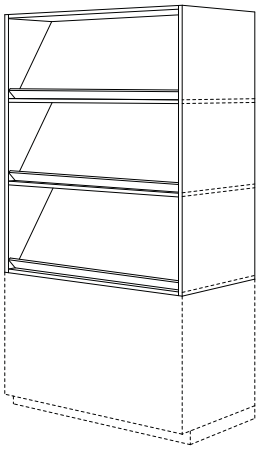
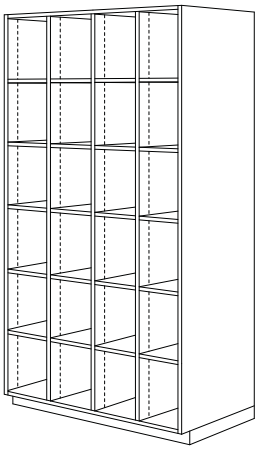


429
Hutch w/ Fixed Shelves

D

cabinet design series (CDS)

400 SERIES - TALL STORAGE CABINETS
(continued)



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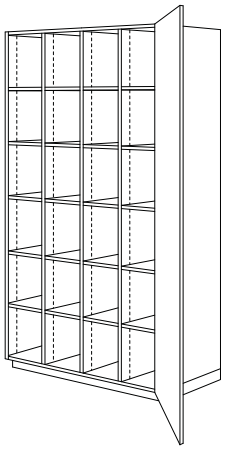

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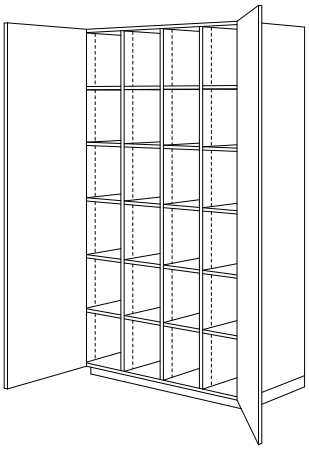

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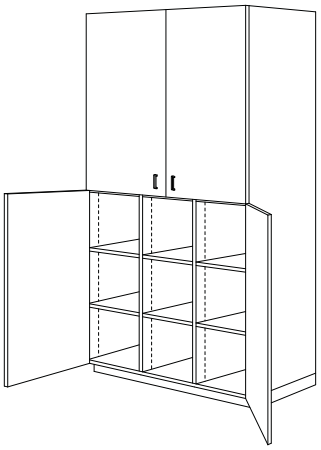

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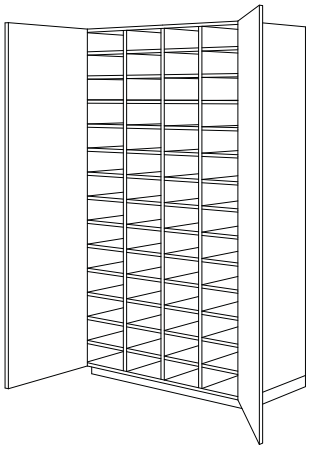

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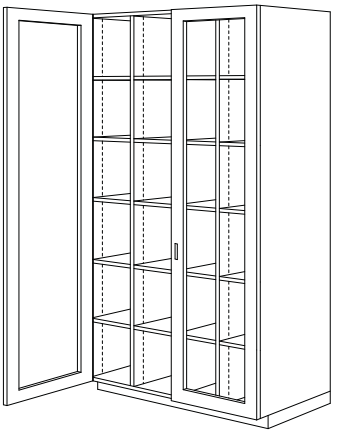

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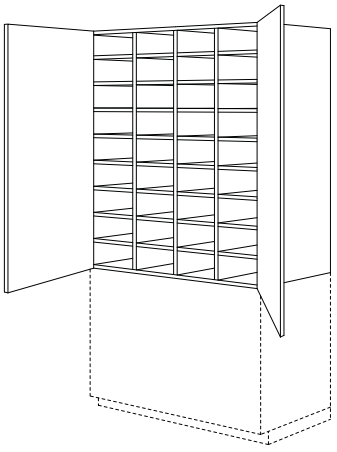
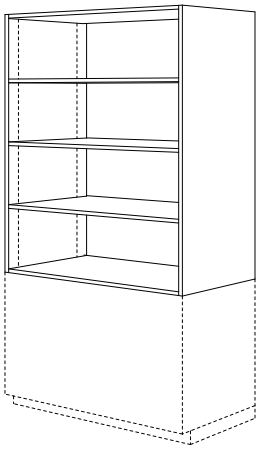
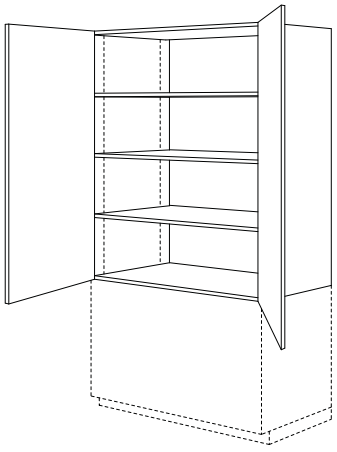


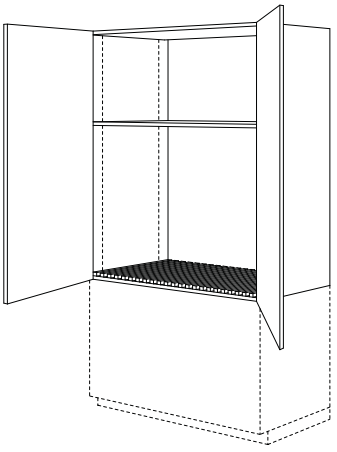
439
Hutch



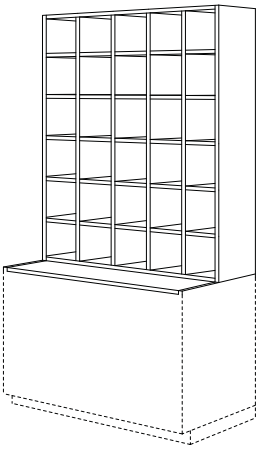
440
Hutch



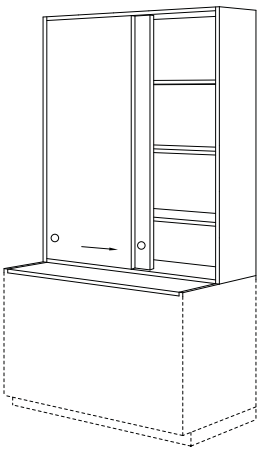
441
Hutch



443
Hutch



444
Hutch



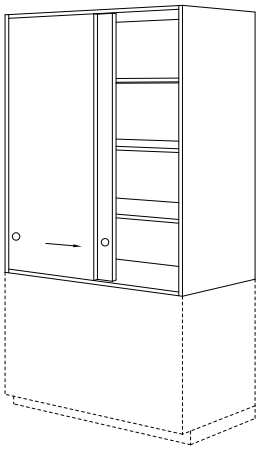
445
Hutch

D

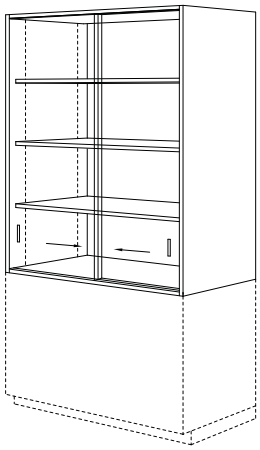
DESIGN IDEAS

cabinet design series (CDS)

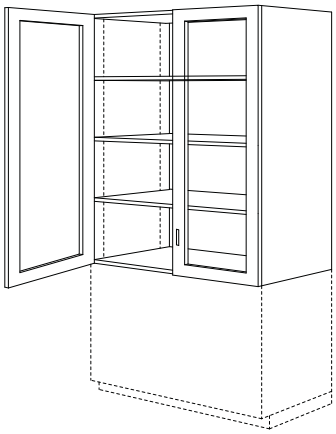
400 SERIES - TALL STORAGE CABINETS
(continued)



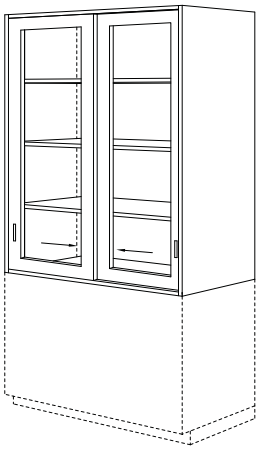
446
Hutch



447
Hutch



448
Hutch



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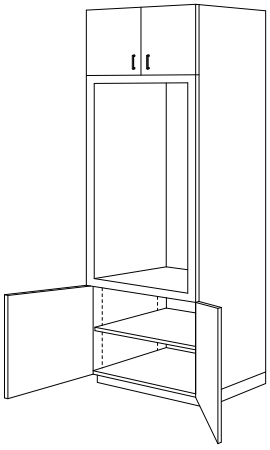
Hutch



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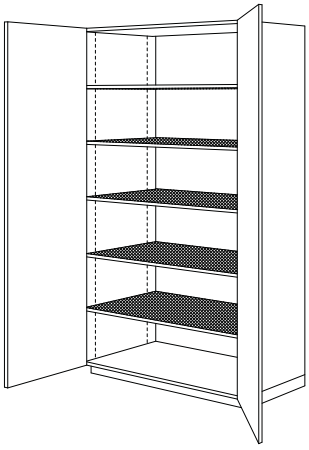

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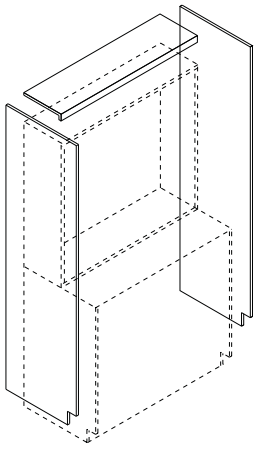

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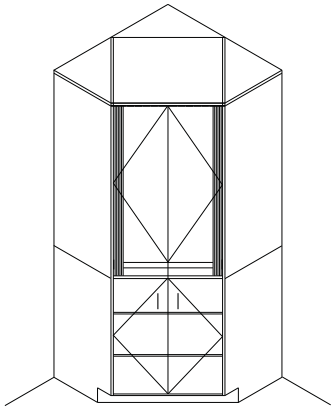
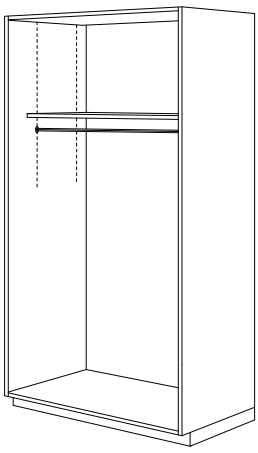


461

D

cabinet design series (CDS)

500 SERIES - WARDROBE CABINETS



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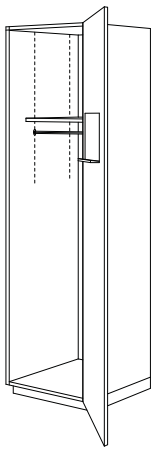

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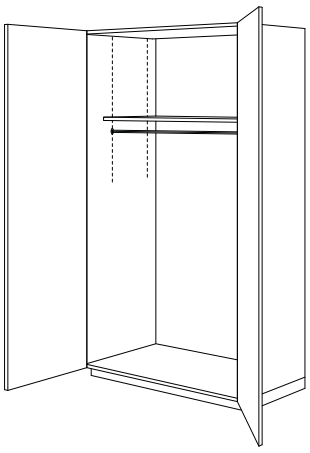

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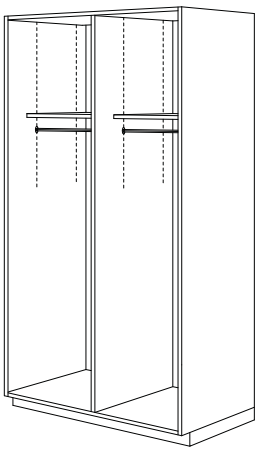

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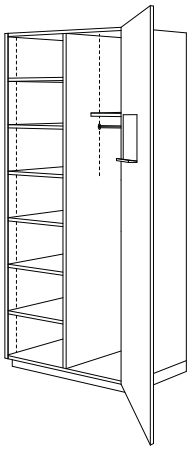

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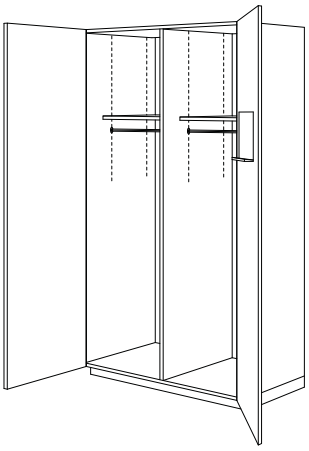

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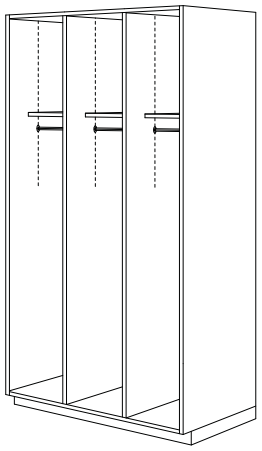

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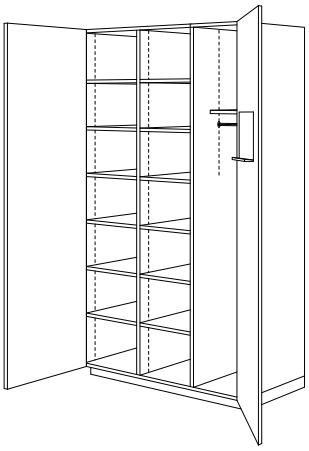

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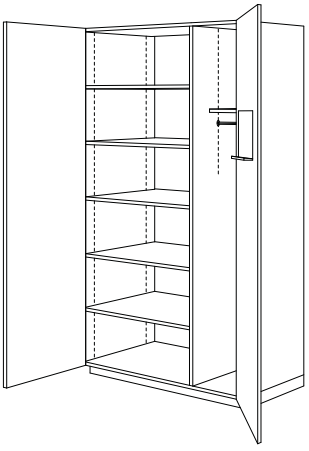

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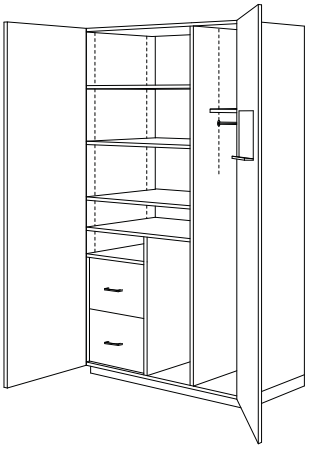

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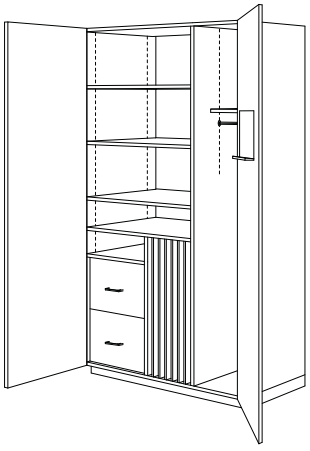

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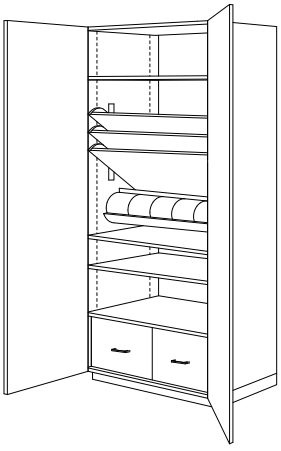


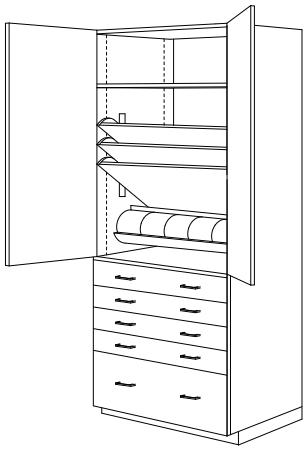
533
See General Notes

D

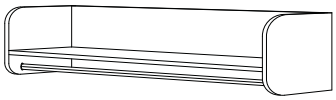
DESIGN IDEAS

cabinet design series (CDS)

500 SERIES - WARDROBE CABINETS
(continued)



534
See General Notes



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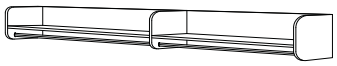

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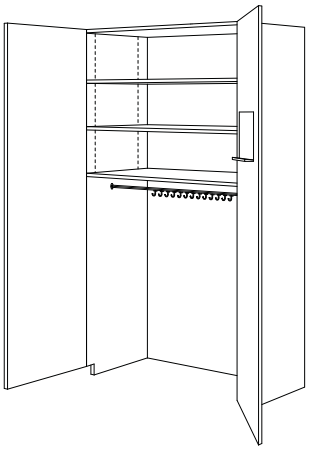
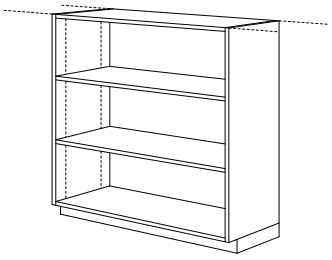


552
Pole w/ Wall Hooks

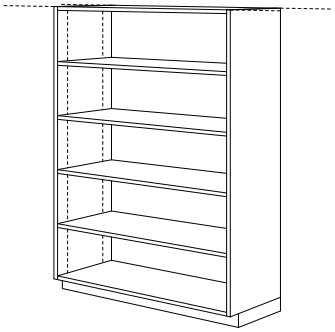
D

cabinet design series (CDS)

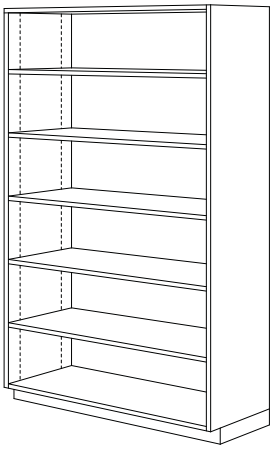
600 SERIES - LIBRARY CABINETS



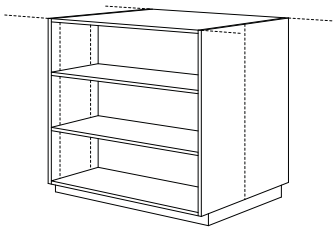
600
605 w/o Back



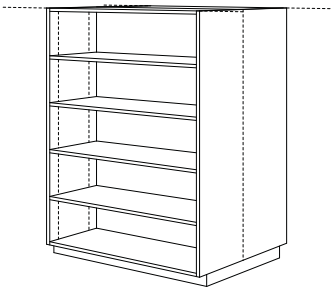
601
606 w/o Back



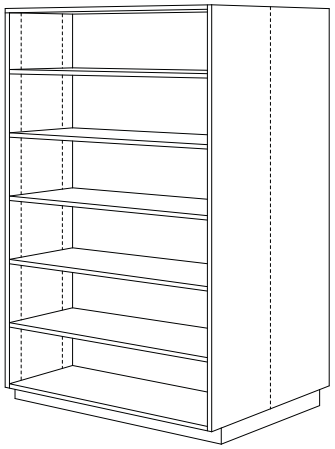
602
607 w/o Back



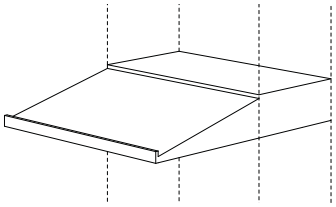
620
625 w/o Back



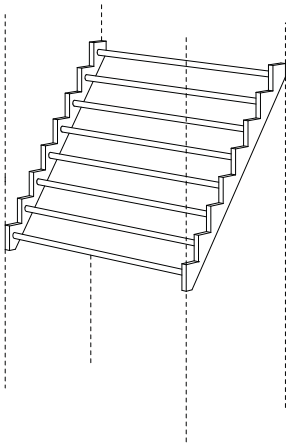
621
626 w/o Back



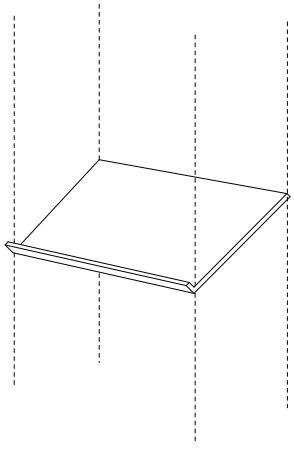
622
627 w/o Back



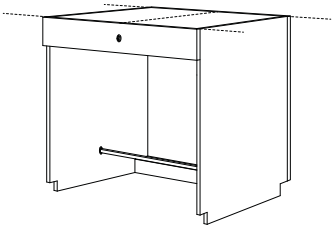
614
Library of Congress Shelf



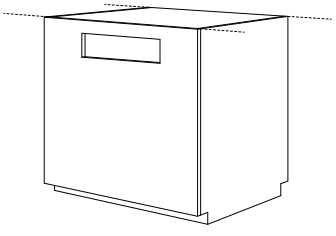
624
Newspaper Rack



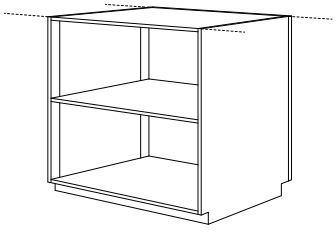
634
Display Shelf



640
Charge Desk



641
Book Return



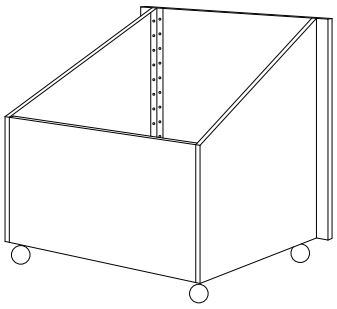
644

D

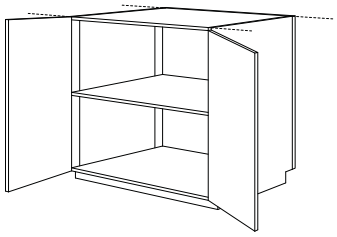
DESIGN IDEAS

cabinet design series (CDS)

600 SERIES - LIBRARY CABINETS
(continued)



651
Book Cart



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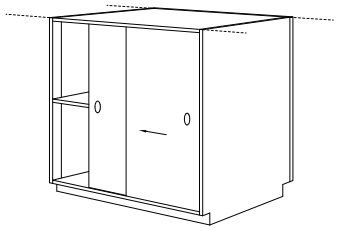

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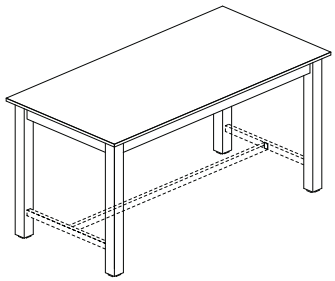

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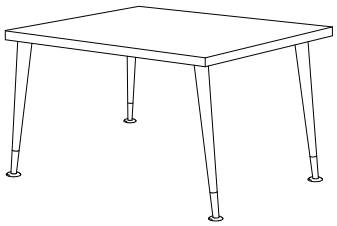

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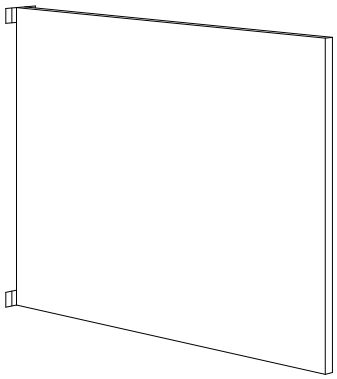

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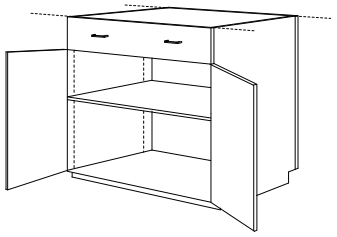

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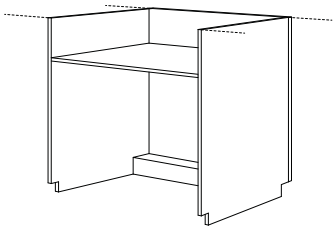

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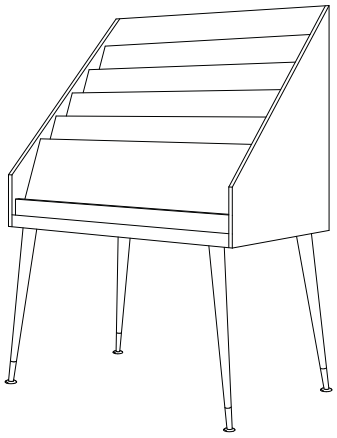

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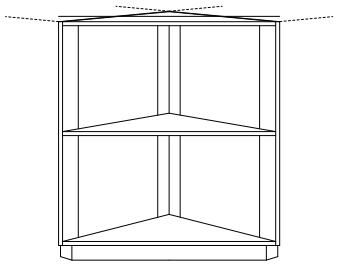
Magazine Rack



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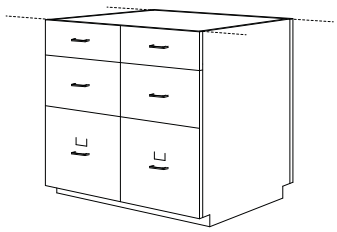

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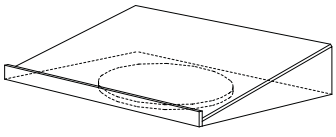
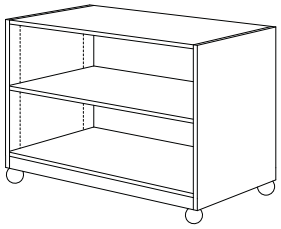


693
Dictionary Stand

D

cabinet design series (CDS)

700 SERIES - MOVEABLE CABINETS



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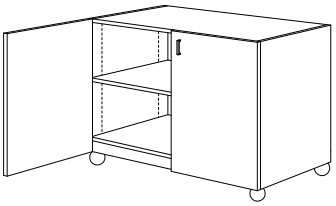

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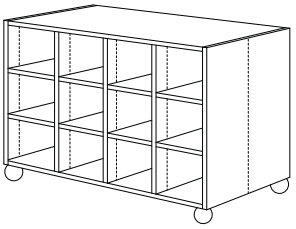

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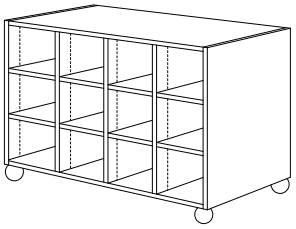

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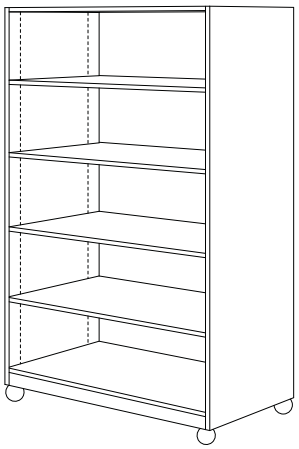

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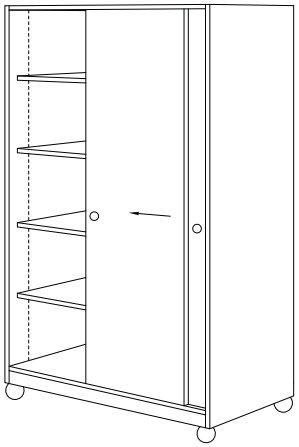
Slide Out Tilting Paper Shelves



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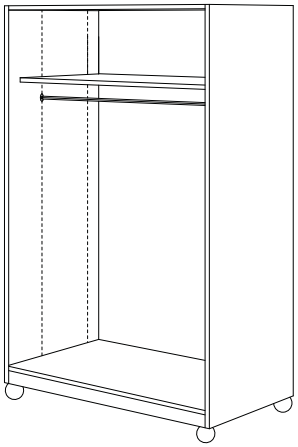

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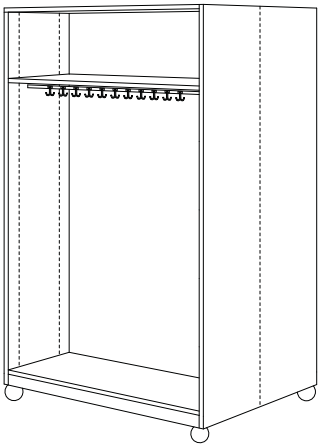


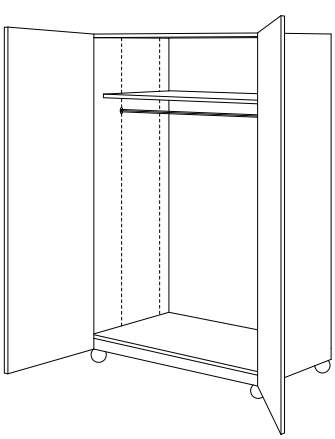
721

D

DESIGN IDEAS

cabinet design series (CDS)

700 SERIES - MOVEABLE CABINETS
(continued)



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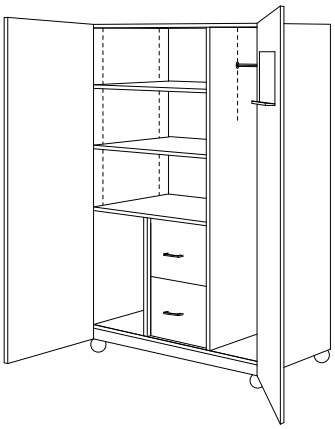

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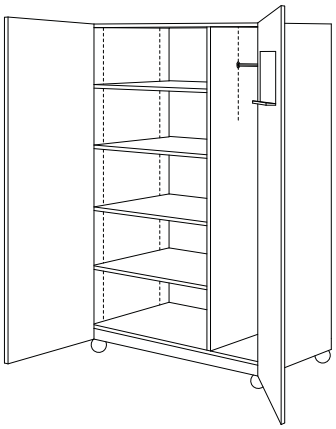

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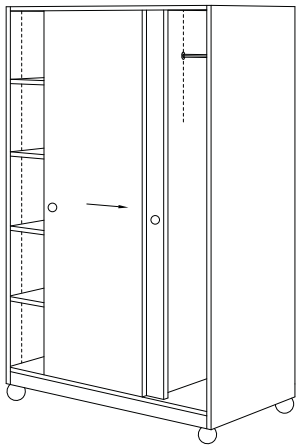

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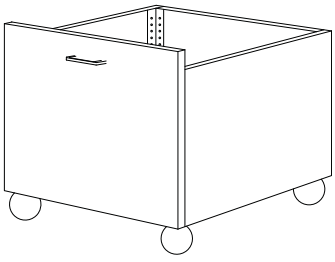

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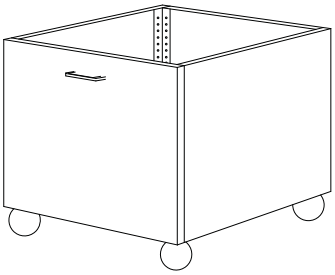
Toy Cart



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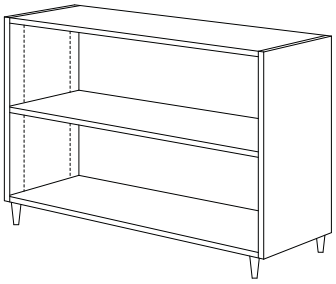
Toy Cart



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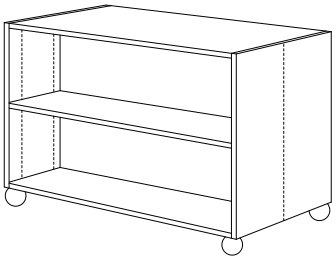

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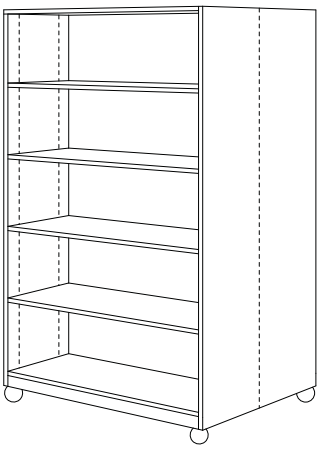

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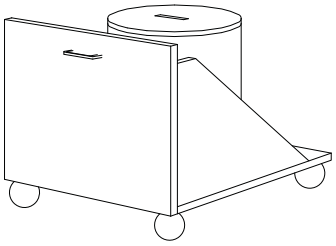

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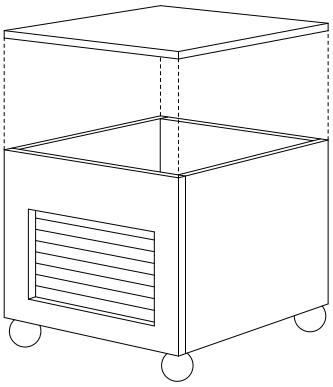
Clay Cart, Tin NIC



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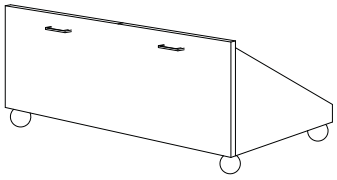
Metal Lined Clay Cart

D

DESIGN IDEAS

cabinet design series (CDS)

700 SERIES - MOVEABLE CABINETS
(continued)



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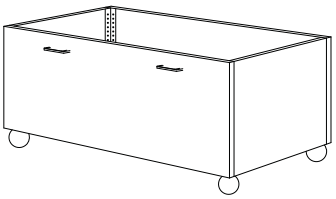
Block Cart



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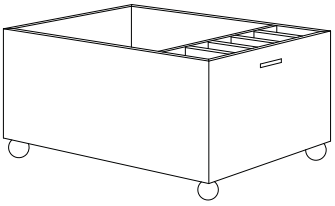
Block Cart



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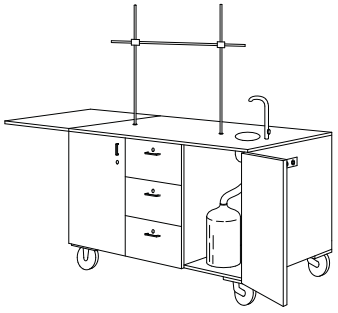
Ball & Bat Cart



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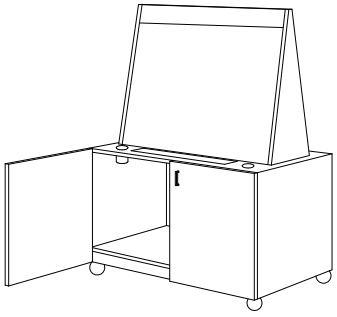
Lab Demonstration Cart



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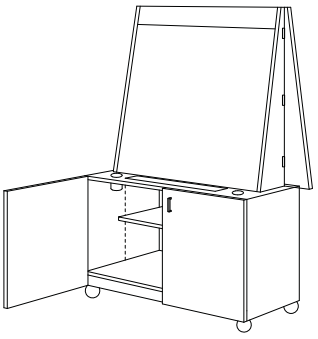
Two Sided Easel



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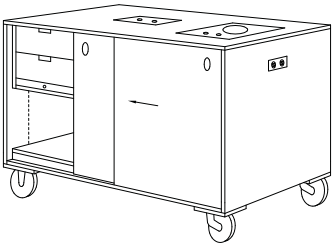
Single Sided Easel



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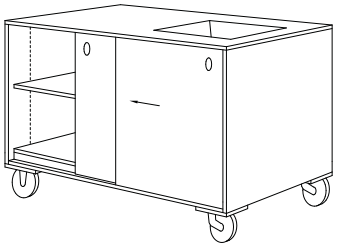
Cooking Demonstration Cart



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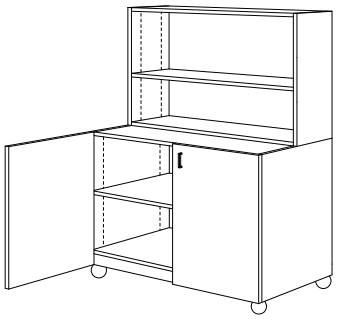
Nature Demonstration Cart



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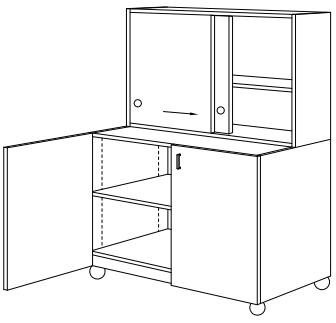

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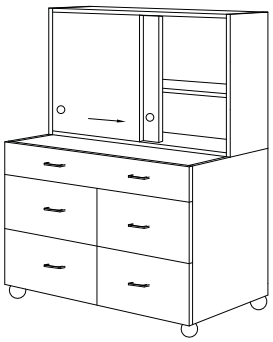

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D

DESIGN IDEAS

cabinet design series (CDS)

700 SERIES - MOVEABLE CABINETS
(continued)

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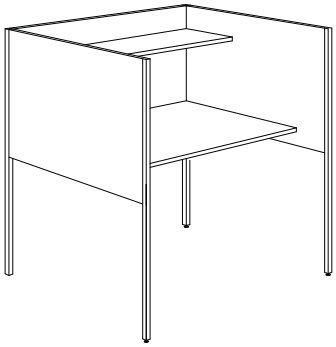

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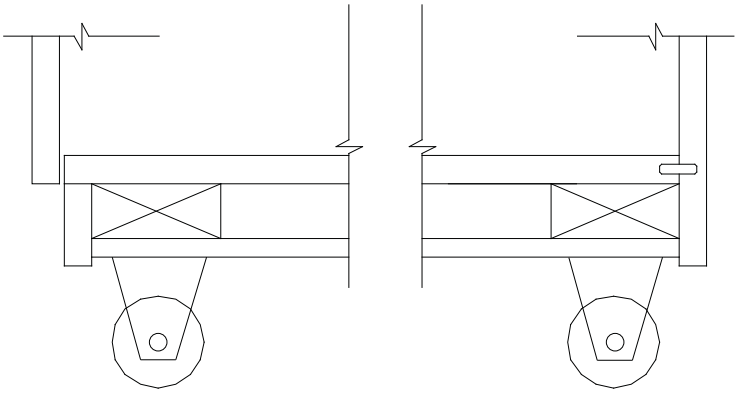
Study Carrel



Typical Diaphragm Bottom Detail

D

PART 1 - GENERAL

1.1 Summary

.1 Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

.2 Section Includes:
.1 Solid Surfacing Fabrications for countertops as indicated, including trim and material needed for a complete installation.

1.2 Related Work

.1 Work of this section is related to work specified in the following sections:
.1 section 06 10 00 - Rough Carpentry
.2 Section 06 20 00 - Finish Carpentry and Millwork
.3 Section 12 35 50 - Thermofoil Cabinets

.2 Alternates: Refer to Alternates for description of Work in this Section affected by alternates.

1.3 References

.1 Reference Standards: In addition to requirements, comply with applicable provisions of following for design, materials, fabrication, and installation of component parts:
.1 ISSFA-2, "Classification And Standards Publication of Solid Surfacing Material".
.2 ANSI Z124-3 for vanities.
.3 SF Standard 51 for use in both splash and food service areas.
.4 Canadian Standards Association (CSA).
.5 ASTM G21 "Fungal Resistance", no growth.
.6 ASTM G21 Bacterial Resistance", no growth.
.7 Stain Resistance, ANSI Z124--5.2 1997.

1.4 Design Requirements

.1 Design Load: Deflection limited to 1/360.

.2 Design items with sufficient strength for handling stresses.

1.5 Submittals

.1 Product Data: Manufacturer's technical literature indicting physical properties and performance criteria for solid surfacing materials and related components.

.2 Shop Drawings: Indicate design parameters, adjacent construction, materials, dimensions, thickness, fabrication details, tolerances, jointing methods, method of support, anchorages, integration with plumbing fixtures and connections, and colours.

.3 Samples: Submit two, 50mm x 50mm samples representative of colours, patterns textures, finishes and edge treatments. Approved samples will be retained as a standard for the work.

.4 Informational Submittals: Submit following packaged separately from other submittals:
.1 Manufacturer's written installation instructions.
.2 Maintenance Data: Manufacturer's recommended cleaning and maintenance procedures. Include in project closeout documents.

1.6 Quality Assurance

.1 Fabricator/Installer Qualifications: Company specializing in fabricating and installing solid surfacing fabrications similar in complexity to those required in this project, including specific requirements indicated.

.2 Source Limitations: Obtain solid surfacing fabrications through one source.

.3 Fire-Test-Response Characteristics: Provide solid surfacing fabrications with the following surface-burning characteristics as determined by testing identical products per ASTM E 84 by UL 723 or another testing and inspecting agency acceptable to authorities having jurisdiction:
.1 Flame-Spread Index: 25 or less.
.2 Smoke-Developed Index: 450 or less.

.4 Mock-ups:
.1 Construct mock-ups in accordance with Section 01 45 00.
.2 Shop prepare one base cabinet unit with countertop and one window sill, complete with hardware, and install on project in designated location.
.3 When accepted, mock-up will demonstrate minimum standard for this work. Mock-up may not remain as part of finished work.

1.7 Delivery, Storage and Handling

.1 Deliver, store, handle, and protect materials in accordance with manufacturer's written instructions.
.1 Provide protective coverings of suitable material. Take special precautions at corners.

1.8 Project Conditions

.1 Environmental Limitations: Do not deliver or install solid surfacing fabrications until building is enclosed, wet work in complete, and HVAC system is operating and maintaining temperature and relative humidity at design levels during the remainder of the construction period.

.2 Field Measurements: verify that field measurements are as indicated on Shop Drawings.

1.9 Sequencing

.1 Sequence work to permit installation of adjacent affected construction, plumbing rough-in.

.2 Coordinate sizes and locations of plumbing, cut-outs and other related Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.

1.10 Warranty

.1 Warranty: Provide manufacturer's 10 year limited warranty covering replacement of the material except for non-covered conditions as follows:
.1 Minor stains, scratches, water spots, and burns which may be corrected by techniques covered in the manufacturer's Use and Care Guide.
.2 Failure of solid surfacing joint material.
.3 Failure due to structural failure of base cabinets or other solid surfacing substrate construction.
.4 See manufacturer's warranty for complete details.

PART 2 - PRODUCTS

2.1 Materials and Components

.1 Solid Surfacing Materials: Homogeneous solid sheets of filled plastic resin complying with ISSFA-2 Colours and Patterns;as selected by Consultant from manufacturer's full range. See Finish Schedule for Colours

.2 Special features: Eased edge treatments.

.3 Accessories:
.1 Adhesives: For seams and drop edges, as recommended by the manufacturer; colour to blend with sheet material.
.2 VOC Limits for Installation adhesives and glues: Use installation adhesives that comply with the limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.2 Fabrication

.1 Assemble work at shop following manufacturer's printed fabrication instructions and deliver to job ready for installation. Manufacture in largest practical pieces for handling and shipping without seams.
.1 Grade: AWI, Premium.
.2 Fabricate work square and to required lines.
.3 Recess and conceal fasteners, connections, and reinforcing.
.4 Design construction and installation details to allow for expansion and contraction of materials Properly frame material with tight, hairline joints held rigidly in place.
.5 Fabricate countertops to profiles and sizes indicated.
.6 Fabricate items to profiles shown with connections and supports as indicated or as required for complete installation in accordance with manufacturer's written instructions and approved submittals.
.7 Provide cut-outs for plumbing fixtures and trim, accessories, appliances, and related items. Confirm lay-out with manufacturer's cut-out templates before beginning work. Round corners of cut-outs and sand edges smooth.
.8 Do not exceed manufacturer's recommended unsupported overhang distances.
.9 Finish exposed surfaces smooth and polish manufacturers recommended sheen.
.10 Radius corners and edges.

.2 Countertops: 13mm thick or as detailed, Solid Surfacing, adhesively joined with no exposed seams edge details as indicated.

.3 Tolerances:
.1 Variation in component Size: Plus/Minus 6mm.
.2 Location of Openings: Plus/Minus 6mm from indicated location.

PART 3 - EXECUTION

3.1 Examination and Preparation

.1 Examine surfaces for conditions that would adversely affect execution.

.2 Preparation: Take field measurements.

3.2 Installation

.1 General: Install in accordance with manufacturer's written installation instructions and approved Submittals. Provide templates and rough-in measurements.
.1 Set items plumb, level, rigid and solidly adhered to substrate.
.2 Prefit items: Adjust supports to make fit. Align joints over support framing.
.3 Apply dabs of silicone on supports; place items on supports and attach.

.2 Seal joint between counter top and splashes and between splashes and walls with Sealant as specified in Section 07 92 00 - Sealants.

.3 Tolerances:
.1 Maximum Variation from True Dimension 3mm.
.2 Maximum Offset From true Position 3mm.

3.3 Cleaning and Protection

.1 Cleaning:
.1 Clean and polish fabrications in accordance with manufacturer's instructions.
.2 Promptly remove excessive mastic and seam adhesive.
.3 Clean tops and splashes in accordance with manufacturer's recommendations.

3.4 Protection

.1 Do not permit construction near unprotected surfaces.

.2 Refer to manufacturer's warranty and exclusions.

END

PART 1 - GENERAL

1.1 REFERENCES

.1 American Society for Testing and Materials International (ASTM)
.1 ASTM C 553-02, Specification for Mineral Fibre Blanket Thermal Insulation for Commercial and Industrial Applications.

.2 Canadian Standards Association (CSA International)
.1 CSA B111-1974(R2003), Wire Nails, Spikes and Staples.

.3 Underwriters Laboratories of Canada (ULC)
.1 CAN/ULC-S702-1997, Standard for Mineral Fibre Insulation.

1.2 SUBMITTALS

.1 Product Data:
.1 Submit manufacturer's printed product literature, specifications and data sheet in accordance with Section 01 33 00 - Submittal Procedures.

1.3 QUALITY ASSURANCE

.1 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.

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

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper plastic polystyrene corrugated cardboard packaging material for recycling in accordance with Waste Management Plan.

PART 2 - PRODUCTS

2.1 INSULATION

.1 Blanket Insulation for walls and ceilings:
  .1 Acoustic insulation for ceilings and walls:
    .1 Standard of Acceptance:
      .1 Roxul AFB mineral wool fibre insulation as manufactured by Roxul Inc.
      .2 Eco Touch QuietZone as manufactured by Owens Corning Canada.
      .3 Sound Control Batts as manufactured by Johns Manville
      .4 Ecobatt Thermal/Acoustic insulation by Knauf Insulation.
      .5 or approved equal.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.

3.2 INSULATION INSTALLATION

.1 Install insulation to maintain continuity of thermal and acoustical protection to building elements and spaces.

.2 Fit insulation closely around electrical boxes, pipes, ducts, frames and other objects in or passing through insulation.

.3 Do not compress insulation to fit into spaces.

3.3 CLEANING

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

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

END

PART 1 - GENERAL

1.1 REFERENCES

.1 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
.1 Material Safety Data Sheets (MSDS).

.2 Underwriter's Laboratories of Canada (ULC)
.1 ULC-S115-1995, Fire Tests of Fire stop Systems.

1.2 DEFINITIONS

.1 Fire Stop Material: device intended to close off opening or penetration during fire or materials that fill openings in wall or floor assembly where penetration is by cables, cable trays, conduits, ducts and pipes and poke-through termination devices, including electrical outlet boxes along with their means of support through wall or floor openings.

.2 Single Component Fire Stop System: fire stop material that has Listed Systems Design and is used individually without use of high temperature insulation or other materials to create fire stop system.

.3 Multiple Component Fire Stop System: exact group of fire stop materials that are identified within Listed Systems Design to create on site fire stop system.

.4 Tightly Fitted; (ref: NBC Part 3.1.9.1.1 and 9.10.9.6.1): penetrating items that are cast in place in buildings of noncombustible construction or have "0" annular space in buildings of combustible construction.
.1 Words "tightly fitted" should ensure that integrity of fire separation is such that it prevents passage of smoke and hot gases to unexposed side of fire separation.

1.3 SUBMITTALS

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

.2 Product Data:
.1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
.2 Submit two (2) copies of WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 35 29.06 - HEALTH AND SAFETY REQUIREMENTS.

.3 Shop Drawings:
.1 Submit shop drawings to show location, proposed material, reinforcement, anchorage, fastenings and method of installation.
.2 Construction details should accurately reflect actual job conditions.

.4 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.
.1 Test reports: in accordance with CAN-ULC-S101 for fire endurance and CAN-ULC-S102 for surface burning characteristics.
.1 Submit certified test reports from approved independent testing laboratories, indicating compliance of applied fire stopping with specifications for specified performance characteristics and physical properties.
.2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
.3 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence and cleaning procedures.
.4 Manufacturer's Field Reports: submit to manufacturer's written reports within three (3) days of review, verifying compliance of Work, as described in PART 3 - FIELD QUALITY CONTROL.

1.4 QUALITY ASSURANCE

.1 Qualifications:
.1 Installer: person specializing in fire stopping installations with five (5) years documented experience. Approved by manufacturer.

.2 Pre-Installation Meetings: convene pre-installation meeting one week prior to beginning work.
.1 Verify project requirements.
.2 Review installation and substrate conditions.
.3 Co-ordination with other building subtrades.
.4 Review manufacturer's installation instructions and warranty requirements.

1.5 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 materials in accordance with manufacturer's written instructions.
.3 Deliver materials to the site in undamaged condition and in original unopened containers, marked to indicate brand name, manufacturer.

.2 Storage and Protection:
.1 Store materials indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Replace defective or damaged materials with new.

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

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Fire stopping and smoke seal systems: in accordance with CAN-ULC-S115.
.1 Asbestos-free materials and systems capable of maintaining effective barrier against flame, smoke and gases in compliance with requirements of CAN- ULC-S115 and not to exceed opening sizes for which they are intended and conforming to specified special requirements described in PART 3.

.2 Service penetration assemblies: systems tested to CAN-ULC-S115.

.3 Service penetration fire stop components: certified by test laboratory to CAN-ULC-S115.

.4 Fire-resistance rating of installed fire stopping assembly in accordance with NBC.

.5 Fire stopping and smoke seals at openings intended for ease of re-entry such as cables: elastomeric seal.

.6 Fire stopping and smoke seals at openings around penetrations for pipes, ductwork and other mechanical items requiring sound and vibration control: elastomeric seal.

.7 Primers: to manufacturer's recommendation for specific material, substrate, and end use.

.8 Water (if applicable): potable, clean and free from injurious amounts of deleterious substances.

.9 Damming and backup materials, supports and anchoring devices: to manufacturer's recommendations, and in accordance with tested assembly being installed as acceptable to authorities having jurisdiction.

.10 Sealants for vertical joints: non-sagging.

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 PREPARATION

.1 Examine sizes and conditions of voids to be filled to establish correct thicknesses and installation of materials.
.1 Ensure that substrates and surfaces are clean, dry and frost free.

.2 Prepare surfaces in contact with fire stopping materials and smoke seals to manufacturer's instructions.

.3 Maintain insulation around pipes and ducts penetrating fire separation without interruption to vapour barrier.

.4 Mask where necessary to avoid spillage and over coating onto adjoining surfaces; remove stains on adjacent surfaces.

3.3 INSTALLATION

.1 Install fire stopping and smoke seal material and components in accordance with manufacturer's certified tested system listing.

.2 Seal holes or voids made by through penetrations, poke-through termination devices, and unpenetrated openings or joints to ensure continuity and integrity of fire separation are maintained.

.3 Provide temporary forming as required and remove forming only after materials have gained sufficient strength and after initial curing.

.4 Tool or trowel exposed surfaces to neat finish.

.5 Remove excess compound promptly as work progresses and upon completion.

3.4 SEQUENCES OF OPERATION

.1 Proceed with installation only when submittals have been reviewed by Consultant.

.2 Mechanical pipe insulation: certified fire stop system component.
.1 Ensure pipe insulation installation precedes fire stopping.

3.5 FIELD QUALITY CONTROL

.1 Inspections: notify Consultant when ready for inspection and prior to concealing or enclosing fire stopping materials and service penetration assemblies.

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.

.3 Remove temporary dams after initial set of fire stopping and smoke seal materials.

3.7 SCHEDULE

.1 Fire stop and smoke seal at:
.1 Penetrations through fire-resistance rated concrete and gypsum board partitions and walls.
.2 Top of fire-resistance rated gypsum board partitions.
.3 Intersection of fire-resistance rated gypsum board partitions.
.4 Control and sway joints in fire-resistance rated gypsum board partitions and walls.
.5 Penetrations through fire-resistance rated floor slabs, ceilings and roofs.
.6 Openings and sleeves installed for future use through fire separations.
.7 Around mechanical and electrical assemblies penetrating fire separations and fire walls.
.8 Rigid ducts: greater than 129 cm^2: fire stopping to consist of bead of fire stopping material between retaining angle and fire separation and between retaining angle and duct, on each side of fire separation.

END

PART 1 - GENERAL

1.1 Description of Work

.1 Sealants and caulking.

.2 Backer rod.

1.2 Related Sections

.1 Section 06 10 00 - Rough Carpentry

.2 Section 07 84 00 - Fire Stopping

.3 Section 08 80 50 - Glazing

1.3 References

.1 CGSB 19-GP-5M, Sealing Compound, One Component, Acrylic Base, Solvent Curing.

.2 CAN/CGSB-19.13-M87, Sealing Compound, One-component, Elastomeric, Chemical Curing.

.3 CGSB 19-GP-14M, Sealing Compound, One Component, Butyl-polyisobutylene Polymer Base, Solvent Curing.

.4 CAN/CGSB-19.17-M90, One-Component Acrylic Emulsion Base Sealing Compound.

.5 CAN/CGSB-19.18-M87, Sealing Compound, One Component, Silicone Base, Solvent Curing.

.6 CAN/CGSB-19.21-M87, Sealing and Bedding Compound Acoustical.

.7 CAN/CGSB-19.22-M89, Mildew Resistant, Sealing Compound for Tubs and Tiles.

.8 CAN/CGSB-19.24-M90, Multi-component, Chemical Curing Sealing Compound.

1.4 Samples

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

.2 Submit duplicate samples of each type of material and colour.

1.5 Quality Assurance

.1 Qualifications: Installers shall be trained and experienced in the necessary skills and shall be thoroughly familiar with the requirements of the specification.

.2 Preconstruction Testing: Letter report from the sealant manufacturer indicating satisfactory results of adhesion, compatibility and stain tests to all substrates to be sealed.

.3 Field Samples: Caulk a section of joint as directed under job conditions at least seven days prior to start of work for review by Consultant. When approved, sample shall be used as a standard of comparison for remainder of work.

1.6 Delivery, Storage, and Handling

.1 Deliver and store materials in original wrappings and containers with manufacturer's seals and labels, intact. Protect from freezing, moisture, water and contact with ground or floor.

1.7 Environmental and Safety 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 acceptable to Labour Canada.

.2 Conform to manufacturer's recommended temperatures, relative humidity, and substrate moisture content for application and curing of sealants including special conditions governing use.

1.8 Warranty

.1 Provide two-year workmanship warranty signed by the installer beginning at date of substantial performance.

.2 Provide twenty (20) year limited weatherseal warranty from sealant manufacturer beginning at date of substantial performance.

PART 2 - PRODUCTS

2.1 Sealant Materials

.1 Sealants and caulking compounds must:
.1 meet or exceed all applicable governmental and industrial safety and performance standards; and
.2 be manufactured and transported in such a manner that all steps of the process, including the disposal of waste products arising therefrom, will meet the requirements of all applicable governmental acts, by laws and regulations including, for facilities located in Canada, the fisheries Act and the Canadian Environmental Protection Act (CEPA).

.2 Sealant and caulking compounds must not be formulated or manufactured with: aromatic solvents, fibrous talc or asbestos, formaldehyde, halogenated solvents, mercury, lead, cadmium, hexavalent chromium, barium or their compounds, except barium sulfate.

.3 Sealant and caulking compounds must not contain a total of volatile organic compounds (VOCs) in excess of 5% by weight as calculated from records of the amounts of constituents used to make the product;

.4 Sealant and caulking compounds must be accompanied by detailed instructions for proper application so as to minimize health concerns and maximize performance, and information describing proper disposal methods.

.5 Caulking that emits strong odours, contains toxic chemicals or is not certified as mould resistant shall not be used in air handling units.

.6 When low toxicity caulks are not possible, confine usage to areas which off gas to the exterior, are contained behind air barriers, or are applied several months before occupancy to maximize off-gas time.

.7 In the selection of the products and materials of this section preference will be given to those with the following characteristics: Water based, water soluble, water clean-up, non-flammable, low Volatile Organic Compound (VOC) content, manufactured without compounds which contribute to ozone depletion in the upper atmosphere, manufactured without compounds which contribute to smog in the lower atmosphere, does not contain methylene chloride, does not contain chlorinated hydrocarbons.

2.2 Sealant Materials

.1 Refer to sealant schedule 3.8 for use and locations.

.2 Type ES#1
.1 One part low modulas, neutral cure, SILYL-terminated non-sag elastomeric sealant conforming to ASTM C920.
.2 Type: S
.3 Grade: NS
.4 Class: 25
.5 Use NT, M, A, G and O.
.6 Additional movement capability of +100 to -50.

.3 Type ES#2
.1 Two component, self leveling and slope grade elastomeric polyurethane for horizontal joints (vehicular and pedestrian traffic bearing) conforming to ASTM C920.
.2 Type: M
.3 Grade: D
.4 Class: 25
.5 Use T and M.
.6 Movement capability of +/-25%

.4 Type ES#3
.1 One part, medium modulas, neutral cure silicone sealant conforming to ASTM C920
.2 Type: S
.3 Grade: NS
.4 Class: 25
.5 Use NT, M, G, A, and O.
.6 Movement capability of +/-25%

.5 Type ES#4
.1 Two-part, neutral care, medium modulas silicone sealant conforming to ASTM C920. Non-staining to porous surfaces per ASTM C1248
.2 Type: M
.3 Grade: NS
.4 Class: 25
.5 Use NT, M, G, A and O.
.6 Additional Movement capability of +/-50%

.6 Type ES#5
.1 One-part mildew-resistant silicone sealant conforming to ASTM C920. Meeting requirements of FDA Regulation No. 21 CFR 177.2600
.2 Type: S
.3 Grade: NS
.4 Class: 25
.5 Use G, A and O.
.6 Additional Movement capability of +/-50%

.7 Type ES#6
.1 One-part acrylic-based acoustical sealant conforming to ASTM C920.

.2 Class: 25

.8 Type ES#7
.1 One-part paintable silicone sealant (water based).

.9 Type ES#8
.1 One-part clear silicone sealant

2.3 Accessories

.1 Primer: Type recommended by the sealant manufacturer and compatible with joint forming materials.

.2 Joint Cleaner: Non-corrosive and non-staining type recommended by sealant manufacturer and compatible with joint forming material.

.3 Polyethylene: Extruded closed cell foam backer rod.
.1 Size: oversize 30 to 50 %, as required for joint design.
.2 Comply with ASTM C 1330.

.4 Bond Breaker Tape.
.1 Polyethylene bond breaker tape which will not bond to sealant.

PART 3 - EXECUTION

3.1 Protection

.1 Protect installed work of other trades from staining or contamination.

3.2 Preparation of Joint Surfaces

.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 Clean and prime surfaces in accordance with manufacturer's directions. Remove loose materials and other foreign matter which may impair adhesion of sealant.

.6 Verify that joint shaping materials and release tapes are compatible with sealant.

.7 Install joint filler with roller or blunt instrument to achieve required joint depth. Do not puncture or twist.

3.3 Sealant Color

.1 Sealant color to be selected by Consultant from manufacturers full range.

3.4 Priming

.1 Where necessary to prevent staining, mask adjacent surfaces prior to prim and caulking.

.2 Prime sides of joints in accordance with sealant manufacturer's instructions immediately prior to caulking.

3.5 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.

3.6 Mixing

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

3.7 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 Cleanup.
.1 Clean adjacent surfaces immediately and leave work neat and clean.
.2 Remove excess and droppings, using recommended cleaners as work progresses.
.3 Remove masking tape after initial set of sealant.
.4 Protect joint sealants during and after cure, from contact with contaminating substances, damage from construction operations or other gauges. Sealants are to be without damage or deterioration at time of substantial performance of the work.
.5 During the course of the Work and upon completion, remove and dispose of excess materials, equipment and debris away from premises.

.4 Acoustically seal all gaps at the top of all wall assemblies required to be acoustically protected and extend to the underside of the roof or upper floor deck, with the manufacturers approved acoustical sealing system. Include through wall gaps and gaps at penetrations through walls between rooms. Apply according to manufacturer's instructions to achieve a continuous seal of the wall structure including up to the underside of the roof deck.

.5 Apply sealant to joints between window or door frames to adjacent building components, around perimeter of every perimeter opening, to control joints in masonry walls, concrete slabs and where indicated.

.6 Fire seal all penetrations in fire rated wall assemblies with the manufacturers approved fire sealing system. Fire sealing is to include gaps between top of wall and underside of roof deck and at any openings or gaps of penetrations through the fire separation. Apply according to manufacturer's instructions to achieve continuous fire rating in wall structure.

3.8 Sealant Schedule

.1 Type ES#1
.1 Use: Vertical expansion and control joints.
.2 Substrate: Masonry, concrete and pre-cast.

.2 Type ES#2
.1 Use: Perimeter joints and non-structural weatherseals.
.2 Substrate: Aluminum, Plastics, Masonry, Concrete

.3 Type ES#3
.1 Use: Structural curtain wall adhesive sealant
.2 Substrate: Glass, Aluminium, Spandrel materials.

.4 Type ES#4
.1 Use: Weatherseals.
.2 Substrate: Metal Panels, Natural Stone Panels

.5 Type ES#5
.1 Use: Plumbing fixtures.
.2 Substrate: ceramic tile, sinks.

.6 Type ES#6
.1 Use: Acoustical sealant around partitions.
.2 Substrate: Gypsum board, Steel, Aluminum.

.7 Type ES#7
.1 Use: Interior joints to be painted.
.2 Substrate: Metal and Gypsum boards.

.8 Typt ES#8
.1 Use: Interior Joints.
.2 substrate: Wood and gypsum board.

PART 1 - GENERAL

1.1 REFERENCES

.1 American Society for Testing and Materials International (ASTM)
.1 ASTM A 653/A 653M-06a, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.2 Canadian General Standards Board (CGSB)
.1 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.

.3 Canadian Standards Association (CSA International)
.1 CSA-G40.20-04/G40.21-04, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
.2 CSA W59-03, Welded Steel Construction (Metal Arc Welding).

.4 Canadian Steel Door Manufacturers' Association (CSDMA)
.1 CSDMA, Recommended Specifications for Commercial Steel Doors and Frames, 2000.
.2 CSDMA, Selection and Usage Guide for Commercial Steel Doors, 1990.

.5 National Fire Protection Association (NFPA)
.1 NFPA 80-99, Standard for Fire Doors and Fire Windows.
.2 NFPA 252-03, Standard Methods of Fire Tests of Door Assemblies.

.6 Underwriters' Laboratories of Canada (ULC)
.1 CAN/ULC-S701-01, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.
.2 CAN/ULC-S702-97, Standard for Thermal Insulation, Mineral Fibre, for Buildings.
.3 CAN/ULC-S704-03, Standard for Thermal Insulation, Polyurethane and Polyisocyanurate Boards, Faced.
.4 CAN4-S104-M80, Standard Method for Fire Tests of Door Assemblies.
.5 CAN4-S105-M85, Standard Specification for Fire Door Frames Meeting the Performance Required by CAN4-S104.

1.2 SYSTEM DESCRIPTION

.1 Design Requirements:
.1 Maximum deflection for exterior steel entrance screens under wind load of 1.2 kPa not to exceed 1/175th of span.
.2 Steel fire rated doors and frames: labelled and listed by an organization accredited by Standards Council of Canada in conformance with CAN4-S104 NFPA 252 for ratings specified or indicated.
.3 Provide fire labelled frames for openings requiring fire protection ratings. Test products in conformance with

CAN4-S104, ASTM E 152 or NFPA 252 and listed by nationally recognized agency having factory inspection services.

1.3 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 Provide shop drawings: in accordance with Section 01 33 00 - Submittal Procedures.
.1 Indicate each type of door, material, steel core thicknesses, mortises, reinforcements, location of exposed fasteners, openings, glazed, arrangement of hardware and fire rating and finishes.
.2 Indicate each type frame material, core thickness, reinforcements, glazing stops, location of anchors and exposed fastenings and reinforcing fire rating finishes.
.3 Include schedule identifying each unit, with door marks and numbers relating to numbering on drawings and door schedule.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Waste Management and Disposal:
.1 Separate waste materials for reuse and recycling in accordance with Municipal and Provincial by-laws.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Acceptable Products: Daybar Industries, Apex Steel Doors and Frames.

.2 Hot dipped galvanized steel sheet: to ASTM A 653M, ZF75, minimum base steel thickness in accordance with CSDMA Table 1 - Thickness for Component Parts.

.3 Reinforcement channel: to CSA G40.20/G40.21, Type 44W, coating designation to ASTM A 653M, ZF75.

2.2 DOOR CORE MATERIALS

.1 Honeycomb construction: Internal Doors.
.1 Structural small cell, 24.5 mm maximum kraft paper 'honeycomb', weight: 36.3 kg per ream minimum, density: 16.5 kg/m^3 minimum sanded to required thickness.

.2 Expanded polystyrene: CAN/ULC-5701 type, density 16 to 32 kg/m3. for exterior doors, as noted on door schedule.

.3 Fire Rated Doors: Rigid extruded fire retardant, closed cell board. Density 32kg/m3 (2.0pcf) min. thermal values: R-11.0 min. in accordance with ASTM CS91 (un-faced) or C1289 (faced).

2.3 PRIMER

.1 Touch-up prime CAN/CGSB-1.181.

2.4 PAINT

.1 Shop spray paint steel doors and frames in a controlled environment accordance with Sections 09 91 99 - Painting. Protect weatherstrips from paint. Provide final finish free of scratches or other blemishes.

2.5 ACCESSORIES

.1 Door silencers: single stud rubber/neoprene type.

.2 Exterior and interior top and bottom caps: rigid polyvinylchloride extrusion conforming to CGSB 41-GP-19Ma steel.

.3 Fabricate glazing stops as formed channel, minimum 16 mm height, accurately fitted, butted at corners and fastened to frame sections with counter-sunk oval head sheet metal screws.

.4 Metallic paste filler: to manufacturer's standard.

.5 Fire labels: Stamped.

.6 Sealant.

.7 Make provisions for glazing as indicated and provide necessary glazing stops.
.1 Provide removable stainless steel glazing beads for use with glazing tapes and compounds and secured with countersunk stainless steel screws dry glazing of snap-on type.
.2 Design exterior glazing stops to be tamperproof.

2.6 FRAMES FABRICATION GENERAL

.1 Fabricate frames in accordance with CSDMA specifications.

.2 Fabricate frames to profiles and maximum face sizes as indicated.

.3 Interior frames: 16 gauge welded type construction.

.4 Exterior Frames: 16 gauge welded thermally broken type.

2.7 FRAME ANCHORAGE

.1 Provide appropriate anchorage to floor and wall construction.

.2 Locate each wall anchor immediately above or below each hinge reinforcement on hinge jamb and directly opposite on strike jamb.

.3 Provide 2 anchors for rebate opening heights up to 1520 mm and 1 additional anchor for each additional 760 mm of height or fraction thereof.

.4 Locate anchors for frames in existing openings not more than 150 mm from top and bottom of each jambs and intermediate at 660 mm on centre maximum.

2.8 FRAMES: WELDED TYPE

.1 Welding in accordance with CSA W59.

.2 Accurately mitre or mechanically joint frame product and securely weld on inside of profile.

.3 Cope accurately and securely weld butt joints of mullions, transom bars, centre rails and sills.

.4 Grind welded joints and corners to a flat plane, fill with metallic paste and sand to uniform smooth finish.

.5 Securely attach floor anchors to inside of each jamb profile.

.6 Weld in 2 temporary jamb spreaders per frame to maintain proper alignment during shipment.

2.9 DOOR FABRICATION GENERAL

.1 Doors: swing type, flush, with provision for glass and/or louvre openings as indicated.

.2 Fabricate doors with longitudinal edges locked seamed.

.3 Blank, reinforce, drill doors and tap for mortised, templated hardware and electronic hardware.

.4 Factory prepare holes 12.7 mm diameter and larger except mounting and through-bolt holes, on site, at time of hardware installation.

.5 Reinforce doors where required, for surface mounted hardware. Provide inverted, recessed, spot welded channels to top and bottom of interior doors.

.6 Provide fire labelled doors for those openings requiring fire protection ratings, as scheduled. Test such products in conformance with CAN4-S104 NFPA 252 and list by nationally recognized agency having factory inspection service and construct as detailed in Follow-Up Service Procedures/Factory Inspection Manuals issued by listing agency to individual manufacturers.

.7 Manufacturer's nameplates on hinge side of doors.

2.10 HOLLOW STEEL CONSTRUCTION

.1 Form face sheets for interior doors from 18 gauge sheet steel with honeycomb.

.2 Form face sheets for exterior doors from 18 gauge sheet steel with polystyrene core laminated under pressure to face sheets.

.3 Exterior metal insulated doors are to meet ASTM C1363 with thermal performance of (Metric) U Factor = 1.647

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 GENERAL

.1 Install labelled steel fire rated frames to NFPA 80 except where specified otherwise.

.2 Install doors and frames to CSDMA Installation Guide.

3.3 FRAME INSTALLATION

.1 Set frames plumb, square, level and at correct elevation.

.2 Secure anchorages and connections to adjacent construction.

.3 Brace frames rigidly in position while building-in. Install temporary horizontal wood spreader at third points of door opening to maintain frame width. Provide vertical support at centre of head for openings over 1200 mm wide. Remove temporary spreaders after frames are built-in.

.4 Make allowances for deflection of structure to ensure structural loads are not transmitted to frames.

.5 Caulk perimeter of frames between frame and adjacent material.

.6 Maintain continuity of air barrier and vapour retarder.

3.4 DOOR INSTALLATION

.1 Install doors and hardware in accordance with hardware templates and manufacturer's instructions and Section 08 71 00 - Door Hardware.

.2 Provide even margins between doors and jambs and doors and finished floor as follows.
.1 Hinge side: 1.0 mm.
.2 Latchside and head: 1.5 mm.
.3 Finished floor: 13 mm.

.3 Adjust operable parts for correct function.

3.5 FINISH REPAIRS

.1 Touch up with primer finishes damaged during installation.

.2 Fill exposed frame anchors and surfaces with imperfections with metallic paste filler and sand to a uniform smooth finish.

3.6 GLAZING

.1 Install glazing for doors and frames in accordance with Canadian Door and Window Manufacturers, Certification Program.

END

PART 1 - GENERAL

1.1 REFERENCES

.1 Architectural Woodwork Manufacturers Association of Canada (AWMAC).
.1 Quality Standards for Architectural Woodwork 1998.

.2 Canadian General Standards Board (CGSB).
.1 CAN/CGSB-71.19-M88, Adhesive, Contact, Sprayable.
.2 CAN/CGSB-71.20-M88, Adhesive, Contact, Brushable.

.3 Canadian Standards Association (CSA International).
.1 CSA A440.2-98, Energy Performance of Windows and Other Fenestration Systems.
.2 CSA O115-M1982(R2001), Hardwood and Decorative Plywood.
.3 CAN/CSA O132.2 Series-90(R1998), Wood Flush Doors.
.4 CAN/CSA-O132.5-M1992(R1998), Stile and Rail Wood Doors.
.5 CAN/CSA-Z808-96, A Sustainable Forest Management System: Guidance Document.
.6 CSA Certification Program for Windows and Doors 00.

.4 Environmental Choice Program (ECP).
.1 CCD-045-92, Sealants and Caulking Compounds.
.2 CCD-046-92, Adhesives.

.5 National Fire Protection Association (NFPA).
.1 NFPA 80-1999, Standard for Fire Doors and Fire Windows.
.2 NFPA 252-1999, Standard Method of Fire Tests of Door Assemblies.

.6 Underwriters' Laboratories of Canada (ULC).
.1 CAN-4S104M-80(R1985), Fire Tests of Door Assemblies.
.2 CAN4-S105M-85 (R1992), Fire Door Frames Meeting the Performance Required by CAN4-S104.

1.2 SUBMITTALS

.1 Product Data:
.1 Submit manufacturer's printed product literature, specifications and data sheet in accordance with Section 01 33 00 - Submittal Procedures.
.2 Submit two copies of WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 33 00 - Submittal Procedures. Indicate VOC's:
.1 For caulking materials during application and curing.
.2 For door materials and adhesives.

.2 Shop Drawings:
.1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.

.2 Indicate door types and cutouts for lights and louvres, sizes, core construction, transom panel construction and cutouts.

1.3 SAMPLES

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

.2 Submit one 300 x 300 mm corner sample of each type wood door.

.3 Show door construction, core, glazing detail and faces.

.4 Manufacturer's Instructions:
.1 Submit manufacturer's installation instructions.

1.4 QUALITY ASSURANCE

.1 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.

.2 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 Storage and Protection:
.1 Protect doors from dampness. Arrange for delivery after work causing abnormal humidity has been completed.
.2 Store doors in well ventilated room, off floor, in accordance with manufacturer's recommendations.
.3 Protect doors from scratches, handling marks and other damage. Wrap Crate doors.
.4 Store doors away from direct sunlight.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for recycling and disposal as per requirements of Municipal and Provincial by-laws.

PART 2 - PRODUCTS

2.1 WOOD FLUSH DOORS

.1 Standard Wood Doors:
.1 Stiles: 3mm thick veneer, logitudinally laminated by hot pressing with type 1 structural glue, as per ASTM-D5456-93 (LVLFSC) or laminated strand lumber (LSL). Include a 22mm piece of hardwood matched with faces for a total width of 107mm.
.2 Top and Bottom Rails: 3mm in wood of SCL, manufacturer's choice (LVLFSC) or LSL).
.3 Core: Solid particle core. Density of 28-32 lbs per cubic foot. Complies with CSA-0177 and ANSI A208-1 standards (LD-1/LD-2. Available NAUF/FSC (LD-2).
.4 Face: Wood veneer 2ply plywood glued to composite crossband.
.1 Door Type 1: Hardwood veneer Doors: To be white maple rotary cut. Finish of doors to be standard clear factory finish.
.5 Lockblock: Integrated.
.6 Glue: type 1 PVA Cross-Link (NAUF).
.7 Acceptable Product:
.1 As manufactured by Baillargeon 8500.
.2 5-8300-ME as manufactured by Lambton Doors. Note: in order to be equal, door to come equipped with 24mm solid hardwood edges.

2.2 GLAZING

.1 Refer to Section 08 80 50 for Glazing.

2.3 FABRICATION

.1 Vertical edge strips to match face veneer.

.2 Prepare doors for louvres and glazing. Provide hardwood species to match face veneer glazing stops with mitred corners.

.3 Bevel vertical edges of single acting doors 3 mm in 50 mm on lock side and 1.5 mm in 50 mm on hinge side.

.4 Radius vertical edges of double acting doors to 60 mm radius.

.5 All interior doors to be stained as per Section 09 91 99 - Painting.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.

3.2 INSTALLATION

.1 Unwrap and protect doors in accordance with CAN/CSA-O132.2 Series, Appendix A.

.2 Install doors and hardware in accordance with manufacturer's printed instructions and CAN/CSA-O132.2 Series, Appendix A.

.3 Adjust hardware for correct function.

.4 Install glazing in accordance with Section 08 80 50 - Glazing.

3.3 ADJUSTMENT

.1 Re-adjust doors and hardware just prior to completion of building to function freely and properly.

3.4 CLEANING

.1 Perform cleaning as soon as possible after installation to remove construction and accumulated environmental dirt.

.2 Remove traces of primer, caulking; clean doors and frames.

.3 On completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END

PART 1 - GENERAL

1.1 SCOPE OF WORK

.1 Supply and deliver all finish hardware as specified in hardware sets for doors listed on door schedule. Hardware shall include all fasteners and devices necessary for the proper installation of hardware.

1.2 REFERENCE STANDARDS

.1 Standard hardware location dimensions in accordance with Canadian Metric Guide for Steel Doors and Frames (Modular Construction) prepare by Canadian Steel Door and Frames Manufacturer's Association.

.2 All hardware shall comply with requirements of the latest National Building Code.

1.3 REQUIREMENTS OF REGULATORY AGENCIES

.1 Use ULC listed and labeled hardware for doors in fire separations and where noted on Door Schedule.

1.4 SUBMITTALS

.1 Submit Hardware Schedule in accordance with Section 01 33 00 - Submittal Procedures or as noted below.

.2 Submit an electronic copy of Finish Hardware Schedule for approval. Schedule shall be written in accordance with DHI Sequence and Format for vertical hardware schedule publication. Schedule shall reference item and door number to hardware set specified. Door index to be included referencing the door number to scheduled item number.

.3 Provide template drawings as requested.

.4 Submit an electronic copy of keying schedules for approval. Schedule shall be written in accordance with DHI Handbook Keying Schedule Systems and Nomenclature. Coordinate all keying in writing.

.5 At completion of job, supply a maintenance manual. For each lockset, door closer, door holder and exit device the manual shall include:
.1 Catalogue pages.
.2 Parts lists.
.3 Manufacturers representatives' name, address and telephone number.
.4 Maintenance instructions.

1.5 QUALITY ASSURANCE

.1 Manufacturers names and product numbers specified are to establish minimum standard of quality. Substitutions shall be considered providing a written request is received ten (10) days prior to tender closing. Catalogue information for each substitute must be submitted with request. Approved substitutions to be included in addendum.

.2 Hardware supplier must have on staff an Architectural Hardware Consultant or person of equivalent qualification and experience. Hardware supplier must have been in hardware supply for a minimum of two (2) years, have supplied similar type projects, and have adequate facilities to service project.

1.6 DELIVERY AND STORAGE

.1 General Contractor to provide clean, dry locked room for storage of hardware on shelving.

.2 Each hardware item shall be delivered to site in manufacturers original packaging. Each item shall be labeled with door and item number to correspond with hardware schedule.

.3 All hardware will be delivered to one receiving area on site.

1.7 WARRANTY

.1 Furnish a one-year written warranty for all products with exceptions of door closers and Mortise locksets and latchsets which shall be warranted for ten (10) years, Exit devices and trim, overhead holders and stops for five (5)years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS ACCEPTED PRODUCTS

.1 Specified in Hardware Sets
- .1 Hinges:
  - .1 McKinney TA714/TA314.
- .2 Locksets:
  - .1 Sargent 10 series.
  - .2 Trim Sargent LB.
- .3 Door closers:
  - .1 Sargent 1430/31
- .4 Push, Pull,kickplates,stops flushbolts:
  - .1 Standard Metal Hager
- .5 Sweeps, weatherstripping, Gasketeting
  - .1 KN Crowder.
- .6 Sliding Door Kits
  - .1 C500 by KN Crowder

2.2 FINISH

.1 Finish for this project in general shall be 26D stainless. Exceptions are as noted in hardware packages.

2.3 KEYING

.1 All locks and cylinders to be keyed separately and on a Master Key System. Key bows and cylinder face to be stamped with Key code. Allow for one on site meetings to chart the Keying requirement. A keying schedule is to be submitted for approval with hardware submittal. All changes to be approved prior to hardware being ordered.

PART 3 - EXECUTION

3.1 INSTALLATION INSTRUCTIONS

.1 Furnish metal door and frame manufacturers with complete instructions and templates for preparation of their work to receive hardware.

.2 Furnish manufacturers' instructions for proper installation of each hardware component.

.3 Recommended mounting heights shall be in accordance with Canadian Metric Guide for Steel Doors and Frames (Modular Construction) prepared by Canadian Steel Door and Frame Manufacturer's Association.

3.2 CLEANING AND ADJUSTING

.1 At final completion General Contractor shall leave hardware clean and free of any disfigurement. Installer shall make a final adjustment to all hardware items and ensure they are functioning properly. Defective hardware shall be replaced or repaired as covered under warranty. Damaged or abused hardware shall be replaced by General Contractor.

3.3 CLEANING

.1 Perform cleaning after installation to remove construction and accumulated environmental dirt.

.2 Clean hardware with damp rag and approved non-abrasive cleaner, and polish hardware in accordance with manufacturers instructions.

.3 Remove protective material from hardware items where present.

.4 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

3.4 SCHEDULE

HW1 (Door 101)

3 Hinges	TA714 114X101	26D	
1 Passage Set	**10U15** LB	26D	
1 Wall Stop	S122	26D	

HW2 (Door 104a)

3 Hinges	TA714 114X101 NRP	26D	McKinney
1 Passage Set	10G05 LB	32D	Sargent
1 Closer	1431 RP9	EN	Sargent
1 Set Weatherstripping	W1		KN Crowder
1 Sweep	W4		KN Crowder
1 Threshold	CT74		KN Crowder

HW3 (Door 106, 107)

3 Hinges	TA714 114X101	26D	McKinney
1 Lockset	21-10G05 LB MKVK	26D	Sargent
1 Auto Bottom	CT52 Semi Mortise	26D	KN Crowder
1 Set Gasket	S22	TAN	KN Crowder
1 Floor Stop	S102L	26D	Standard Metal

HW4 (Door 108, 110)

3 Hinges	TA714 114X101	26D	McKinney
1 Lockset	10U65 LB	26D	Sargent
1 Closer	1431-O	EN	Sargent
1 Wall Stop	S122	26D	Standard Metal

HW5 (Door 104b, 104c, 105, 109)

3 Hinges	TA714 114X101	26D	McKinney
1 Passage Set	10U15 LB	26D	Sargent
1 Floor Stop	S102L	26D	Standard Metal
2 Set Gasket	S22	TAN	KN Crowder
1 Auto Bottom	CT-52		KN Crowder

HW6 (Door 101A)

1 Top Track	C-500x 2xdoor width	26D	KN Crowder
1 Fascia	C-170 x 2xdoor width	26D	KN Crowder
4 Hangers	C-500	26D	KN Crowder
1 Floor Guide	C-1204	26D	KN Crowder
4 In track Catch	CDC-400	26D	KN Crowder
2 Pulls	C71	26D	Crowder

HW7 (Door 111)

6 Hinges	TA714 114X101	26D
1 Lockset	21-**10G04** LB MKVK	26D
1 Closer	1431-0 EN	EN
1 Set Flush Bolts	F65	26D
1 Set Gaskets	S22	TAN

Note: Door 111 is not permitted to be held open

END

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 08 14 16 - Flush Wood Doors.

1.2 REFERENCES

.1 American Society for Testing and Materials International, (ASTM).
.1 ASTM C 542-94(1999), Specification for Lock-Strip Gaskets.
.2 ASTM D 2240-02b, Test Method for Rubber Property - Durometer Hardness.
.3 ASTM E 84-01, Test Method for Surface Burning Characteristics of Building Materials.

.2 Canadian General Standards Board (CGSB).
.1 CAN/CGSB-12.1-M90, Tempered or Laminated Safety Glass.
.2 CAN/CGSB-12.10-M76, Glass, Light and Heat Reflecting.

.3 Canadian Standards Association (CSA International).
.1 CSA Certification Program for Windows and Doors 2000.

.4 Environmental Choice Program (ECP).
.1 CCD-045-95, Sealants and Caulking.

.5 Flat Glass Manufacturers Association (FGMA).
.1 FGMA Glazing Manual - 1997.

1.3 SYSTEM DESCRIPTION

.1 Maintain continuous glazing assembly to ensure acoustical requirements are met.

1.4 SUBMITTALS

.1 Product Data:
.1 Submit manufacturer's printed product literature, specifications and data sheet in accordance with Section 01 33 00 - Submittal Procedures.
.2 Submit two copies of WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 33 00 - Submittal Procedures. Indicate VOC's:
.1 For glazing materials during application and curing.

.2 Shop Drawings:
.1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.

.3 Manufacturer's Instructions:
.1 Submit manufacturer's installation instructions.

.4 Closeout Submittals:
.1 Provide maintenance data including cleaning instructions for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.5 QUALITY ASSURANCE

.1 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.
.1 Provide testing and analysis of glass under provisions of Section 01 45 00 - Quality Control.
.2 Provide shop inspection and testing for glass.

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

1.6 SITE CONDITIONS

.1 Environmental 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.

1.7 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials.

.2 Divert metal cut-offs from landfill by disposal at nearest metal recycling facility.

.3 Divert uninstalled materials for reuse at nearest used building materials facility or similar type facility.

.4 Divert unused caulking and sealant materials from landfill through disposal at special wastes depot.

.5 Unused or damaged glazing materials are not recyclable and must not be diverted to municipal recycling programs.

.6 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.7 Dispose of corrugated cardboard polystyrene plastic packaging material in appropriate on-site bin for recycling in accordance with site waste management program.

PART 2 - PRODUCTS

2.1 INSULATING GLASS (GL1)

.1 For exterior door lites.
  .1 To meet requirements of NBC Table A-9.7.3.2(1)B as a minimum standard.
  .2 Insulating glass units to meet requirements of:
    .1 CAN/CGSB -12.8-9.7
    .2 CSA A440 .2-98
  .3 Insulating glass units
    .1 Units to be 6mm tempered glass.
    .2 Low-E coating on 3rd surface to be metallic, hard, prolitic.
    .3 Light transmittance: 70%
    .4 Shading coefficient: 0.46
    .5 U-Value: winter 0.24 max, summer 0.22 max
    .6 12mm air space, argon filled.
    .7 Glass thickness to meet NBC table A-9.7.3.2 (1) B.
    .8 Total IGU thickness: 18 to 22mm.

2.2 GLAZING UNIT (GL2) For door lites

.1 6mm clear tempered glass.

.2 Glazing to come complete with film where indicated.

2.3 SILVER MIRROR GLASS

.1 6MM thick to CAN/CGSB-12.5
  .1 Type 1B float glass.

2.4 FILMS

.1 Film Type 1: Frosted Translucent Film, for all door lites.

2.5 ACCESSORIES

.1 Setting blocks: Neoprene EPDM, Shore A durometer hardness to ASTM D 2240, to suit glazing method, glass light weight and area.

.2 Spacer shims: Neoprene, Shore A durometer hardness to ASTM D 2240, 75 mm (3")long x one half height of glazing stop x thickness to suit application. Self adhesive on one face.

.3 Glazing tape:
  .1 Preformed butyl compound with integral resilient tube spacing device, 10-15 Shore A durometer hardness to ASTM D 2240; coiled on release paper.

.4 Glazing splines: resilient silicone, extruded shape to suit glazing channel retaining slot, colour as selected.

.5 Lock-strip gaskets: to ASTM C 542.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: Comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.

3.2 EXAMINATION

.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.

3.3 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.

3.4 INSTALLATION: INTERIOR WET/DRY METHOD (TAPE AND SEALANT)

.1 Perform work in accordance with FGMA Glazing Manual and Laminators Safety Glass Association - Standards Manual for glazing installation methods.

.2 Cut glazing tape to length and install against permanent stops, projecting 1.6 mm (1/16") above sight line.

.3 Place setting blocks at 1/4 points, with edge block maximum 150mm (6") from corners.

.4 Rest glazing on setting blocks and push against tape to ensure full contact at perimeter of light or unit.

.5 Install removable stops, with spacer shims inserted between glazing and applied stops at 600 mm (2'-0") intervals, 6 mm (1/4") below sight line.

.6 Fill gaps between light and applied stop with sealant to depth equal to bite on glazing, to uniform and level line.

.7 Trim protruding tape edge.

3.5 CLEANING

.1 Perform cleaning after installation to remove construction and accumulated environmental dirt.

.2 Remove traces of primer, caulking.

.3 Remove glazing materials from finish surfaces.

.4 Remove labels after work is complete.

.5 Clean glass using approved non-abrasive cleaner in accordance with manufacture's instructions.

.6 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

3.6 PROTECTION OF FINISHED WORK

.1 After installation, mark light with an "X" by using removable plastic tape or paste.

END

FINISH SCHEDULE LEGEND

	CODE		
FLOOR	CPT1	Interface, Ceremony Collection, CE172 104956 Origami, Size: 25cm x 1m	Installed: Ashlar
	CPT2	Tandus, Abrasive Action II, Colour: Winter Gray	
	LVT1	Tandus Centiva, Classic Stone Okara Gray, ECL 7126 FR	Lay tile in 1/3 broken joint spacing
BASE	RB1	100mm Rubber Base, Johnsonite, Color: Charcoal	
WALLS	CT1	Ceramic Wall Tile, Olympia Maple Leaf, Matte Finish, Color: Artic white, Size: 2 1/8" x 8 1/2"	Kitchen backsplash and in WR's up to height as indicated on drawings
	PT1	Dulux, Color: Winter Bird	Wall Color
	PT2	Dulux, Accent Color: Falling Rain	Accent Color in locations as determined by architect
	PT3	Dulux, Accent Colour: Noble Grey	
	GT2	MAPEI 93 Warm Grey	For use with CT1 tile
MISC	TH1	Thermofoil Bluff Hill, Colour:Classic Maple	For millwork drawers and doors
	SS1	Corian # Rice Paper	Countertops
	SN1	Stair Nosing	
	ST1	Clear polyurethane stain	For wood doors and frames (interior wood doors to be factory finish)
CEILING	AT1	Armstrong Dune Square lay in, Size: 610x1220x16	White
	PT5	Paint, Ceiling White	
EXTERIOR	CED	Cedar shingles to match existing	

ROOM NUMBER	ROOM NAME	RESILIENT	CARPET	RUBBER BASE	GYPSUM BOARD PT	TILE	ACOUSTIC TILE	GYPSUM BOARD PT	EXISTING	
101	ENTRY		CPT2	RB1	PT1				▪	
102	CONFERENCE		CPT1	RB1	PT1/PT3				▪	
104	RECEIVING	LVT1		RB1	PT1/PT2			PT5		
105	KITCHEN	LVT1		RB1	PT1	CT1		PT5		
106	EQUIPMENT	LVT1		RB1	PT1		AT1			
107	OFFICE		CPT1	RB1	PT1		AT1			
108	WR	LVT1		RB1	PT1/PT2	CT1		PT5		
109	CORRIDOR	LVT1		RB1	PT1			PT5		
110	WR	LVT1		RB1	PT1/PT2	CT1		PT5		
111	JANITOR	LVT1		RB1	PT1			PT5		

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 09 27 10 - Gypsum Board Accessories.

1.2 REFERENCES

.1 American Society for Testing and Materials International, (ASTM)
.1 ASTM C 36/C 36M-01, Specification for Gypsum Wallboard.
.2 ASTM C 475-01, Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
.3 ASTM C 514-01, Specification for Nails for the Application of Gypsum Board.
.4 ASTM C 840-01, Specification for Application and Finishing of Gypsum Board.
.5 ASTM C 1002-01, Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
.6 ASTM C 1047-99, Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.
.7 ASTM C 1280-99, Specification for Application of Gypsum Sheathing Board.

.2 Association of the Wall and Ceilings Industries International (AWEI)

.3 Underwriters' Laboratories of Canada (ULC)
.1 CAN/ULC-S102-1988(R2000), Surface Burning Characteristics of Building Materials and Assemblies.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver materials in original packages, containers or bundles bearing manufacturers brand name and identification.

.2 Store materials inside, level, under cover. Keep dry. Protect from weather, other elements and damage from construction operations and other causes.

.3 Handle gypsum boards to prevent damage to edges, ends or surfaces. Protect metal accessories and trim from being bent or damaged.

1.4 SITE ENVIRONMENTAL REQUIREMENTS

.1 Maintain temperature minimum 10 degrees C, maximum 21 degrees C for 48 hours prior to and during application of gypsum boards and joint treatment, and for at least 48 hours 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.

1.5 SAMPLES

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

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Standard board: to ASTM C 36/C 36M 16mm thick Type X, 1200mm wide x maximum practical length, ends square cut, edges bevelled.

.2 Abuse resistant gypsum panels: Standard 16mm thick, firecode core, 1200mm wide x maximum practical length, ends cut square, edges bevelled.

.3 Water resistant gypsum panels: Standard 16mm thick, firecode core when used in fire rated partition, 1200mm wide x maximum practical length, ends cut square, edges bevelled.

.4 Drywall furring channels: 0.5 mm core thickness galvanized steel channels for screw attachment of gypsum board.

.5 Nails: to ASTM C 514.

.6 Steel drill screws: to ASTM C 1002.

.7 Joint compound: to ASTM C 475, asbestos-free.

PART 3 - EXECUTION

3.1 ERECTION

.1 Do application and finishing of gypsum board in accordance with ASTM C 840 except where specified otherwise.

.2 Do application of gypsum sheathing in accordance with ASTM C 1280.

.3 Install work plumb to tolerance of 1:1200.

3.2 APPLICATION

.1 Do not apply gypsum board until bucks, anchors, blocking, electrical and mechanical work are approved.

.2 Apply single layer gypsum board to metal furring or metal framing using screw fasteners. Maximum spacing of screws 500mm on centre.

.1 Single-Layer Application:

.1 Apply gypsum board vertically or horizontally, providing sheet lengths that will minimize end joints.

.3 Apply 300mm diameter bead of acoustic sealant continuously around periphery of each face of partitioning to seal gypsum board/structure junction where partitions abut fixed building components. Seal full perimeter of cut-outs around electrical boxes, ducts, in partitions where perimeter sealed with acoustic sealant.

.4 Install gypsum board with face side out.

.5 Do not install damaged or damp boards.

.6 Locate edge or end joints over supports. Stagger vertical joints over different studs on opposite sides of wall.

3.3 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 at 150 mm on centre using contact adhesive for full length.

.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 to following levels in accordance with Association of the Wall and Ceiling Industries (AWCI) International Recommended Specification on Levels of Gypsum Board Finish:
.1 Levels of finish:
.1 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.
.2 Provide a level 4 smooth finish.

.7 Finish corner beads, control joints 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 Apply one coat of white primer sealer over surface to be textured. When dry apply textured finish in accordance with manufacturer's instructions.

.12 Provide protection that ensures gypsum drywall work will remain without damage or deterioration at time of substantial completion.

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 07 92 00 - Joint Sealants.

1.2 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 American Society for Testing and Materials International (ASTM)
.1 ASTM C 144-04, Specification for Aggregate for Masonry Mortar.
.2 ASTM C 207-06, Specification for Hydrated Lime for Masonry Purposes.
.3 ASTM C 979-05, Specification for Pigments for Integrally Coloured Concrete.

.3 Canadian General Standards Board (CGSB)
.1 CGSB 71-GP-22M-78(AMEND.), Adhesive, Organic, for Installation of Ceramic Wall Tile.
.2 CAN/CGSB-75.1-M88, Tile, Ceramic.
.3 CAN/CGSB-25.20-95, Surface Sealer for Floors.

.4 Canadian Standards Association (CSA International)
.1 CAN/CSA-A3000-03(R2006), Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).

.5 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.

1.3 SUBMITTALS

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

.2 Provide product data in accordance with Section 01 33 00 - Submittals.
.1 Include manufacturer's information on:
.1 Ceramic tile, marked to show each type, size, and shape required.

.2 Chemical resistant mortar and grout (Epoxy and Furan).
.3 Cementitious backer unit.
.4 Dry-set cement mortar and grout.
.5 Divider strip.
.6 Elastomeric membrane and bond coat.
.7 Reinforcing tape.
.8 Levelling compound.
.9 Latex cement mortar and grout.
.10 Commercial cement grout.
.11 Organic adhesive.
.12 Waterproofing isolation membrane.
.13 Fasteners.

.3 Provide samples in accordance with Section 01 33 00 - Submittals.
.1 Base tile: submit duplicate, 1'-0" x 1'-0" sample panels of each colour, texture, size, and pattern of tile.
.2 Trim shapes, bullnose cap and cove including bullnose cap and base pieces at internal and external corners of vertical surfaces, each type, colour, and size.
.3 Adhere tile samples to 1/2" thick plywood and grout joints to represent project installation.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Packing, shipping, handling and unloading:
.1 Deliver, store and handle materials in accordance with Section 01 33 00 - Submittals.

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.

1.6 MAINTENANCE

.1 Extra Materials:
.1 Provide maintenance materials in accordance with Section 01 33 00 - 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 FLOOR AND WALL TILE

.1 Ceramic Tile (CT-1):
  .1 Standard of Acceptance:
    .1 Series: Olympia Tile, Maple Leaf Collection.
      .1 Dimensions: 2 1/8 x 8 1/2".
      .2 Colour: Refer to Finish Schedule.

2.2 MORTAR AND ADHESIVE MATERIALS

.1 Cement: to CSA-A5, type 10.

.2 Sand: to ASTM C 144, passing 16 mesh.

.3 Latex additive: formulated for use in cement mortar and thin set bond coat.

.4 Water: potable and free of minerals and chemicals which are detrimental to mortar and grout mixes.

2.3 BOND COAT

.1 Dry set cement mortar: to ANSI A108.1.

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

2.4 GROUT

.1 Colouring Pigments:
  .1 Pure mineral pigments, limeproof and nonfading, complying with ASTM C 979.
  .2 Colouring pigments to be added to grout by manufacturer.
  .3 Job coloured grout are not acceptable.
  .4 Use in Commercial Cement Grout, Dry-Set Grout, and Latex Cement Grout.

.2 Cement Grout: to ANSI A108.1.
  .1 Use one part white cement to one part white sand passing a number 30 screen.

.3 Commercial Cement Grout: to CTI A118.6.

.4 Dry-Set Grout: to CTI A118.6.

.5 Latex Cement Grout: to ANSI A108.1, fast curing, high early strength, polymer-modified, stain resistant, sanded mix for floors, unsanded mix for walls and floors with polished tiles commercial tile grout.

.6 Colour: to be selected by Architect form Manufacturers' full range.

.7 Standard of Acceptance:
.1 Ultraflex 3 as manufactured by MAPEI.
.2 Flextile 52 as manufactured Flextile Ltd.
.3 or approved equal.

2.5 ACCESSORIES

.1 Prefabricated Movement Joints: purpose made, having a Shore A Hardness not less than 60 and elasticity of plus or minus 40 percent when used in accordance to TTMAC Detail 301EJ.

.2 Sealant: in accordance with Section 07 92 00 -Joint Sealants.

.3 Protective coating: to CAN/CGSB-25.20, Type 1 to tile and grout manufacturers recommendations.

2.6 MIXES

.1 Mix bond and levelling coats, and grout to manufacturer's instructions.

.2 Adjust water volumes to suit water content of sand.

2.7 PATCHING AND LEVELLING COMPOUND

.1 Cement base, acrylic polymer compound, manufactured specifically for resurfacing and leveling concrete floors. Products containing gypsum are not acceptable.

.2 Have not less than the following physical properties:
.1 Compressive strength - 25 MPa.
.2 Tensile strength - 7 MPa.
.3 Flexural strength - 7 MPa.
.4 Density - 1.9.

.3 Capable of being applied in layers up to 2" thick, being brought to feather edge, and being trowelled to smooth finish.

.4 Ready for use in 48 hours after application.

2.8 CLEANING COMPOUNDS

.1 Specifically designed for cleaning masonry and concrete and which will not prevent bond of subsequent tile setting materials including patching and leveling compounds and elastomeric waterproofing membrane and coat.

.2 Materials containing acid or caustic material are not acceptable.

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 to clean and sound surfaces.

.3 Where tile is installed over plywood substrate, utilize an un-coupling membrane.

.4 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.

.5 Maximum surface tolerance 1:800.

.6 Make joints between tile uniform and approximately 1.5mm wide, plumb, straight, true, even and flush with adjacent tile. Ensure sheet layout not visible after installation. Align patterns.

.7 Lay out tiles so perimeter tiles are minimum 1/2 size.

.8 Sound tiles after setting and replace hollow-sounding units to obtain full bond.

.9 Make internal angles square, external angles bullnosed.

.10 Use bullnose edged tiles at termination of wall tile panels, except where panel abuts projecting surface or differing plane.

.11 Install divider strips at junction of tile flooring and dissimilar materials.

.12 Allow minimum 24 hours after installation of tiles, before grouting.

.13 Clean installed tile surfaces after installation and grouting cured.

.14 Make control joints at 4800m in each direction. Make joint width same as tile joints. Fill control joints with sealant in accordance with Section 07 92 00 - Joint Sealants. Keep building expansion joints free of mortar and grout.

3.3 CLEANING

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

PART 1 - GENERAL

1.1 REFERENCES

.1 American Society for Testing and Materials International (ASTM)
.1 ASTM A 1008 Standard Specification for Steel, Sheet, Cold Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
.2 ASTM A 641 Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
.3 ASTM A 653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
.4 ASTM C 423 Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
.5 ASTM C 635 Standard Specification for Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
.6 ASTM C 636 Recommended Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.
.7 ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials.
.8 ASTM E 1414 Standard Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum.
.9 ASTM E 1111 Standard Test Method for Measuring the Interzone Attenuation of Ceilings Systems.
.10 ASTM E 1264 Classification for Acoustical Ceiling Products.
.11 ASTM E 1477 Standard Test Method for Luminous Reflectance Factor of Acoustical Materials by Use of Integrating-Sphere Reflectometers.
.12 ASTM D 3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
.13 ASTM E 119 Standard Test Methods for Fire Tests of Building Construction and Material.

.2 Canadian General Standards Board (CGSB)
.1 CAN/CGSB-92.1-M89, Sound Absorptive Prefabricated Acoustical Units.

.3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
.1 Material Safety Data Sheets (MSDS).

.4 Underwriter's Laboratories of Canada (ULC)
.1 CAN/ULC-S102-2003, Surface Burning Characteristics of Building Materials and Assemblies.

1.2 SUBMITTALS

.1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
.1 Submit duplicate full size samples of each type acoustical units.

.2 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
.1 Indicate lay-out, insert and hanger spacing and fastening details, splicing method for main and cross runners, change in level details, and acoustical unit support at ceiling fixture lateral bracing and accessories.

1.3 DESIGN REQUIREMENTS

.1 Maximum deflection: 1/360th of span to ASTM C 635 deflection test.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver acoustical ceiling units to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.

.2 Before installing acoustical ceiling units, permit them to reach room temperature and a stabilized moisture content.

.3 Handle acoustical ceiling units carefully to avoid chipping edges or damaged units in any way.

1.5 PROJECT CONDITIONS

.1 Standard Ceilings: Do not install interior ceilings until space is enclosed and weatherproof; wet work in place is completed and nominally dry; work above ceilings is complete; and ambient conditions of temperature and humidity are continuously maintained at values near those intended for final occupancy. Building areas to receive ceilings shall be free of construction dust and debris.

1.6 MAINTENANCE

.1 Extra Materials: Deliver extra materials to Owner. Furnish extra materials described below that match products installed. Packaged with protective covering for storage and identified with appropriate labels.
.1 Acoustical Ceiling Units: Furnish quality of full-size units equal to 5.0 percent of amount installed.

.2 Exposed Suspension System Components: Furnish quantity of each exposed suspension component equal to 2.0 percent of amount installed.

PART 2 - PRODUCTS

2.1 ACOUSTICAL CEILING PANELS

.1 Acoustic units for suspended ceiling system: to CAN/CGSB-92.1.
.1 AT-1: Acoustic Tile 610mm x 1220mm x 16mm thick
.1 Standard of Acceptance:
.1 Armstrong Dune Square Lay-in.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Do not proceed with installation until all wet work such as concrete, terrazzo, plastering and painting has been completed and thoroughly dried out, unless expressly permitted by manufacturer's printed recommendations.

3.2 PREPARATION

.1 Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less than half width units at borders, and comply with reflected ceiling plans. Coordinate panel layout with mechanical and electrical fixtures.

.2 Coordination: Furnish layouts for preset inserts, clips, and other ceiling anchors whose installation is specified in other sections.
.1 Furnish concrete inserts and similar devices to other trades for installation well in advance of time needed for coordination of other work.

3.3 INSTALLATION

.1 Install suspension system and panels in accordance with the manufacturer's instructions, and in compliance with ASTM C 636 and with the authorities having jurisdiction.
.2 Suspend main beam from overhead construction with hanger wires spaced 1200mm on center along the length of the main runner. Install hanger wires plumb and straight.
.3 Install wall moldings at intersection of suspended ceiling and vertical surfaces. Miter corners where wall moldings intersect or install corner caps.

.4 For reveal edge panels: Cut and reveal or rabbet edges of ceiling panels at border areas and vertical surfaces.
.5 Install acoustical panels in coordination with suspended system, with edges resting on flanges of main runner and cross tees. Cut and fit panels neatly against abutting surfaces. Support edges by wall moldings.

3.4 ADJUSTING AND CLEANING

.1 Replace damaged and broken panels.
.2 Clean exposed surfaces of acoustical ceilings, including trim, edge moldings, and suspension members. Comply with manufacturer's instructions for cleaning and touch up of minor finish damage. Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END

PART 1 - GENERAL

1.1 REFERENCES

.1 American Society for Testing and Materials International (ASTM)
.1 ASTM C 635-04, Standard Specifications for the Manufacture, Performance and Testing of Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings.
.2 ASTM C 636/C 636M-06, Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.

.2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
.1 Material Safety Data Sheets (MSDS).

1.2 DESIGN REQUIREMENTS

.1 Maximum deflection: 1/360th of span to ASTM C 635 deflection test.

1.3 SUBMITTALS

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

1.4 DELIVERY, STORAGE AND HANDLING

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

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

PART 2 - PRODUCTS

2.1 SUSPENSION SYSTEMS

.1 Intermediate duty system to ASTM C 635.

.2 Components: All main beams and cross tees shall be commercial quality hot-dipped galvanized (galvanized steel, aluminum, or stainless steel) as per ASTM A 653. Main beams and cross tees are double-web steel construction with type exposed flange design. Exposed surfaces chemically cleansed, capping pre-finished galvanized steel (aluminum or stainless steel) in baked polyester paint. Main beams and cross tees shall have

rotary stitching (exception: extruded aluminum or stainless steel).
.1 Structural Classification: ASTM C 635 ID.
.2 Color: White and match the actual color of the selected ceiling tile.
.3 Acceptable Products:
.1 Type 1 Suspension System: Prelude XL 15/16" White.

.3 Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.

.4 Wire for Hangers and Ties: ASTM A 641, Class 1 zinc coating, soft temper, pre-stretched, with a yield stress load of at least time three design load, but not less than 12 gauge.

.5 Edge Moldings and Trim: Metal or extruded aluminum of types and profiles indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations, including light fixtures, that fit type of edge detail and suspension system indicated. Provide moldings with exposed flange of the same width as exposed runner.

.6 Accessories: splices, clips, wire ties, retainers and wall moulding flush, to complement suspension system components, as recommended by system manufacturer.

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 Installation: in accordance with ASTM C 636.

.2 Install suspension system to manufacturer's instructions and Certification Organizations tested design requirements.

.3 Do not erect ceiling suspension system until work above ceiling has been inspected by Architect.

.4 Secure hangers to overhead structure using attachment methods as indicated.

.5 Install hangers spaced at maximum 1200mm centres and within 150 mm from ends of main tees.

.6 Lay out centre line of ceiling both ways, to provide balanced borders at room perimeter.

.7 Ensure suspension system is co-ordinated with location of related components.

.8 Refer to Reflected Ceiling plans and provide full coordination with mechanical, electrical and sprinkler contractors.

.9 Install wall moulding to provide correct ceiling height.

.10 Completed suspension system to support super-imposed loads, such as lighting fixtures, diffusers and grilles

.11 Support at light fixtures diffusers with additional ceiling suspension hangers within 150mm of each corner and at maximum 610mm around perimeter of fixture.

.12 Attach cross member to main runner to provide rigid assembly.

.13 Frame at openings for light fixtures, air diffusers, speakers and at changes in ceiling heights.

.14 Install access splines to provide 25 percent ceiling access.

.15 Finished ceiling system to be square with adjoining walls and level within 1:1000.

3.3 CLEANING

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

.2 Touch up scratches, abrasions, voids and other defects in painted surfaces.

END

PART 1 - GENERAL

1.1 REFERENCES

.1 American Society for Testing and Materials International (ASTM).
.1 ASTM F 1066-04, Standard Specification for Vinyl Composition Floor Tile.

.2 Canadian General Standards Board (CGSB)
.1 CAN/CGSB-25.20-95, Surface Sealer for Floors.

.3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
.1 Material Safety Data Sheets (MSDS).

.4 South Coast Air Quality Management District (SCAQMD), California State
.1 SCAQMD Rule 1168-05, Adhesives and Sealants Applications.

1.2 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 Provide samples in accordance with Section 01 33 00 - Submittal Procedures.
.1 Submit duplicate tile in size specified, 300 mm (1'-0") long.

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

1.3 DELIVERY, STORAGE AND HANDLING

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

.2 Waste Management and Disposal:
.1 Separate waste materials for reuse and recycling in accordance with Municipal and Provincial by-laws.
.2 Keep all discarded packaging away from children.

1.4 ENVIRONMENTAL REQUIREMENTS

.1 Maintain air temperature and structural base temperature at flooring installation area above 20 degrees C for 48 hours before, during and for 48 hours after installation.

1.5 MAINTENANCE

.1 Extra Materials:
.1 Provide maintenance materials of resilient tile flooring, base and adhesive in accordance with Section 01 78 00 - Closeout Submittals.
.2 Provide 2m^2 (22'-0")^2 of each colour, pattern and type flooring material required for this project for maintenance use.
.3 Extra materials from same production run as installed materials.
.4 Identify each container of floor tile and each container of adhesive.
.5 Deliver to Engineer, upon completion of the work of this section.
.6 Store where directed by Consultant.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Type 1 (LVT-1) Luxury Vinyl Tile, Tandus Centiva, Event series, Collection stone. To have 30 mil wear layer.

2.2 ACCESSORIES

.1 Rubber Base: continuous, top set, complete with premoulded end stops and external corners. See finish schedule for locations.
.1 Style: see finish schedule.
.2 Eliminate all voids between base and wall.
.3 Seal edges of base with silicone caulking.
.4 Lengths: cut lengths minimum 2400mm.
.5 Follow manufacturer's installation instructions.
.6 See finish schedule for locations.
.7 Acceptable products:
.1 RB1 Acceptable product: Johnsonite Traditional Wall Base.

.2 Primers and Adhesives: of types recommended by resilient flooring manufacturer for areas subjected to spillage and heavy rolling loads.
.1 Adhesive: maximum VOC limit 60 g/L to SCAQMD Rule 1168.

.3 Subfloor Filler and Leveler: as recommended by flooring manufacturer for use with their product.

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 INSPECTION

.1 Ensure concrete floors are dry, by using test methods recommended by tile manufacturer.

3.3 SUB-FLOOR TREATMENT

.1 Remove or treat old adhesives to prevent residual, old flooring adhesives from bleeding through to new flooring and/or interfering with the bonding of new adhesives.

.2 Remove sub-floor ridges and bumps. Fill low spots, cracks, joints, holes and other defects with sub-floor filler.

.3 Plywood sub-floor to flooring manufacturer's printed instructions.

3.4 TILE APPLICATION

.1 Provide high ventilation rate, with maximum outside air, during installation, and for 48 to 72 hours after installation. If possible, vent directly to outside. Do not let contaminated air recirculate through district or whole building air distribution system. Maintain extra ventilation for at least one month following building occupation.

.2 Apply adhesive uniformly using recommended trowel in accordance with flooring manufacturer's instructions. Do not spread more adhesive than can be covered by flooring before initial set takes place.

.3 Cut tile and fit neatly around fixed objects.

.4 Continue flooring through areas to receive movable type partitions without interrupting floor pattern.

.5 Terminate flooring at centerline of door in openings where adjacent floor finish or colour is dissimilar.

.6 Install transition strips at unprotected or exposed edges where flooring terminates.

3.5 BASE APPLICATION

.1 Lay out base to keep number of joints at minimum. Base joints at maximum length available or at internal or premoulded corners.

.2 Clean substrate and prime with one coat of adhesive.

.3 Apply adhesive to back of base.

.4 Set base against wall and floor surfaces tightly by using 3 kg hand roller.

.5 Install straight and level to variation of 1:1000.

.6 Scribe and fit to door frames and other obstructions. Use premoulded end pieces at flush door frames.

.7 Cope internal corners. Use premoulded corner units for right angle external corners. Use formed straight base material for external corners of other angles, minimum 300 mm (1'-0") each leg. Wrap around toeless base at external corners.

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.

.2 Remove excess adhesive from floor, base and wall surfaces without damage.

.3 Clean, seal and wax floor and base surface to flooring manufacturer's instructions. In carpeted areas clean, seal and wax base surface before carpet installation.

3.8 PROTECTION

.1 Protect new floors from time of final set of adhesive until final inspection.

.2 Prohibit traffic on floor for 48 hours after installation.

.3 Use only water-based coating for linoleum.

END

PART 1 - GENERAL

1.1 References

.1 American Association of Textile Chemists and Colorists (AATCC)
- .1 AATCC 16-1998, Color Fastness to Light.
- .2 AATCC 23-1999, Color Fastness to Burn Gas Fumes.
- .3 AATCC 129-2001, Colour Fastness to Ozone in the Atmosphere Under High Humidities.
- .4 AATCC 134-2001, Electrostatic Propensity of Carpet.
- .5 AATCC 171-2000, Carpets: Cleaning of; Hot Water Extraction Method.
- .6 AATCC 174-1998, Antimicrobial Activity Assessment of Carpets.
- .7 AATCC 175-1998, Stain Resistance: Pile Floor Coverings.
- .8 AATCC 189-2001, Fluorine Content of Carpet Fibers.

.2 American Society for Testing and Materials (ASTM International)
- .1 ASTM D 1335-98, Tuft Bind of Pile Floor Coverings.
- .2 ASTM D 3936-00 Standard Test Method for Resistance to Delamination of the Secondary Backing of Pile Yarn Floor Covering.
- .3 ASTM D 5417-99, Standard Practice for Operation of the Vettermann Drum Tester.
- .4 ASTM E 84-01, Test Method for Surface Burning Characteristics of Building Materials.
- .5 ASTM E 662-01, Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials.

.3 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-4.2 No.27.6-M91, Textile Test Methods - Flame Resistance - Methemine Tablet Test for Textile Floor Coverings.
- .2 CAN/CGSB-4.2 No.77.1-94/ISO 4919:1978, Textile Test Methods - Carpets - Determination of Tuft Withdrawal Force.
- .3 CGSB 4-GP-36M-78, Carpet Underlay, Fiber Type.
- .4 CAN/CGSB-4.129-93(R1997), Carpets for Commercial Use.
- .5 CGSB 20-GP-23M-78, Cushion, Carpet, Flexible Polymeric Material.
- .6 CAN/CGSB-25.20-95, Surface Sealer Floors.

.4 Carpet and Rug Institute (CRI)
- .1 CRI-104-96, Standard Installation of Commercial Carpet.
- .2 IAQ Carpet Testing Program.

.5 National Floor Covering Association (NFCA)
- .1 Floor Covering Specification Manual 1998.

.6 Underwriters' Laboratories of Canada (ULC)
- .1 CAN/ULC-S102.2-88(R2000), Surface Burning Characteristics of Flooring, Floor Covering and Miscellaneous Materials and Assemblies.

1.2 Submittals

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

.2 Submit verification to demonstrate compliance with CAN/ULC S102 and CAN/ULC S102.2.

.3 Submit proof that carpet has been tested and passed the Indoor Air Quality (IAQ) Carpet Testing Program requirements of the Carpet and Rug Institute (CRI) and the Canadian Carpet Institute (CCI).

.4 Submit report verifying that tuft bind meets requirements of CAN/CGSB-4.129 when tested to CAN/CGSB-4.2 No.77.1.

.5 Submit report outlining proposed dust control measures.

.6 Submit carpet schedule using same room designations indicated on drawings.

.7 Submit carpet manufacturer's installation instructions: Indicate special procedures and perimeter conditions requiring special attention.

.8 Submit certification and description of carpet recycling process.

1.3 Product Data

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

.2 Submit product data sheet for each carpet, undercushion, adhesive, carpet protection and subfloor patching compound.

.3 Submit WHMIS MSDS - Material Safety Data Sheets acceptable to Labour Canada and Health Canada for carpet adhesive. Indicate VOC content.

.4 Submit data on specified products, describing physical and performance characteristics, sizes, patterns, colours, and methods of installation.

1.4 Shop Drawings

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

.2 Submit drawings showing columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required as well as direction of carpet pile and pattern,

location of edge moldings and edge bindings to Consultant for review prior to installation of carpet.

1.5 Samples

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

.2 Submit duplicate 250mm x 1000mm pieces of each type carpet specified, duplicate 250mm x 1000mm pieces for each colour selected.

1.6 Closeout Submittals

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

.2 Submit maintenance data: Include maintenance procedures, recommendations for maintenance materials and equipment, and suggested schedule for cleaning.

1.7 Qualifications

.1 Installer Qualifications:
.1 Flooring contractor requirements.
.1 Specialty contractor normally engaged in this type of work, with prior experience in installation of these types of materials.
.2 Certified by carpet manufacturer prior to bid submission.
.3 Must not sub-contract labour without written approval of Consultant.

.2 Be responsible for proper product installation, including floor testing and preparation as specified and in accordance with carpet manufacturers written instructions.

1.8 Regulatory Requirements

.1 Prequalification: tested to CAN/CGSB-4.2-No.27.6.

.2 Indoor Air Quality: compliance with CRI/CCI Green Label Indoor Air Quality Program, CRI/CCI-IAQ requirements for maximum total volatile chemicals released into air. Label each carpet product with CRI/CCI-IAQ label.

1.9 Delivery, Storage and Handling

.1 Label packaged materials. For carpet tile products indicate nominal dimensions of tile and indicate installation direction.

.2 Store packaged materials in original containers or wrapping with manufacturer's seals and labels intact.

.3 Store carpeting and accessories in location as directed by Consultant. Store carpet and adhesive at minimum temperature of 18° C and relative humidity of maximum 65% for minimum of 48 hours before installation.

.4 Prevent damage to materials during handling and storage. Keep materials under cover and free from dampness.

.5 Store materials in area of installation for minimum period of 48 hours prior to installation, remove from cartons.

.6 Modular carpet: store on pallet form as supplied by Manufacturer. Do not stack pallets.

1.10 Waste Management and Disposal

.1 Separate and recycle waste materials in accordance with Waste Reduction Workplan.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper plastic polystyrene corrugated cardboard packaging material in appropriate on-site for recycling in accordance with Waste Management Plan.

1.11 Environmental Requirements

.1 Moisture: Ensure substrate is within moisture limits and alkalinity limits prescribed by manufacturer. Prepare moisture testing and provide report to Consultant.

.2 Temperature: Maintain ambient temperature of not less than 18° C from 48 hours before installation to at least 48 hours after completion of work.

.3 Relative humidity: Maintain relative humidity between 10 and 65% RH for 48 hours before, during and 48 hours after installation.

.4 Safety: Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials.

.5 Ventilation:
.1 Ventilate area of work as directed by Consultant by use of approved portable supply and exhaust fans.
.2 Ventilate enclosed spaces in accordance with Section 01 51 00 - Temporary Utilities.
.3 Provide continuous ventilation during and after carpet application. Run ventilation system 24 hours per day during installation; provide continuous ventilation for 3 days after completion of carpet installation.

.6 Do not install carpet until space is enclosed and weatherproof, wet-work in space is completed and nominally dry, work above ceilings is complete.

1.12 Extra Materials

.1 Provide extra materials of carpet and adhesives in accordance with Section 01 78 00 - Closeout Submittals.

.2 Provide 10m^2 of each colour, pattern and type of carpeting.

.3 Extra materials to be from same production run as installed materials.

.4 Identify each package of carpet and each container of adhesive.

.5 Deliver to Consultant and store where directed.

PART 2 - PRODUCTS

2.1 Manufacturers

.1 Certified to Carpet and Rug Institute's and the Canadian Carpet Institute IAQ requirements.

2.2 Modular Carpet

.1 Type 1: Carpet Tile (CPT1)
.1 Standard of Acceptance:
.1 Interface.
.2 Style:Ceremony Collection.
.3 Colours: Refer to Finish Schedule.
.4 Installation method: Ashlar.
.5 Size: 25cm x 1M.

.2 Type 2: Carpet Tile 2 (CPT2)
.1 Standard of Acceptance:
.1 Tandus.
.2 Style: Abrasive Action II.
.3 Colours: Refer to Finish Schedule.

.4 Installation method: Broadloom.

.3 Carpet: to CAN/CGSB-4.129 and as follows:
.1 Certified for flammability to Health Canada regulations under "Hazardous Products (Carpet) Regulations", Part II of the Schedule.
.2 Maximum flame spread rating 300, maximum smoke developed classification 500.
.3 Certified to Carpet and Rug Institute's and the Canadian Carpet Institute's IAQ requirements.

2.3 Special Requirements

.1 Soil Resistance: 350 ppm fluorine minimum.

.2 Permanent static control: to AATCC 134, 3000V maximum at 20%RH and 22° C.

.3 Anti-microbial: to AATCC 174, 99% reduction, 0% growth.

.4 Stain resistance: to AATCC 175, 8.

2.4 Accessories

.1 Adhesive (Type 1):
.1 Pressure sensitive type: recommended by carpet manufacturer for floating installation of modular carpet or specialty backed carpets.
.2 Chemical composition: compounded acrylic adhesive, applied to PET polyester backing with PET polyester release liner.
.3 Dimensions: 76mm x 76mm.
.4 Zero calculated VOCs.
.5 Standard of acceptance: Interface Flor Tactiles.

.2 Carpet protection: non-staining heavy duty kraft paper.

.3 Subfloor patching compound: Recommended by Flooring manufacturer.

PART 3 - EXECUTION

3.1 Sub-Floor Treatment

.1 Large patch areas are to be primed with a compatible primer, where indicated in schedule.

.2 Wherever a powdery or porous concrete surface is encountered, a primer compatible with the adhesive shall be used to provide a suitable surface for glue-down installation, where indicated in schedule.

3.2 Preparation

.1 Prepare floor surfaces in accordance with CRI 104 Standard for Installation of Commercial Carpet.

.2 Pre-condition carpeting following manufacturer's printed instructions.

3.3 Installation

.1 Install in accordance with manufacturer's printed instructions and in accordance with Carpet and Rug Institute Standard for Installation of Commercial Carpet, CRI 104.

.2 Install carpet after finishing work is completed but before telephone and electrical pedestal outlets are installed.

.3 Finish installation to present smooth wearing surface free from conspicuous seams, burring and other faults.

.4 Use material from same dye lot. Ensure colour, pattern and texture match within any one visual area.

.5 Fit neatly around architectural, mechanical, electrical and telephone outlets, and furniture fitments, around perimeter of rooms into recesses, and around projections.

.6 Extend carpet into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

.7 Install carpet smooth and free of bubbles, puckers, and other defects.

3.4 Modular Carpet

.1 Apply tactiles and install modular carpet in accordance with manufacturer's written instructions.

.2 Lay modular carpet with butt seams.

3.5 Base Installation

.1 Install 100mm base. Refer to Room Finish schedule for type, size and colour.

.2 Install toeless type base before installation of carpet on floors.

.3 Lengths: cut lengths minimum 2400mm.

.4 Follow manufacturer's installation instructions.

3.6 Protection of Finished Work

.1 Vacuum carpets clean immediately after completion of installation. Protect traffic areas.

.2 Prohibit traffic on carpet for a period of 24 hours until adhesive is cured.

.3 Install carpet protection to satisfaction of Consultant.

END

PART 1 - GENERAL

1.1 REFERENCES

.1 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  .1 Material Safety Data Sheets (MSDS).

.2 Master Painters Institute (MPI)
  .1 MPI Architectural Painting Specifications Manual, 2004.
  .2 MPI - Maintenance Repainting Manual, 1998.

.3 Green Seal Standard GS-11; May 20, 1993.

.4 MPI (APL) - Master Painters Institute.

.5 SCAQMD 1168 - South Coast Air Quality Management District Rule #1168; October 3, 2003.

.6 SSPC (PM1) - Steel Structures Painting Manual, Vol. 1, Good Painting Practice; Society for Protective Coatings; 1993, Third Edition.

.7 SSPC (PM2) - Steel Structures Painting Manual, Vol. 2, Systems and Specifications; Society for Protective Coatings; 1995, Seventh Edition.

.8 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.

1.2 DEFINITIONS

.1 Paints are available in a wide range of sheens or glosses, as measured by a gloss meter from a 60 degree angle from vertical, as a percentage of the amount of light that is reflected. The following terms are used to describe the gloss of our products.
  .1 Flat - Less than 5 Percent.
  .2 Matte - 0 - 10 Percent.
  .3 Eggshell - 10 - 25 Percent.
  .4 Satin - 20 - 35 Percent.
  .5 Semi-Gloss - 35 - 70 Percent.
  .6 Gloss - 70 - 85 Percent.

1.3 SUBMITTALS

.1 Submittals in accordance with Section 01 33 00 - Submittal Procedures 01 00 10 - General Instructions.

.2 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance

with Section 01 33 00 - Submittal Procedures. Indicate VOCs during application and curing.

.3 Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.4 Submit manufacturer's installation and application instructions.

.5 Product Environmental Data:
.1 Submittals Required:
.1 Green Seal Standard GS-11 Certified Product certificates.
.2 Product Data: Provide a complete list of all products to be used, with the following information for each:
.1 Manufacturer's name, product name and/or catalog number, and general product category and instructions, including special surface preparation procedures.
.2 Cross-reference to specified paint system(s) that the product is to be used in; include description of each system.
.3 Submit product data for the use and application of paint/coating thinner.
.3 Samples: Submit three paper samples, 5 inches by 7 inches (127mm x 178mm) in size, illustrating selected colors for each color and system selected with specified coats cascaded.
.4 Maintenance Data: Submit data on cleaning, touch-up, and repair of painted and coated surfaces.

1.4 QUALITY ASSURANCE

.1 Manufacturer Qualifications: All primary products specified in this section will be supplied by a single manufacturer with a minimum of ten (10) years experience.
.2 Installer Qualifications: All products listed in this section are to be installed by a single installer with a minimum of five (5) years demonstrated experience in installing products of the same type and scope as specified.
.3 Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
.1 Finish areas designated by Architect.
.2 Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
.3 Refinish mock-up area as required to produce acceptable work.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Storage and Protection:
.1 Provide and maintain dry, temperature controlled, secure storage.
.2 Store materials and supplies away from heat generating devices.
.3 Store materials and equipment in well-ventilated area within temperature as recommended by manufacturer.
.4 Store products in manufacturer's unopened packaging until ready for installation.
.5 Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

.2 Fire Safety Requirements:
.1 Provide one 9 kg Type ABC dry chemical 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.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with Municipal and Provincial bylaws.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Place materials defined as hazardous or toxic waste, including tubes and containers, in containers or areas designated for hazardous waste.

.4 Never pour leftover coating down any sink or drain. Use up material on the job or seal can and store safely for future use.

.5 Do not incinerate closed containers.

.6 For specific disposal or recycle guidelines, contact the local waste management agency or district. Recycle whenever possible.

.7 Paint, stain and wood preservative finishes and related materials (thinners, and solvents) are regarded as hazardous products and are subject to regulations for disposal. Information on these controls can be obtained from Provincial Ministries of Environment and Regional levels of Government.

1.7 SITE CONDITIONS

.1 Heating, Ventilation and Lighting:
.1 Ventilate enclosed spaces.
.2 Co-ordinate use of existing ventilation system with Consultant 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.

.4 Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.8 WARRANTY

.1 At project closeout, provide to the Owner or owner's representative an executed copy of the Manufacturer's standard form outlining the terms and conditions of and any exclusions to their Limited Warranty against Manufacturing Defect.

1.9 EXTRA MATERIALS

.1 At project closeout, supply the Owner or owner's representative one gallon of each product for touch-up purposes.

.2 At project closeout, provide the color mixture name and code to the Owner or owner's representative for accurate future color matching.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

.1 Requests for substitutions will be considered in accordance with provisions of Section 01 33 00 - Submittal Procedures.

2.2 MATERIALS - GENERAL

.1 Volatile Organic Compound (VOC) Content:
.1 Provide coatings that comply with the most stringent requirements specified in the following:
.1 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
.2 Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.

.2 Compatibility: Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

.3 Paint materials listed in the MPI Approved Products List (APL) are acceptable for use on this project.

.4 Provide paint materials for paint systems from single manufacturer.

.5 Only qualified products with E2 "Environmentally Friendly" rating are acceptable for use on this project.

.6 Conform to latest MPI requirements for all painting work including preparation and priming.

.7 Materials (primers, paints, coatings, varnishes, stains, lacquers, fillers, thinners, solvents, etc.) in accordance with MPI - Architectural Painting Specification Manual and MPI - Maintenance Repainting Manual "Approved Product" listing.

2.3 COLOURS

.1 Colour schedule will be based upon selection of six base colours and six accent colours.

2.4 MIXING AND TINTING

.1 Except where specifically noted in this section, all paint shall be ready-mixed and pre-tinted. Agitate all paint prior to and during application to ensure uniform color, gloss, and consistency.

.2 Thinner addition shall not exceed manufacturer's printed recommendations. Do not use kerosene or other organic solvents to thin water-based paints.

.3 Where paint is to be sprayed, thin according to manufacturer's current guidelines.

.4 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.

2.5 INTERIOR FINISH COATS

.1 Flat Finish:
.1 Latex: Gypsum wallboard, drywall and `sheet rock type materials', general ceilings throughout unless otherwise indicated.
.1 Two (2) Coats
.2 Standard of acceptance: Benjamin Moore & Co. - Eco Spec Interior Latex Flat #219 (MPI Listed Product, Category 143).

.2 Eggshell Finish:
.1 Latex: Gypsum wallboard, drywall and `sheet rock type materials', general walls throughout unless otherwise indicated.
.1 Two (2) Coats
.2 Standard of acceptance: Benjamin Moore & Co - Eco Spec Interior Latex Eggshell Enamel #223 (MPI Listed Product, Category 144).

.3 Satin/Semi-Gloss Finish:
.1 Latex: Gypsum wallboard, drywall and `sheet rock type materials', washrooms, utility rooms, storage.
.1 Two (2) Coats
.2 Standard of acceptance: Benjamin Moore & Co - Eco Spec Interior Latex Semi - Gloss Enamel #224 (MPI Listed Product, Category 147).

.4 High Gloss Finish: High contact/High traffic areas: Metal Doors and Frames.
.1 Latex:
.1 Two (2) Coats
.2 Standard of acceptance: Benjamin Moore & Co - Latex High Gloss Metal & Wood Enamel #309 (MPI Listed Product, Category 114).

2.6 INTERIOR WOOD

.1 Wood - Millwork and trim where indicated on drawings.
.1 Finish Material: Water Borne Zero VOC Stain
.2 Finish Color: To be chosen from Manufacturers complete range.
.3 Finish Coats: Two (2) coats.
.4 Standard of acceptance: Purity Interior 0-VOC stain as manufactured by Sansin.

2.7 PRIMING

.1 All surfaces to receive finished paint to be primed prior to painting.

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 sheet.

.2 Perform preparation and operations for interior painting in accordance with MPI - Architectural Painting Specifications Manual and MPI - Maintenance Repainting Manual except where specified otherwise.

3.2 EXAMINATION

.1 Do not begin installation until substrates have been properly prepared.

.2 Ensure that surfaces to receive paint are dry immediately prior to application.

.3 Ensure that moisture-retaining substrates to receive paint have moisture content within tolerances allowed by coating manufacturer. Where exceeding the following values, promptly notify Architect and obtain direction before beginning work.
.1 Interior Wood: 15 percent.
.2 Interior Finish Detail Woodwork, Including Trim, and Casework: 10 percent.
.3 Plaster and Gypsum: 15 percent.

.4 Examine surfaces to receive coatings for surface imperfections and contaminants that could impair performance or appearance of coatings, including but not limited to, loose primer, rust,

scale, oil, grease, mildew, algae, or fungus, stains or marks, cracks, indentations, or abrasions. Report to Consultant damages, defects, unsatisfactory or unfavourable conditions before proceeding with work.

.5 Correct conditions that could impair performance or appearance of coatings in accordance with specified surface preparation procedures before proceeding with coating application.

3.3 PREPARATION - GENERAL

.1 Clean and prepare surfaces in accordance with MPI - Architectural Painting Specification Manual and MPI - Maintenance Repainting Manual specific requirements and coating manufacturer's recommendations.

.2 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.

.3 Sand and dust between coats as required to provide adequate adhesion for next coat and to remove defects visible from a distance up to 1000 mm.

.4 Do not apply paint until prepared surfaces have been accepted by Consultant.

.5 Do not start work until surfaces to be finished are in proper condition to produce finished surfaces of uniform, satisfactory appearance.

.6 Stains and Marks: Remove completely, if possible, using materials and methods recommended by coating manufacturer; cover stains and marks which cannot be completely removed with isolating primer or sealer recommended by coating manufacturer to prevent bleed-through.

.7 Remove Mildew, Algae, and Fungus using materials and methods recommended by coating manufacturer.

.8 Remove dust and loose particulate matter from surfaces to receive coatings immediately prior to coating application.

.9 Remove or protect adjacent hardware, electrical equipment plates, mechanical grilles and louvers, lighting fixture trim, and other items not indicated to receive coatings.

.10 Move or protect equipment and fixtures adjacent to surfaces indicated to receive coatings to allow application of coatings.

.11 Protect adjacent surfaces not indicated to receive coatings.

.12 Prepare surfaces in accordance with manufacturer's instructions for specified coatings and indicated materials, using only methods and materials recommended by coating manufacturer.

3.4 SURFACE PREPARATION

.1 Prepare substrates in accordance with MPI requirements.

.2 Gypsum Board: Repair cracks, holes and other surface defects with joint compound to produce surface flush with adjacent surfaces.

.3 Metals - Ferrous, Shop-Primed: Remove loose primer and rust, if present, by scraping and sanding, feathering edges of cleaned areas to produce uniform flat surface; solvent-clean surfaces and spot-prime bare metal with specified primer, feathering edges to produce uniform flat surface.

.4 Polyvinyl Chloride (PVC) Pipe: remove contaminants and markings with denatured alcohol scuff sand and wipe with solvent for maximum adhesion. Test adhesion before starting the job.

.5 Wood:
.1 Seal knots, pitch streaks, and sap areas with sealer recommended by coating manufacturer; fill nail recesses and cracks with filler recommended by coating manufacturer; sand surfaces smooth.
.2 Apply primer coat to back of wood trim and paneling.

.6 Wood Doors: Seal door tops and bottoms prior to finishing.

.7 Wood Doors - Field-Glazed Frames and Sash: Prime or seal glazing channels prior to glazing.

3.5 APPLICATION - GENERAL

.1 Method of application to be as approved by Consultant. Conform to manufacturer's application instructions unless specified otherwise.

.2 Sand and dust between coats to remove visible defects.

.3 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.

.4 Finish closets and alcoves as specified for adjoining rooms.

.5 Finish top, bottom, edges and cutouts of doors after fitting as specified for door surfaces.

.6 Apply each coat to uniform coating thickness in accordance with manufacturer's instructions, not exceeding manufacturer's specified maximum spread rate for indicated surface; thins, brush marks, roller marks, orange-peel, or other application imperfections are not permitted.

.7 Allow manufacturer's specified drying time, and ensure correct coating adhesion, for each coat before applying next coat.

.8 Inspect each coat before applying next coat; touch-up surface imperfections with coating material, feathering, and sanding if required; touch-up areas to achieve flat, uniform surface without surface defects visible from 1.5 m.

.9 Remove dust and other foreign materials from substrate immediately prior to applying each coat.

.10 Where paint application abuts other materials or other coating color, terminate coating with a clean sharp termination line without coating overlap.

.11 Re-prepare and re-coat unsatisfactory finishes; refinish entire area to corners or other natural terminations.

3.6 MECHANICAL / ELECTRICAL EQUIPMENT

.1 Paint conduits, piping, hangers, ductwork and other mechanical and electrical equipment exposed in finished areas, to match adjacent surfaces, except as indicated.

.2 Do not paint over nameplates.

.3 Paint disconnect switches for fire alarm system and exit light systems in red enamel.

.4 Paint both sides and edges of backboards for telephone and electrical equipment before installation. Leave equipment in original finish except for touch-up as required, and paint conduits, mounting accessories and other unfinished items.

3.7 CLEANING

.1 Clean excess coating materials, and coating materials deposited on surfaces not indicated to receive coatings, as construction activities of this section progress; do not allow to dry.

.2 Re-install hardware, electrical equipment plates, mechanical grilles and louvers, lighting fixture trim, and other items that have been removed to protect from contact with coatings.

.3 Reconnect equipment adjacent to surfaces indicated to receive coatings.

.4 Relocate to original position equipment and fixtures that have been moved to allow application of coatings.

.5 Remove protective materials.

3.8 PROTECTION

.1 Protect completed coating applications from damage by subsequent construction activities.

.2 Repair to Architect's acceptance coatings damaged by subsequent construction activities. Where repairs cannot be made to Architect's acceptance, re-apply finish coating to nearest adjacent change of surface plane, in both horizontal and vertical directions.

END

PART 1 - GENERAL

1.1 References

.1 American Society for Testing and Materials (ASTM)
.1 ASTM A 167-99, Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
.2 ASTM B 456-95, Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.
.3 ASTM A 653/A 653M-99, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
.4 ASTM A 924/A 924M-99, Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.

.2 Canadian General Standards Board (CGSB)
.1 CAN/CGSB-1.81-M90, Air Drying and Baking Alkyd Primer for Vehicles and Equipment.
.2 CAN/CGSB-1.88-92, Gloss Alkyd Enamel, Air Drying and Baking.
.3 CAN/CGSB-12.5-M86, Mirrors, Silvered.
.4 CGSB 31-GP-107Ma-90, Non-inhibited Phosphoric Acid Base Metal Conditioner and Rust Remover.

.3 Canadian Standards Association (CSA)
.1 CAN/CSA-B651-95, Barrier-Free Design.
.2 CAN/CSA-G164-M92, Hot Dip Galvanizing of Irregularly Shaped Articles.

1.2 Shop Drawings

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

.2 Indicate size and description of components, base material, surface finish inside and out, hardware and locks, attachment devices, description of rough-in-frame, building-in details of anchors for grab bars.

1.3 Closeout Submittals

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

1.4 Waste Management and Disposal

.1 Separate waste materials for recycling and disposal as per requirements of Municipal and Provincial by-laws.

1.5 Extra Materials

.1 Provide special tools required for accessing, assembly/disassembly or removal for toilet and bath accessories in accordance with requirements specified in Section 01 78 00 - Closeout Submittals.

.2 Deliver special tools to Owner.

PART 2 - PRODUCTS

2.1 Materials

.1 Sheet steel: to ASTM A 653/A 653M with ZF001 designation zinc coating.

.2 Stainless steel sheet metal: to ASTM A 167, Type 304, with satin finish.

.3 Stainless steel tubing: Type, commercial grade, seamless welded, 1.2 mm wall 304

.4 Fasteners: concealed screws and bolts hot dip galvanized, exposed fasteners to match face of unit. Expansion shields fibre, lead or rubber as recommended by accessory manufacturer for component and its intended use.

2.2 Components

.1 Grab Bar (GB-1): 610mm long, concealed mounting, 18 gauge type 304 satin stainless 38mm dia. tubing complete with peened finish. Refer to drawings for mounting heights.
.1 Standard of Acceptance:
.1 Model A6806.99 x 24 as manufactured by Bobrick.
.2 Model 812 x 24 as manufactured by Bradley.

.2 Grab Bar (GB-2): 914mm long, concealed mounting, 18 gauge type 304 satin stainless 38mm dia. tubing complete with peened finish. Refer to drawings for mounting heights.
.1 Standard of Acceptance:
.1 Model A6806.99 x 36 as manufactured by Bobrick.
.2 Model 812 x 36 as manufactured by Bradley.

.3 Sanitary Napkin Disposal (ND): Satin-finish stainless steel. Cover is drawn, one-piece construction; secured to cabinet with

full-length stainless steel piano-hinge. Capacity: 1.0-gal. (3.8-L). Unit 7 1/2" W, 10" H, 3 13/16" D (190 x 255 x 95mm).
.1 Standard of Acceptance:
.1 Model B-270 as manufactured by Bobrick
.2 Model 4781-15 as manufactured by Bradley

.4 Robe Hook (RH-1): In Office
.1 Standard of Acceptance:
.1 Standard of Acceptance: Satin chrome finish square
.1 Model RM817 as manufactured by Rockwood

.5 Robe Hook (RH-2): In Washrooms
.1 Satin finish stainless steel. Contoured hook is 3 15/16" (100mm) wide. Flange is 2" x 2" (50 x 50mm). Projects 1 7/8" (50mm) from wall.
.2 Standard of Acceptance:
.1 Model B-76727 as manufactured by Bobrick.
.2 Model 9214 as manufactured by Bradley.

.6 Soap Dispenser (SD): Horizontal tank is satin-finish stainless steel. Valve dispenses all-purpose hand soaps. Capacity: 40 fl oz (1.2 L). Soap refill window. Concealed wall fastening. Hinged filler-top requires special key to open. Vandalresistant. Unit 8 1/8" W, 4 3/4" H (205 x 120mm); wall to push-button, 3 1/2" (90mm).
.1 Standard of Acceptance:
.1 Model B-2112 as manufactured by Bobrick.
.2 Model 6542 as manufactured by Bradley.

.7 Paper Towel Dispenser (PTD-2): Satin-finish stainless steel. Touchfree, pull towel mechanism. Dispenser 12" length per pull. Accomodates 8" wide, up to 8" high diameter rolls. Unit: 11 3/4" W x 15" H x 9" D.
.1 Standard of Acceptance:
.1 Model B-2860 as manufactured by Bobrick

.8 Toilet Tissue Dispenser (TT): Satin-finish stainless steel unit and dispensing mechanism. Flush tumbler lock. Holds two rolls up to 5 1/4" (133mm) diameter (1800 sheets). Extra roll drops in place when bottom roll is depleted. Theft-resistant, heavy-duty spindles. Extends 2 3/4" (70mm) from wall. Rough Wall Opening: 6 1/4" W, 11 1/4" H, 3 1/4" min. depth (160 x 285 x 85mm).
.1 Standard of Acceptance:
.1 Model B-4388 as manufactured by Bobrick.
.2 Model 5412 as manufactured by Bradley.

.9 Waste Receptacle (GAR): Waste receptacle shall be 22-gauge (.8mm) stainless steel. Exposed surfaces shall have satin finish. Waste receptacle shall be euqipped with vinyl bumper strip and rubber fee.
.1 Standard of Acceptance: Model B-2260 as manufactured by Bobrick.

2.3 Fabrication

.1 Weld and grind joints of fabricated components flush and smooth. Use mechanical fasteners only where approved.

.2 Wherever possible form exposed surfaces from one sheet of stock, free of joints.

.3 Brake form sheet metal work with 1.5 mm radius bends.

.4 Form surfaces flat without distortion. Maintain flat surfaces without scratches or dents.

.5 Back paint components where contact is made with building finishes to prevent electrolysis.

.6 Hot dip galvanize concealed ferrous metal anchors and fastening devices to CSA G164.

.7 Shop assemble components and package complete with anchors and fittings.

.8 Deliver inserts and rough-in frames to job site at appropriate time for building-in. Provide templates, details and instructions for building in anchors and inserts.

.9 Provide steel anchor plates and components for installation on studding and building framing.

2.4 Finishes

.1 Chrome and nickel plating: to ASTM B 456, satin finish.

PART 3 - EXECUTION

3.1 Installation

.1 Install and secure accessories rigidly in place as follows:
.1 Stud walls: install steel back-plate to stud prior to plaster or drywall finish. Provide plate with threaded studs or plugs.
.2 Hollow masonry units or existing plaster/drywall: use toggle bolts drilled into cell/wall cavity.
.3 Solid masonry, marble, stone or concrete: use bolt with lead expansion sleeve set into drilled hole.

.2 Install grab bars on built-in anchors provided by bar manufacturer.

.3 Use tamper proof screws/bolts for fasteners.

.4 Fill units with necessary supplies shortly before final acceptance of building.

.5 Install mirrors in accordance with Section 08 80 50 - Glazing.

.6 Follow manufacturer's installation instructions.

3.2 Schedule

.1 Locate accessories where indicated. Exact locations determined by Consultant.

END

PART 1 - GENERAL

1.1 SUBMITTALS

.1 Submit under provisions of Section 01 33 00 - Submittals.

.2 Product Data: Manufacturer's data sheets on each product to be used, including:
- .1 Preparation instructions and recommendations.
- .2 Storage and handling requirements and recommendations.
- .3 Installation methods.

.3 Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

.4 Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.

1.2 QUALITY ASSURANCE

.1 Single Source Responsibility: Obtain each type of projection screen required from a single manufacturer as a complete unit, including necessary mounting hardware and accessories.

.2 Coordination of Work: Coordinate layout and installation of projection screens with other construction supported by, or penetrating through, ceilings, including light fixtures, HVAC equipment, fire-suppression system, and partitions.

1.3 DELIVERY STORAGE AND HANDLING

.1 Store products in manufacturer's unopened packaging until ready for installation.

.2 Protect equipment from damage during delivery, handling, storage, and installation.

1.4 COORDINATION

.1 Coordinate work with installation of ceilings, walls, electric service power characteristics, and location.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Fire Extinguishers
.1 Type 1: Type ABC Model # ABC-100WWD
.2 Type 2: CO2 extinguisher with wall bracket Model # CO2-100WW.

.2 Fire Extinguisher Cabinet (EC)
.1 Semi-recessed fire extinguisher cabinet constructed of 22 ga. (.76mm) steel tub and 16 ga. (1.57mm) steel door & trim with 2" (51mm) return frame, a full length semi-concealed piano hinge and flush stainless steel door latch. Entire cabinet finished in baked enamel paint and glazed with (5mm) clear glass.
.2 Standard of Acceptance: Model # CE-950-3-2 as manufactured by National Fire Equipment or approved equal.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Do not begin installation until substrates have been properly prepared.

.2 Verify rough-in openings are properly prepared.

.3 If substrate preparation is the responsibility of another installer, notify Consultant of unsatisfactory preparation before proceeding.

3.2 PREPARATION

.1 Clean surfaces thoroughly prior to installation.

.2 Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

.1 Install in accordance with manufacturer's instructions.

3.4 PROTECTION

.1 Protect installed products until completion of project.

.2 Touch-up, repair or replace damaged products before Substantial Completion.

END

PART 1 - GENERAL

1.1 Work Included

.1 Provide labour, materials, products, equipment and services to supply and install thermofoil cabinets.

.2 Prepare cut-outs and holes in thermofoil cabinets to accommodate mechanical and electrical services and service fittings and fixtures.

1.2 Related Work

.1 Section 01 61 00 - Common Product Requirements.

.2 Section 01 78 00 - Closeout Submittals.

.3 Section 06 20 00 - Finish Carpentry and Millwork.

.4 Section 06 61 16 - Solid Surface Fabrications.

.5 Coordinate Mechanical's and Electrical's requirements.

1.4 Submittals

.1 Submission requirements
.1 Make submissions in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data: Submit manufacturer's data sheets on each product to be used, including:
.1 Preparation instructions and recommendations.
.2 Storage and handling requirements and recommendations.
.3 Installation methods.

.3 Shop Drawings: Indicate casework locations, plans, elevations, rough-in points of mechanical and electrical service fittings, fixtures and anchor placement dimensions and tolerances and clearances required.

.4 Selection Samples: For each finish product specified, submit two complete sets of colour chips representing manufacturer's full range of available colours and patterns.

.5 Verification Samples: For each finish product specified, submit two samples, minimum size 150mm square, representing actual product, colour and finish.

.6 Submit manufacturer's certificates that certify products meet or exceed specified requirements.

.7 Operation and Maintenance Data
.1 Submit operation and maintenance data.

1.5 Quality Assurance

.1 Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum ten years documented experience.

.2 Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
.1 Finish areas designated by Architect.
.2 Do not proceed with remaining work until workmanship, colour, and sheen are approved by Architect.
.3 Refinish mock-up area as required to produce acceptable work.
.4 Accepted mock-ups shall be comparison standard for remaining work.

1.6 Delivery, Storage and Handling

.1 Store products indoors, under cover in manufacturer's unopened packaging until ready for installation.

PART 2 - PRODUCTS

2.1 Manufacturers

.1 Premoule Thermo Doors: which is located at: 2375 Dalton Street; Quebec, QC, G1P 3S3; Toll Free: 866-652-1422; Tel: 418-652-1422; Web: www.premoule.com; or approved equal.

.2 Request for substitutions will be considered in accordance with provisions of Section 00 21 13 - Instruction to Bidders.

2.2 Materials and Components

.1 Cabinet Doors and Drawer Fronts:
.1 Thermofoil on 19mm medium density fiberboard.
.1 Concealed Hinges.

PART 3 - EXECUTION

3.1 Examination

.1 Do not begin installation until substrates have been properly prepared.

.2 If substrate preparation is the responsibility of another installer, notify Construction Manager of unsatisfactory preparation before proceeding.

3.2 Inspection

.1 Prior to installation of casework, check and verify that no irregularities exist that would affect quality of execution of work specified.

3.3 Preparation

.1 Coordinate the work with the schedule and other requirements of other work being prepared in the area at the same time with regard to mechanical and electrical service connections and general construction work.

.2 Clean surfaces thoroughly prior to installation.

.3 Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.4 Installation

.1 Install in accordance with manufacturer's instructions.

.2 Use anchoring devices and fasteners to suit conditions and substrate materials encountered.

.3 Set cabinet work items plumb and square, securely anchored to building structure.

.4 Carefully scribe cabinet work abutting other components.

.5 Adjust doors, drawers, hardware, fixtures, and other moving or operating parts to function smoothly.

.6 Apply small bead of sealant at junction of countertop and adjacent wall finish.

.7 Clean casework, shelves and hardware.

3.5 Field Quality Control

.1 Repair or remove and replace defective work, as directed by Consultant upon completion of installation.

3.6 Adjusting and Cleaning

.1 On completion, touch up marred or abraded finished surfaces.

.2 Wipe down surfaces to remove fingerprints and markings and leave in clean condition.

3.7 Protection

.1 Protect installed products until completion of project.

.2 As a minimum measure protect all countertops with 3 mm thick corrugated cardboard taped in place.

.3 Advise Consultant of procedures and precautions for protection of material, installed casework, and fixtures from damage by work of other trades.

PART 1 - GENERAL

1.1 SUBMITTALS

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

.2 Shop drawings to show:

.1 Mounting arrangements.

.2 Operating and maintenance clearances.

.3 Shop drawings and product data accompanied by:

.1 Detailed drawings of bases, supports, and anchor bolts.

.2 Acoustical sound power data, where applicable.

.3 Points of operation on performance curves.

.4 Manufacturer to certify current model production.

.5 Certification of compliance to applicable codes.

.4 Closeout Submittals:

.1 Provide operation and maintenance data for incorporation into O&M manual as specified

.2 Operation and maintenance manual approved by, and final copies deposited with, Consultant before final inspection.

.3 Operation data to include:

.1 Control schematics for mechanical systems.

.2 Description of systems and their controls.

.3 Description of operation of systems at various loads together with reset schedules and seasonal variances.

.4 Operation instruction for systems and component.

.5 Description of actions to be taken in event of equipment failure.

.6 Valves schedule and flow diagram.

.4 Maintenance data to include:

.1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.

.2 Data to include schedules of tasks, frequency, tools required and task time.

.5 Performance data to include:

.1 Equipment manufacturer's performance datasheets with point of operation as left after commissioning is complete.

.2 Equipment performance verification test results.

.3 Special performance data as specified.

.4 Testing, adjusting and balancing reports as specified in Section 23 05 93

.6 Approvals:

.1 Submit 2 copies of draft Operation and Maintenance Manual to Consultant for approval. Submission of individual data will not be accepted unless directed by Consultant.

.2 Make changes as required and re-submit as directed by Consultant.

.7 Additional data:

.1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.

.8 Site records:

.1 Consultant will provide 1 set of reproducible mechanical drawings. Provide sets of white prints as required for each phase of work. Mark changes as work progresses and as changes occur. Include changes to existing mechanical systems, control systems and low voltage control wiring.

.2 Transfer information monthly to reproducibles, revising reproducibles to show work as actually installed.

.3 Use different colour waterproof ink for each service.

.4 Make available for reference purposes and inspection.

.9 As-built drawings:

.1 Prior to start of Testing, Adjusting and Balancing for HVAC, finalize production of electronic as-built drawings.

.2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: - "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (Date).

.3 Submit to Consultant for approval and make corrections as directed.

.4 Perform testing, adjusting and balancing for HVAC using as-built drawings.

.5 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.

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

1.2 MAINTENANCE

.1 Furnish spare parts as follows:

.1 One set of packing for each pump.

.2 One casing joint gasket for each size pump.

.3 One head gasket set for each heat exchanger.

.4 One glass for each gauge glass.

.5 One filter cartridge or set of filter media for each filter or filter bank in addition to final operating set.

.6 One set of spare belts and filters for each air handling unit

.2 Provide one set of special tools required to service equipment as recommended by manufacturers.

.3 Furnish one commercial quality grease gun, grease and adapters to suit different types of grease and grease fittings.

1.3 EQUIPMENT INSTALLATION

.1 Unions or flanges: provide for ease of maintenance and disassembly

.2 Space for servicing, disassembly and removal of equipment and components: provide as recommended by manufacturer or as indicated.

.3 Equipment drains: pipe to hub or funnel floor drain.

.4 Install equipment, rectangular cleanouts and similar items parallel to or perpendicular to building lines

1.4 PROTECTION OF OPENINGS

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

1.5 ELECTRICAL

.1 Electrical work to conform to Division 26 including the following:

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

.2 Control wiring and conduit is specified in Division 26 except for conduit, wiring and connections below 50V. Refer to Division 26 for quality of materials and workmanship.

1.6 MOTORS

.1 Provide motors for mechanical equipment as specified.

.2 If delivery of specified motor will delay delivery or installation of any equipment, install motor approved by Engineer for temporary use. Final acceptance of equipment will not occur until specified motor is installed.

.3 Motors under 373 W: speed as indicated, continuous duty, built-in overload protection, resilient mount, single phase, 120 V, unless otherwise specified or indicated.

.4 Motors 373 W and larger: EEMAC Class B, squirrel cage induction, speed as indicated, continuous duty, drip proof, ball bearing, maximum temperature rise 40 C, 1 phase, 240 V, unless otherwise specified or indicated.

1.7 GUARDS

.1 Provide guards for unprotected drives.

.2 Guards for belt drives:

.1 Expanded metal screen welded to steel frame.

.2 Minimum 1.2 mm thick sheet metal tops and bottoms.

.3 38 mm diameter holes on both shaft centres for insertion of tachometer.

.4 Removable for servicing.

.3 Provide means to permit lubrication and use of test instruments with guards in place.

.4 Install belt guards to allow movement of motors for adjusting belt tension.

.5 Guard for flexible coupling:

.1 "U" shaped, minimum 1.6 mm thick galvanized mild steel.

.2 Securely fasten in place.

.3 Removable for servicing.

.6 Unprotected fan inlets or outlets:

.1 Wire or expanded metal screen, galvanized, 19 mm mesh.

.2 Net free area of guard: not less than 80% of fan openings.

.3 Securely fasten in place.

.4 Removable for servicing.

1.8 SLEEVES

.1 Pipe sleeves: at points where pipes pass through masonry, concrete or fire rated assemblies and as indicated.

.2 Schedule 40 steel pipe.

.3 Sleeves with annular fin continuously welded at midpoint:

.1 Through foundation walls.

.2 Where sleeve extends above finished floor.

.4 Sizes: minimum 6 mm clearance all around, between sleeve and uninsulated pipe or between sleeve and insulation

.5 Terminate sleeves flush with surface of concrete and masonry walls, concrete floors on grade and 25 mm above other floors.

.6 Fill voids around pipes:

.1 Caulk between sleeve and pipe in foundation walls and below grade floors with waterproof fire retardant non-hardening mastic.

.2 Where sleeves pass through walls or floors, provide space for firestopping.

.3 Where pipes/ducts pass through fire rated walls, floors and partitions, maintain fire rating integrity.

.4 Ensure no contact between copper tube or pipe and ferrous sleeve.

.5 Fill future-use sleeves with lime plaster or other easily removable filter.

.6 Coat exposed exterior surfaces of ferrous sleeves with heavy application of zinc rich paint to CGSB.

1.9 TESTS

.1 Give 24 hour written notice of date for tests.

.2 Insulate or conceal work only after testing and approval by Engineer.

.3 Conduct tests in presence of Engineer.

.4 Bear costs including retesting and making good.

.5 Piping:

.1 General: maintain test pressure without loss for 4 hours unless otherwise specified.

.2 Test drainage, waste and vent piping to National Building Code and authorities having jurisdiction.

.3 Test domestic hot, cold water piping at 1-1/2 times system operating pressure or minimum 860 kPa, whichever is greater.

.6 Prior to tests, isolate all equipment or other parts which are not designed to withstand test pressures or test medium.

1.10 DEMONSTRATION AND OPERATING INSTRUCTIONS

.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.

.2 Where specified elsewhere in mechanical specification, manufactures to provide demonstrations and instructions.

.3 Use operation and maintenance manual, as-built drawings, audio visual aids, etc. as part of instruction materials.

.4 Where deemed necessary, Owner may record these demonstrations on video tape for future reference.

1.11 OPERATION AND MAINTENANCE MANUAL

.1 Provide operation and maintenance date for incorporation into manual specified in Section 01730 - Operation and Maintenance Manual.

.2 Operation and maintenance manual to be approved by, and final copies deposited with, Engineer before final inspection.

.3 Operation data to include:

.1 Control schematics for each system including environmental controls.

.2 Description of operation of each system at various loads together with reset schedules and seasonal variances.

.3 Description of operation of each system at various loads together with reset schedules and seasonal variances.

.4 Operation instruction for each system and each component.

.5 Description of actions to be taken in event of equipment failure.

.6 Valves schedule and flow diagram.

.7 Color coding chart.

.4 Maintenance data shall include:

.1 Servicing maintenance, operation and trouble-shooting instructions for each item of equipment.

.2 Data to include schedules of tasks, frequency, tools required and task time.

.5 Performance data to include:

.1 Equipment manufacturer's performance data sheets with point of operation as left after commissioning is complete.

.2 Equipment performance verification test results.

.3 Special performance data as specified elsewhere.

.6 Approvals:

.1 Submit 2 copies of draft Operation and Maintenance Manual to Engineer for approval. Submission of individual data will not be accepted unless so directed by Engineer.

.7 Additional data:

.1 Prepare and insert into operation and maintenance manual when need for same becomes apparent during demonstrations and instructions specified above.

1.12 DELIVERY, STORAGE, AND HANDLING

.1 Waste Management and Disposal

.2 Construction/Demolition Waste Management and Disposal: separate waste materials for recycling.

.3 Replace any damaged or worn equipment / products with new prior to turnover to the Owner.

PART 2 - PRODUCTS

.1 NOT USED

PART 3 - EXECUTION

3.1 PAINTING REPAIRS AND RESTORATION

.1 Prime and touch up marred finished paintwork to match original.

.2 Restore to new condition, finishes which have been damaged.

3.2 CLEANING

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

3.3 FIELD QUALITY CONTROL

.1 Site Tests: conduct following tests directed by the consultant or manufacturer as referred to or described in related sections of this specification.

3.4 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.

.2 Use operation and maintenance manual, as-built drawings, and audio visual aids as part of instruction materials.

.3 Instruction duration time requirements as specified in appropriate sections.

3.5 PROTECTION

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

END OF SECTION

PART 1 - GENERAL

1.1 SUBMITTALS

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

.2 Shop drawings; submit drawings for review by professional engineer registered or licensed in Provinces or Territories of, Canada.

.3 Shop drawings to show:

.1 Mounting arrangements.

.2 Operating and maintenance clearances.

.4 Shop drawings and product data accompanied by:

.1 Detailed drawings of bases, supports, and anchor bolts.

.2 Acoustical sound power data, where applicable.

.3 Points of operation on performance curves.

.4 Manufacturer to certify current model production.

.5 Certification of compliance to applicable codes.

.5 In addition to the transmittal letter referred to in Section 01 33 00 - Submittal Procedures: use MCAC "Shop Drawing Submittal Title Sheet". Identify section and paragraph number.

.6 Closeout Submittals:

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

.2 Operation and maintenance manual approved by, and final copies deposited with, Consultant before final inspection.

.3 Operation data to include:

.1 Control schematics for systems including environmental controls.

.2 Description of systems and their controls.

.3 Description of operation of systems at various loads together with reset schedules and seasonal variances.

.4 Operation instruction for systems and component.

.5 Description of actions to be taken in event of equipment failure.

.6 Valves schedule and flow diagram.

.7 Colour coding chart.

.4 Maintenance data to include:

.1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.

.2 Data to include schedules of tasks, frequency, tools required and task time.

.5 Performance data to include:

.1 Equipment manufacturer's performance datasheets with point of operation as left after commissioning is complete.

.2 Equipment performance verification test results.

.3 Special performance data as specified.

.4 Testing, adjusting and balancing reports as specified in Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.

.6 Approvals:

.1 Submit 2 copies of draft Operation and Maintenance Manual to Consultant for approval. Submission of individual data will not be accepted unless directed by Consultant.

.2 Make changes as required and re-submit as directed by Consultant.

.7 Additional data:

.1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.

.8 Site records:

.1 Consultant will provide 1 set of reproducible mechanical drawings. Provide sets of white prints as required for each phase of work. Mark changes as work progresses and as changes occur. Include changes to existing mechanical systems, control systems and low voltage control wiring.

.2 Transfer information weekly to reproducibles, revising reproducibles to show work as actually installed.

.3 Use different colour waterproof ink for each service.

.4 Make available for reference purposes and inspection.

.9 As-built drawings:

.1 Prior to start of Testing, Adjusting and Balancing for HVAC, finalize production of as-built drawings.

.2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: - "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (Date).

.3 Submit to Consultant for approval and make corrections as directed.

.4 Perform testing, adjusting and balancing for HVAC using as-built drawings.

.5 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.

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

1.2 QUALITY ASSURANCE

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

.2 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.3 MAINTENANCE

.1 Furnish spare parts in accordance with Section 01 78 00 - Closeout Submittals as follows:

.1 One set of packing for each pump.

.2 One casing joint gasket for each size pump.

.3 One glass for each gauge glass.

.2 Provide one set of special tools required to service equipment as recommended by manufacturers and in accordance with Section 01 78 00 - Closeout Submittals.

.3 Furnish one commercial quality grease gun, grease and adapters to suit different types of grease and grease fittings.

1.4 DELIVERY, STORAGE, AND HANDLING

.1 Waste Management and Disposal:

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

.2 Replace any damaged or worn equipment / products with new prior to turnover to the Owner.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used

PART 3 - EXECUTION

3.1 PAINTING REPAIRS AND RESTORATION

.1 Prime and touch up marred finished paintwork to match original.

.2 Restore to new condition, finishes which have been damaged.

3.2 CLEANING

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

3.3 FIELD QUALITY CONTROL

.1 Site Tests: conduct following tests in accordance with Section 01 45 00 - Quality Control and submit report as described in PART 1 - SUBMITTALS.

.2 Manufacturer's Field Services:

.1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.

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

3.4 DEMONSTRATION

.1 Consultant will use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.

.2 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 Use operation and maintenance manual, as-built drawings, and audio visual aids as part of instruction materials.

.4 Instruction duration time requirements as specified in appropriate sections.

.5 Consultant will record these demonstrations on video tape for future reference.

3.5 PROTECTION

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

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

.1 This Section specifies the water distribution piping system, including potable cold, hot and re-circulated hot water piping including associated fittings, and specialties within the building.

1.2 RELATED SECTIONS

.1 Drawings and general provisions of the Contract, including General and Supplementary Conditions, Section 22 05 00 - Common Work Results-Plumbing applies to work of this section.

1.3 REFERENCE DOCUMENTS

.1 Latest editions of listed standards to govern.

.2 CSA B137 Series-13 - Thermoplastic pressure piping compendium

.3 NSF/ANSI 14 - Plastic Piping System Components and Related Materials

.4 NSF/ANSI 61 - Drinking Water Systems Components - Health Effects

1.4 DEFINITIONS

.1 Definitions shall be in accordance with local plumbing codes and ASTM F 2389.

1.5 SUBMITTALS

.1 Material list naming each product to be used identified by manufacturer and product number.

1.6 QUALITY ASSURANCE

.1 Material shall be certified by NSF International as complying with NSF 14, NSF 61, and ASTM F 2389 or CSA B137 Series-13

.2 Material shall comply with manufacturers specifications.

.3 Special Engineered products shall be certified by NSF International as complying with NSF 14.

.4 Health and Safety: Do construction occupational health and safety in accordance with Division 01 – General Requirements

.5 Verification: Contractor’s verification in accordance with Division 01 – General Requirements.

1.7 DELIVERY STORAGE AND HANDLING

.1 Deliver store and handle products in accordance with manufacturer’s recommendations.

.2 Replace any damaged or worn equipment / products with new prior to turnover to the Owner.

PART 2 - PRODUCTS

2.1 PIPING AND PIPING PRODUCTS

.1 Buried: IPEX composite water service tubing Q-Line to AWWA C903; ASTM F1282; CSA B137.9 and MSF-PW

.2 Pipe shall be manufactured from: Polyvinyl Chloride to CSA B137.6, NSF-61, CAN/ULC-S102.2, and ASTM F442

.3 Pipe shall be IPEX AquaRise CPVC, or approved alternate.

.4 Water or Fire Suppression Entrance:

.1 Ductile iron pipe: Class 54 to A WWA Cl51/A21.51, cement-mortar-lined to AWWA C04/A21.4 with no internal asphalt coating .

.2 Cast iron fittings: Class 250 to A WW A CIIO/A21.10. Mechanical joints: cement-mortar-lined to A WWA Cl04/A21.4 with no internal asphalt coating .

.3 Retaining gland: Megalug. Gaskets and sizing to manufacturer's standard.

2.2 FITTINGS

.1 Fittings shall be manufactured from Polyvinyl Chloride to CSA B137 Series-13, NSF-61, CAN/ULC-S102.2, and ASTM F442

.2 Fittings shall be IPEX AquaRise CPVC or approved alternate.

2.3 WARRANTY

.1 Manufacturer shall warrant pipe and fittings for 10 years to be free of defects in materials or workmanship.

.2 Warranty shall cover labor and material costs of repairing and/or replacing defective materials and repairing any incidental damage caused by failure of the piping system do to defects in materials or workmanship.

2.4 VALVES

.1 Valves shall be manufactured in accordance with the manufacturers specifications and shall comply with the performance requirements of ASTM F 2389, ASTM F442, CSA B137 Series-13. The valves shall contain no rework or recycled materials except that

generated in the manufacturer's own plant of the same specification.

.2 Valves shall be IPEX AquaRise CPVC, or approved alternate.

2.5 SMOKE AND FIRE RATINGS

.1 Where indicated on the drawings that a Plenum-rated Piping System is needed, then the pipe shall have a Flame Spread Classification of less than 25 and Smoke Development rating of less than 50.

.2 Pipe shall be Ipex AquaRise CPVC, or approved alternate

2.6 UV PROTECTION

.1 Where indicated on the drawings that the pipe will be exposed to direct UV light for more than 30 days, it shall be provided with a Factory applied, UV-resistant coating or alternative UV protection.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

.1 Install listed pipe materials and joining methods below in the following applications:

.1 Aboveground Polyvinylchloride (PVC) piping in SDR 6, 7.4 or 11 based on the required minimum pressure rating and use temperature.

3.2 VALVE APPLICATIONS

.1 Install gate valves close to main on each branch and riser serving 2 or more plumbing fixtures or equipment connections and where indicated.

.2 Install gate or ball valves on inlet to each plumbing equipment item, on each supply to each plumbing fixture not having stops on supplies, and elsewhere as indicated.

.3 Install drain valve at base of each riser, at low points of horizontal runs, and where required to drain water distribution piping system.

.4 Install swing check valve on discharge side of each pump and elsewhere as indicated.

.5 Install ball valves in each hot-water circulating loop and discharge side of each pump.

3.3 PIPING INSTALLATIONS

.1 Install hangers and supports at intervals specified in the applicable Plumbing Code and as recommended by pipe manufacturer.

.2 Support vertical piping at each floor and as specified in the applicable Plumbing Code.

.3 Fire stopping shall be provided to both be compatible with the Piping and meet the requirements of ASTM E 814 or ULC S115 , "Fire Tests of Through-Penetration Firestops". Pipe insulations or fire resistive coating shall be removed where the pipe passes through a fire stop and, if required by the firestop manufacturer, for 3 inches beyond the firestop outside of the fire barrier.

.4 When installed in systems with pumps in excess of 7.5 HP, piping shall be protected from excessive heat generated by operating the pump at shut-off conditions. Where the possibility exists that the pump will operate with no flow, the protection method shall be a temperature relief valve or comparable level of protection, set to a maximum temperature of 185°F.

.5 If heat tracing is specified for the piping, it should be installed on the pipe interior or exterior, and it must be suitable for use with plastic piping and self-regulating to ensure the surface temperature of the pipe and fittings will not exceed 70°C (158°F).

3.4 INSPECTING AND CLEANING

.1 The pipes should be flushed with cold water after finishing the installation. Inspect and test piping systems following procedures of authorities having jurisdiction and as specified by the piping system manufacturer.

.2 Clean and disinfect water distribution piping following procedures of the authority having jurisdiction.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 22 42 03 - Commercial Washroom Fixtures

1.2 REFERENCES

.1 Latest editions of listed standards to govern.

.2 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.

.4 ANSI/ASME B16.24-01, Cast Copper Alloy Pipe Flanges and Flanged Fittings, Class 150, 300, 400, 600, 900, 1500 and 2500.

.3 ASTM International Inc.

.1 ASTM A 307-07b, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.

.2 ASTM A 536-84(2004)e1, Standard Specification for Ductile Iron Castings.

.3 ASTM B 88M-05, Standard Specification for Seamless Copper Water Tube (Metric).

.4 American National Standards Institute/American Water Works Association (ANSI)/(AWWA)

.1 ANSI/AWWA C111/A21.11-07, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

.5 Canadian Standards Association (CSA International)

.1 CSA B242-05, Groove and Shoulder Type Mechanical Pipe Couplings.

.6 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

.7 Manufacturer's Standardization Society of the Valve and Fittings Industry (MSS).

.1 MSS-SP-67-02a, Butterfly Valves.

.2 MSS-SP-70-06, Gray Iron Gate Valves, Flanged and Threaded Ends.

.3 MSS-SP-71-05, Gray Iron Swing Check Valves, Flanged and Threaded Ends.

.4 MSS-SP-80-03, Bronze Gate, Globe, Angle and Check Valves.

.8 National Research Council (NRC)/Institute for Research in Construction

.1 NRCC 38728, National Plumbing Code of Canada (NPC) - 1995.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Provide manufacturer's printed product literature and datasheets for insulation and adhesives, and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Closeout Submittals:

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

1.4 QUALITY ASSURANCE

.1 Health and Safety: Do construction occupational health and safety in accordance with Division 01 – General Requirements

.2 Verification: Contractor’s verification in accordance with Division 01 – General Requirements.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Packaging Waste Management: remove for reuse in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.2 Place materials defined as hazardous or toxic is designated containers.

.3 Handle and dispose of hazardous materials in accordance with Regional and Municipal regulations.

.4 Replace any damaged or worn equipment / products with new prior to turnover to the Owner.

PART 2 - PRODUCTS

2.1 SUSTAINABLE REQUIREMENTS

.1 Materials and products in accordance with Section 01 47 15 - Sustainable Requirements: Construction.

2.2 PIPING

.1 Domestic hot, cold and recirculation systems, within building.

.1 Above ground: copper tube, hard drawn, type L: to ASTM B 88M.

.1 Acceptable Manufacturer: GL Copper, Mueller, Viega ProPress, or approved alternate.

.2 Water or Fire Suppression Entrance:

.1 Ductile iron pipe: Class 54 to A WWA Cl51/A21.51, cement-mortar-lined to AWWA C04/A21.4 with no internal asphalt coating .

.2 Cast iron fittings: Class 250 to A WW A CIIO/A21.10. Mechanical joints: cement-mortar-lined to A WWA Cl04/A21.4 with no internal asphalt coating .

.3 Retaining gland: Megalug. Gaskets and sizing to manufacturer's standard.

2.3 FITTINGS

.1 Bronze pipe flanges and flanged fittings, Class 150: to ANSI/ASME B16.24.

.2 Cast bronze threaded fittings, Class 125 : to ANSI/ASME B16.15.

.3 Cast copper, ANSI/ASME B16.18 or wrought copper, ANSI/ASME B16.22; with 301 stainless steel internal components, EPDM seal, and push-to-connect joints. Victaulic PermaLynx.

.4 Wrought copper and copper alloy, solder type: to ANSI/ASME B16.22.

.5 NPS 2 and larger: ANSI/ASME B16.18 or ANSI/ASME B16.22 roll grooved to CSA B242. Cast bronze to ANSI/ASME B16.18 or wrought copper ANSI/ASME B16.22. Victaulic Co. of Canada CTS fittings.

.1 Fittings shall be manufactured to copper-tube dimensions. (Flaring of tube or fitting ends to accommodate IPS sized couplings is not permitted.)

.6 NPS 1 ½ and smaller : wrought copper to ANSI/ASME B16.22; with 301 stainless steel internal components and EPDM seals. Suitable for operating pressure to 1380 kPa.

2.4 JOINTS

.1 Rubber gaskets, latex-free 1.6 mm thick: to AWWA C111.

.2 Bolts, nuts, hex head and washers: to ASTM A 307, heavy series.

.3 Solder: 95/5 tin copper alloy.

.4 Teflon tape: for threaded joints.

.5 Grooved couplings: designed with angle bolt pads to provide rigid joint, complete with EPDM gasket.

.1 Victaulic Style 606.

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

.1 Victaulic Style 47.

2.5 GATE VALVES

.1 NPS 2 1/2 and over, in mechanical rooms or penthouses, flanged:

.1 Rising stem: to MSS-SP-80, Class 125, 860 kPa, flat flange faces, cast-iron body, OS&Y bronze trim specified Section 23 05 23.02 - Valves - Cast Iron.

.2 Acceptable Manufacturer: Crane, Jenkins, Newman, Hattersley, Appollo, Nibco.

.2 NPS 2 1/2 and over, other than mechanical rooms or penthouses, flanged:

.1 Non-rising stem: to MSS-SP-70, Class 125, 860 kPa, flat flange faces, cast-iron body, bronze trim, bolted bonnet specified Section 23 05 23.02 - Valves - Cast Iron: Gate, Globe, Check.

.2 Acceptable Manufacturer: Crane, Jenkins, Newman, Hattersley, Appollo.

2.6 SWING CHECK VALVES

.1 NPS 2 and under, soldered:

.1 To MSS-SP-80, Class 125, 860 kPa, bronze body, bronze swing disc, screw in cap, regrindable seat as specified Section 23 05 23.01 - Valves - Bronze.

.2 Acceptable Manufacturer: Crane, Jenkins, Newman, Hattersley, Appollo, Nibco.

.2 NPS 2 and under, screwed:

.1 To MSS-SP-80, Class 125, 860 kPa, bronze body, bronze swing disc, screw in cap, regrindable seat as specified Section 23 05 23.01 - Valves - Bronze.

.2 Acceptable Manufacturer: Crane, Jenkins, Newman, Hattersley, Appollo, Nibco.

.3 NPS 2 1/2 and over, flanged:

.1 To MSS-SP-71, Class 125, 860 kPa, cast iron body, flat flange faces, regrind renewable seat, bronze disc, bolted cap specified Section 23 05 23.02 - Valves - Cast Iron: Gate, Globe, Check.

.2 Acceptable Manufacturer: Crane, Jenkins, Newman-Hattersley, Appollo, Nibco.

2.7 BALL VALVES

.1 NPS 2 and under, screwed:

.1 Class 150.

.2 Bronze body, chrome plated brass stainless steel ball, PTFE adjustable packing, brass gland and PTFE Bunan TFE Teflon seat, steel lever handle as specified Section 23 05 23.01 - Valves - Bronze.

.3 Acceptable Manufacturer: Crane, Jenkins, Newman-Hattersley, Appollo, Nibco.

.2 NPS 2 and under, soldered:

.1 To ANSI/ASME B16.18, Class 150.

.2 Bronze body, chrome plated brass ball, PTFE adjustable packing, brass gland and PTFE seat, steel lever handle, with NPT to copper adaptors as specified Section 23 05 23.01 - Valves - Bronze.

.3 Acceptable Manufacturer: Crane, Jenkins, Newman, Hattersley, Appollo.

2.8 BUTTERFLY VALVES

.1 NPS 2-1/2 and over, lug:

.1 To MSS-SP-67, Class 200.

.2 Cast iron body, ductile iron chrome plated disc, stainless steel stem, EPT liner.

.3 Lever operated.

.2 NPS 2-1/2 and over, grooved ends:

.1 Class 300 psi CWP, bubble tight shut-off, cast bronze body. EPDM encapsulated ductile iron disc. (ANSI/NSF-61 approved.) Copper-tube dimensioned grooved ends.

.2 Operator:

.3 NPS 4 and under: lever handle.

.4 NPS 6 and over: gear operated.

.3 Acceptable Material: Victaulic Series 608, Nibco.

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 with NPC, Province(s) Plumbing Code and local authority having jurisdiction.

.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 Install CWS piping below and away from DHW, HWS and HWR and other hot piping so as to maintain temperature of cold water as low as possible.

.5 Connect to fixtures and equipment in accordance with manufacturer's written instructions unless otherwise indicated.

.6 Buried tubing:

.1 Lay in well compacted washed sand in accordance with AWWA Class B bedding.

.2 Bend tubing without crimping or constriction. Minimize use of fittings.

.7 Grooved joint couplings and fittings shall be installed in accordance with the manufacturer’s written installation instructions. Grooved ends shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove.

.8 Gaskets shall be verified as suitable for the intended service prior to installation. Gaskets shall be moulded and produced by the coupling manufacturer. The grooved coupling manufacturer’s factory trained representative shall provide onsite training for Contractor’s field personnel in the use of grooving tools, application of groove, and installation of grooved joint products. The manufacturer’s representative shall periodically visit the jobsite and review installation. Contractor shall remove and replace any joints deemed improperly installed.

3.3 VALVES

.1 Isolate equipment, fixtures and branches with butterfly and/or ball valves.

.2 Balance recirculation system using lockshield globe valves. Mark settings and record on as-built drawings on completion.

3.4 PRESSURE TESTS

.1 Conform to requirements of Section 21 05 01 - Common Work Results for Mechanical.

.2 Test pressure: greater of 1 1/2 times maximum system operating pressure or 860 kPa.

3.5 FLUSHING AND CLEANING

.1 Flush entire system for 8 h. Ensure outlets flushed for 2 hours. Let stand for 24 hours, then draw one sample off longest run. Submit to testing laboratory to verify that system is clean to Federal potable water guidelines. Let system flush for additional 2 hours, then draw off another sample for testing.

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 DISINFECTION

.1 Flush out, disinfect and rinse system to requirements of Engineer.

.2 Upon completion, provide laboratory test reports on water quality to Engineer for approval.

3.8 START-UP

.1 Timing: start up after:

.1 Pressure tests have been completed.

.2 Disinfection procedures have been completed.

.3 Certificate of static completion has been issued.

.4 Water treatment systems operational.

.2 Provide continuous supervision during start-up.

.3 Start-up procedures:

.1 Establish circulation and ensure that air is eliminated.

.2 Check pressurization to ensure proper operation and to prevent water hammer, flashing and/or cavitation.

.3 Commission water conditioning specified Section 22 31 13 - Residential Domestic Water Softeners.

.4 Bring Hot Water storage tank up to design temperature slowly.

.5 Monitor piping HWS and HWR piping systems for freedom of movement, pipe expansion as designed.

.6 Check control, limit, safety devices for normal and safe operation.

.4 Rectify start-up deficiencies.

3.9 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 that flow rate and pressure meet Design Criteria.

.2 Test, Adjust and Balance DHWR in accordance with Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.

.3 Adjust pressure regulating valves while withdrawal is maximum and inlet pressure is minimum.

.4 Sterilize HWS and HWC systems for Legionella control.

.5 Verify performance of temperature controls.

.6 Verify compliance with safety and health requirements.

.7 Check for proper operation of water hammer arrestors. Run one outlet for 10 seconds, then shut off water immediately. If water hammer occurs, replace water hammer arrestor or re-charge air chambers. Repeat for outlets and flush valves.

.8 Confirm water quality consistent with supply standards, and ensure no residuals remain as result of flushing or cleaning.

.3 Reports:

.1 Include certificate of water flow and pressure tests conducted on incoming water service, demonstrating adequacy of flow and pressure.

3.10 OPERATION REQUIREMENTS

.1 Co-ordinate operation and maintenance requirements including, cleaning and maintenance of specified materials and products with Section 23 05 05 - Installation of Pipework.

.2 Operational requirements include:

.1 Cleaning materials and schedules.

.2 Repair and maintenance materials and instructions.

3.11 CLEANING

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

.2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 22 42 03 - Commercial Washroom Fixtures

.2 Section 22 42 16 - Commercial Lavatories and Sinks

1.2 REFERENCES

.1 Latest editions of listed standards to govern.

.2 ASTM International Inc.

.1 ASTM D 2235, Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.

.2 ASTM D 2564, Standard Specification for Solvent Cements for Poly(Vinyl-Chloride) (PVC) Plastic Piping Systems.

.3 Canadian Standards Association (CSA International)

.1 CAN/CSA-Series B1800, Thermoplastic Nonpressure Pipe Compendium - B1800 Series.

.4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Provide manufacturer's printed product literature and datasheets for piping and adhesives, and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Provide two copies of WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 35 30 - Health and Safety Requirements.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle in accordance with Section01 61 00 - Common Product Requirements.

.2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

.3 Store at temperatures and conditions recommended by manufacturer.

.4 Packaging Waste Management: remove for reuse and return by manufacturer: pallets, crates, and packaging materials

.5 Replace any damaged or worn equipment / products with new prior to turnover to the Owner.

PART 2 - PRODUCTS

2.1 MATERIAL

.1 Adhesives and Sealants: in accordance with Section 07 92 00 - Joint Sealants.

.2 Use least toxic sealants, adhesives, sealers and finishes necessary to comply with the requirements of the project.

2.2 PIPING AND FITTINGS

.1 For buried and above ground DWV piping to:

.1 CAN/CSA B181.1.

.2 CAN/CSA B181.2

.3 CAN/CSA B182.1

.2 Standard of Acceptance:

.1 IPEX System 15 or approved alternate, where concealed or below slab.

.2 IPEX System XFR or approved alternate, where not concealed or below slab.

2.3 JOINTS

.1 Solvent weld for PVC: to ASTM D 2564.

.2 Solvent weld for ABS: to ASTM D 2235

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 with National Plumbing Code Provincial Plumbing Code and local authority having jurisdiction.

.3 Install with expansion / compensation offsets

.4 Install buried pipe on 150 mm bed of washed clean sand, shaped to accommodate fittings, to line and grade as indicated. Backfill with washed clean sand.

.5 Install above ground piping parallel and close to walls and ceilings to conserve headroom and space, and to grade as indicated

.6 All DWV piping for this project shall be run concealed inside the walls, above ceilings, or inside bulkheads except for mechanical rooms and penthouses

3.3 TESTING

.1 Pressure test buried systems before backfilling.

.2 Hydraulically test to verify grades and freedom from obstructions. Monitor levels for a minimum of 24-hours.

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 cleanout rods can probe as far as the next cleanout, at least.

.2 Test to ensure traps are fully and permanently primed.

.3 Storm water drainage:

.1 Verify domes are secure.

.2 Ensure weirs are correctly sized and installed correctly.

.3 Verify provisions for movement of roof system.

.4 Ensure fixtures are properly anchored, connected to system and effectively vented.

.5 Affix applicable label (storm, sanitary, vent, pump discharge) c/w directional arrows every floor or 4.5 m (whichever is less).

3.5 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 and recycling in accordance with section 01 74 21 - Construction/Demolition Waste Management and Disposal.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 22 11 16 – Domestic Water Piping: Copper

.2 Section 22 13 18 – Drainage Waste and Vent Piping: Plastic

1.2 REFERENCES

.1 Latest editions of listed standards to govern.

.2 Canadian Standards Association (CSA International)

.1 CAN/CSA-B45 Series-02, Plumbing Fixtures.

.2 CAN/CSA-B125.3, Plumbing Fittings.

.3 CAN/CSA-B651, Accessible Design for the Built Environment.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Plumbing contractor shall refer to Plumbing Drawings and Plumbing Fixture Schedules for selected plumbing fixtures and trim.

.2 Provide manufacturer's printed product literature and datasheets for washroom fixtures, and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Indicate fixtures and trim:

.1 Dimensions, construction details, roughing-in dimensions.

.2 Factory-set water consumption per flush at recommended pressure.

.3 For water closets: minimum pressure required for flushing.

.4 Shop Drawings:

.1 Provide as required by submittal section

1.4 CLOSEOUT SUBMITTALS

.1 Provide operation and maintenance data for washroom fixtures, for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

.2 Include:

.1 Description of fixtures and trim, giving manufacturer's name, type, model, year, capacity.

.2 Details of operation, servicing, maintenance.

.3 List of recommended spare parts.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle in accordance with manufacturer's written instructions.

.2 Deliver materials to site in original factory packaging, labeled with manufacturer's name, address.

.3 Replace any damaged or worn equipment / products with new prior to turnover to the Owner.

PART 2 - PRODUCTS

2.1 PRODUCT CLARIFICATION

.1 The information provided in the following sections of this specification for equipment and plumbing fixtures are generic descriptions and may not necessarily reflect the actual type, model, or performance required for this project. The contractor is requested to refer to equipment and plumbing fixture schedules shown on drawings, for more detailed information pertaining to products required for installation on this project.

.2 Fixtures: manufacture in accordance with CAN/CSA-B45 series.

.3 Trim, fittings: manufacture in accordance with CAN/CSA-B125.3.

.4 Exposed plumbing brass to be chrome plated.

.5 Number, locations: Architectural drawings to govern.

2.2 WATER CLOSETS

.1 Type WC-1: floor-mounted, barrier free; top of seat at 430 mm to 485 mm (17" to 19"), open front black hinged seat, with cover.

.1 Bowl: vitreous china, floor mounted, elongated rim, dual flush 1.6 gpf (6 Lpf) or 1.0 gpf (4 Lpf), Pressure Assisted Two Piece Toilet with 12" Rough-in

.1 Acceptable Manufacturer: American Standard, Kohler, Zurn, Mansfield, or approved alternate.

2.3 WASHROOM LAVATORIES

.1 LAV-1: Wall-Hung, integral back, half pedestal type:

.1 Bowl: Vitreous china, recessed self-draining deck, with splash lip, supply openings on 203 mm (8") centres, rear overflow. Size: 540 x 559 mm (21-1/4" x 22").

.2 Acceptable Manufacturer: American Standard, Kohler, Zurn, Mansfield or approved alternate.

.3 Trim: wide spread with 8" centres, below deck mount, chrome plated brass, 11.94" high x 4.5" radius gooseneck spout, aerator, wrist blade handles, 1/4 turn ceramic disc valve cartridges, accessories to limit maximum flow rate to 8.35 litres/minute, less pop-up drain.

.4 Acceptable Manufacturer: Delta, Zurn, Chicago, T&S Brass, Moen Commercial, Kohler Commercial, American Standard, or approved alternate.

.5 Waste fitting: Brass tailpiece, off-set waste cast brass P-trap with cleanout, chrome plated.

.6 Acceptable Manufacturer: McGuire, OS&B, Zurn, Delta

.2 Type LAV-2: 18-gauge type 316 Stainless Steel, satin finish on exposed surfaces, radius coved bowl corners, 16 gauge side wall brackets, one piece wall hanger, supply openings on 150 mm (6") centres. Size: 419 x 432 mm (16-1/2" x 17").

1. Acceptable Manufacuter: Kindred, Elkay
2. Trim: wide spread with 8" centres, below deck mount, chrome plated brass, 11.94" high x 4.5" radius gooseneck spout, aerator, wrist blade handles, 1/4 turn ceramic disc valve cartridges, accessories to limit maximum flow rate to 8.35 litres/minute, less pop-up drain.
    1. Acceptable Manufacturer: Delta, Zurn, Chicago, T&S Brass, Moen Commercial, Kohler Commercial, American Standard, AMI (Addendum 1), or approved alternate.
3. Access Panel: 14-gauge steel door and trim with steel return frame, fully concealed piano type hinge, flush steel lockable cam latch operated by a key. Size 305 x 305mm (1k2" X 12") door, panel Set flush with wall with vandal proof screws, finish to match wall.
    .1 Acceptable Manufacturer: Zurn, Mifab, Williams Bros., Acorn, or approved alternate.
4. Waste fitting: Brass tailpiece, cast brass P-trap with cleanout, chrome plated.
    .1 Acceptable Manufacturer: McGuire, OS&B, Zurn, Delta

2.4 FIXTURE PIPING

.1 Hot and cold water supplies to fixtures:

.1 Chrome plated flexible supply pipes with screwdriver handwheel stop, reducers, escutcheon.

.2 Waste:

.1 Brass P trap with clean out on fixtures not having integral trap or unless otherwise specified.

.2 Chrome plated in exposed places.

2.5 FIXTURE SUPPLY FITTINGS

.1 1/4 turn ceramic disc loose key supply fittings, chrome plated. Supply fittings to be equipped with moderators designed to produce laminar flow to eliminate aeration of water.

2.6 CHAIR CARRIERS

.1 Factory manufactured floor-mounted carrier systems for all wall-mounted fixtures.

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 Mounting heights:

.1 Wall-hung fixtures: as indicated on architectural details as measured from finished floor.

.2 Barrier free: to most stringent NBCC or CAN/CSA B651.

.3 Caulk around water closets to floors / walls hung lavatories to walls with mildew resistant silicone sealant, white in color, and tooled to smooth bead.

.4 Connect fixtures complete with supplies and drains, trapped, supported level and square. Hot water faucets shall be on left. Fixtures on outside walls to have supplies from floor; other fixtures to be served from wall. Wall hung fixtures to be securely and firmly mounted.

3.3 ADJUSTING

.1 Conform to water conservation requirements specified this section.

.2 Adjustments:

.1 Adjust water flow rate to design flow rates.

.2 Adjust pressure to fixtures to ensure no splashing at maximum pressures.

.3 Adjust flush valves to suit actual site conditions.

.3 Checks:

.1 Water closets: flushing action.

.2 Aerators: operation, cleanliness.

.3 Vacuum breakers, backflow preventers: operation under all conditions.

.4 Thermostatic controls:

.1 Verify temperature settings, operation of control, limit and safety controls.

3.4 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 Section 22 11 13 – DOMESTIC WATER PIPING - POLY

.2 Section 22 11 16 -DOMESTIC WATER PIPING - COPPER

.3 Section 22 13 18 - DRAINAGE WASTE AND VENT PIPING - PLASTIC

1.2 REFERENCES

.1 Latest editions of listed standards to govern.

.2 Canadian Standards Association (CSA International)

.1 CAN/CSA-B45 Series-02(R2008), Plumbing Fixtures.

.2 CAN/CSA-B125.3-05, Plumbing Fittings.

.3 CAN/CSA-B651-04, Accessible Design for the Built Environment.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Provide manufacturer's printed product literature and datasheets for fixtures, and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Plumbing contractor shall refer to plumbing fixture schedules and drawings for verification of lavatories and sinks to be furnished and installed under this contract.

1.4 QUALITY ASSURANCE

.1 Health and Safety: Do construction occupational health and safety in accordance with Division 01 – General Requirements

.2 Verification: Contractor’s verification in accordance with Division 01 – General Requirements.

1.5 CLOSEOUT SUBMITTALS

.1 Provide maintenance data in accordance with Section 01 78 00 - Closeout Submittals

.2 Include:

.1 Description of fixtures and trim, giving manufacturer's name, type, model, year, capacity.

.2 Details of operation, servicing, maintenance.

.3 List of recommended spare parts.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle in accordance with Section01 61 00 - Common Product Requirements.

.2 Deliver materials to site in original factory packaging, labeled with manufacturer's name, address.

.3 Replace any damaged or worn equipment / products with new prior to turnover to the Owner.

PART 2 - PRODUCTS

2.1 PRODUCT CLARIFICATION

.1 The information provided in the following sections of this specification for equipment and plumbing fixtures are generic descriptions and may not necessarily reflect the actual type, model, or performance required for this project. The contractor is requested to refer to equipment and plumbing fixture schedules shown on drawings, for more detailed information pertaining to products required for installation on this project.

2.2 MANUFACTURED UNITS

.1 Fixtures: manufacture in accordance with CAN/CSA-B45 series.

.2 Trim, fittings: manufacture in accordance with CAN/CSA-B125.

.3 Exposed plumbing brass to be chrome plated.

.4 Number, locations: architectural drawings to govern.

2.3 MOP SINKS

.1 MS-1: molded stone, 203 mm high undrilled integral back. Size: 610 x 610 x 250 mm, Supply fitting; with built-in elevated vacuum breaker, indexed cross handles, adjustable top brace, 3/4" (19 mm) hose thread on spout with bucket hook inlets 8" (203 mm) on centre, chrome finish. Supplied complete with: 36" hose with 3/4" chrome couplings and stainless steel wall bracket; 24" long stainless steel mop hanger with three rubber spring loaded grips; 20-gauge type 304 stainless steel back splash panels.

.1 Acceptable Manufacturer: Stern Williams, FIAT, Acorn Engineering

.2 Hot and cold Supply Backflow Preventer: Stainless Steel Reduced Pressure Principle Assembly; Reinforced Nylon Housing; Stainless steel fasteners; silicone and buna nitrile elastomers; delrin, nylon internals; stainless steel springs; cast, stainless steel ball valves; forged brass nickel plated struts. Valve to be as follows:

.1 Sizes: 1/2"

.2 Maximum working water pressure 175 PSI

.3 Maximum working water temperature 180°F

.4 Hydrostatic test pressure 350 PSI

.5 End connections Threaded FNPT ANSI B1.20.1

.6 Acceptable manufacturer: Wilkins, Conbraco, Watts, or approved alternate

2.4 STAINLESS STEEL COUNTER-TOP SINKS

.1 LV-2: Wheelchair accessible, single compartment with faucet ledge. 18 Gauge, type 304 stainless steel, self-rimming, exposed surfaces to be satin finished undercoated, clamps. Compartment sizes: 410 x 460 x 152 mm (16" x 18" x 6"), 3 hole 1-1/2" (38 mm) diameter, 4" (102 mm) centres, 8" (203 mm) centreset.

.1 Acceptable Manufacturer: Kindred, Elkay, Novanni, or approved alternate.

.2 Trim: chrome plated brass, 10.4" high x 6" radius gooseneck spout, aerator, wrist blade handles, 1/4 turn ceramic disc valve cartridges, accessories to limit maximum flow rate to 8.35 litres/minute, less pop-up drain.

.1 Acceptable Manufacturer: Delta, American Standard, Chicago, Zurn, T&S Brass, Moen Commercial, Kohler Commercial, or approved alternate.

.3 Waste fitting: stainless steel basket strainer/stopper, tailpiece, cast brass P-trap with cleanout.

.1 Acceptable Manufacturer: McGuire, Delta, Zurn

2.5 FIXTURE PIPING

.1 Hot and cold water supplies to each fixture:

.1 Exposed: Chrome plated rigid with screwdriver stop, reducers, and escutcheon.

.2 Concealed: Flexible; with screwdriver stop, reducers, and escutcheon.

.2 Waste: Brass P trap with clean out on each fixture not having integral trap. Chrome plated in all exposed places.

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 Mounting heights:

.1 Wall-hung fixtures: as indicated by Architectural, measured from finished floor.

.2 Physically handicapped: to comply with most stringent of either NBCC or CAN/CSA-B651.

3.3 ADJUSTING

.1 Conform to water conservation requirements specified this section.

.2 Adjustments:

.1 Adjust water flow rate to design flow rates.

.2 Adjust pressure to fixtures to ensure no splashing at maximum pressures.

.3 Checks:

.1 Aerators: operation, cleanliness.

.2 Vacuum breakers, backflow preventers: operation under all conditions.

.3 Wash fountains: operation of flow-actuating devices.

.4 Thermostatic controls:

.1 Verify temperature settings, operation of control, limit and safety controls.

3.4 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 SUMMARY

.1 Division 01 – General Requirements.

.2 Division 20 – Common Work Results for Mechanical.

.3 Related Sections:

.1 Section 01 91 01 – General Commissioning Requirements.

.2 Section 01 91 41 – Commissioning Training.

.3 Section 23 05 02 – Mechanical Systems Commissioning.

.4 Section 25 01 11 – EMCS: Startup, Verification and Commissioning

.5 Section 25 01 12 – EMCS: Training

.6 Section 26 10 01 – Electrical Systems Commissioning.

.7 Section 26 10 02 – Electrical Testing Requirements.

1.2 SCOPE

.1 Provide labour tools and supervision to conduct functional testing as described/specified herein and in Section 01 91 01 for the following equipment and systems:

.1 Hot water heating system including boilers, pumps and piping.

.2 Control system.

.3 Ventilation system including air handling units, exhaust fans, ducting terminal units and exhaust fans.

.4 Test and balance (TAB) work.

.5 Potable and non-potable DHW System.

.6 HVAC Zones Functional Test.

1.3 FUNCTIONAL TESTING

.1 This section specifies the functional testing requirements for Division 23 systems and equipment. The functional testing process, requirements and test method definitions are described in Section 01 91 01 and the Commissioning Plan.

.2 Prerequisites for functional testing are as follows:

.1 All related equipment has been started up and start-up reports and pre functional checklists submitted and approved ready for functional testing.

.2 All control system functions for this and all interlocking systems are programmed and operable per contract documents, including final setpoints and schedules with debugging, loop tuning and sensor calibrations completed.

.3 Piping system flushing complete and required report approved.

.4 Test and balance (TAB) complete and approved for the hydronic system.

.5 All A/E punch list items for this equipment corrected.

.6 These functional test procedures reviewed and approved by installing contractor.

.7 Safeties and operating ranges reviewed by the CA.

.8 Test requirements and sequences of operation attached.

.9 Schedules and setpoints attached.

.10 False loading equipment, system and procedures ready.

.11 Crankcase heaters have been on long enough for immediate startup.

.12 Sufficient clearance around equipment for servicing.

.13 Record of all values for pre-test setpoints changed to accommodate testing has been made and a check box provided to verify return to original values (control parameters, limits, delays, lockouts, schedules, etc.)

.14 Other miscellaneous checks of the pre-functional checklist and start-up reports completed successfully.

.3 Monitoring is a method of testing as a stand-alone method or to augment manual testing. All points listed in the required monitoring section of the test requirements which are control system monitored points shall be trended by the controls contractor. At the CA's request, the controls contractor shall trend up to 20% more points than listed herein at no extra charge. Hard copies of monitored data must be in columnar format with time down the left column and at least 5 columns of point values on the same page. Graphical output is desirable, and will be required for all output, if the system can produce it.

.4 Functional Testing protocols for each component/system involved are provided in the Commissioning Plan.

1.4 TESTING EQUIPMENT

.1 All test equipment necessary to fulfill the testing requirements of this section and/or as required in Division 23 specifications including the commissioning plan shall be provided as part of the work of this section.

PART 2 - PRODUCTS

2.1 NOT USED

PART 3 - EXECUTION

3.1 NOT USED

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 NOT USED

1.2 REFERENCES

.1 Latest editions of listed standards to govern.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-1.181, Ready-Mixed Organic Zinc-Rich Coating.

.3 Canadian Standards Association (CSA International)

.1 CSA B139, Installation Code for Oil Burning Equipment.

.4 Green Seal Environmental Standards (GSES)

.1 Standard GS-11, 2nd Edition, Environmental Standard for Paints and Coatings.

.5 National Fire Code of Canada

.6 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards

.1 SCAQMD Rule 1113, Architectural Coatings.

.2 SCAQMD Rule 1168, Adhesive and Sealant Applications.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Provide manufacturer's printed product literature, specifications and 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 manufacturer's written instructions.

.2 Replace any damaged or worn equipment / products with new prior to turnover to the Owner.

.3 Delivery and Acceptance Requirements:

.1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

PART 2 - PRODUCTS

2.1 MATERIAL

.1 Paint: zinc-rich to CAN/CGSB-1.181.

.1 Paints: in accordance with manufacturer's recommendations for surface conditions.

.2 Sealants: in accordance with Section 07 92 00 - Joint Sealants.

.3 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 manufacturer and National Fire Code of Canada.

.2 Provide space for disassembly, removal of equipment and components as CSA without interrupting operation of other systems, equipment, or components.

3.4 DRAINS

.1 Install piping with grade in direction of flow except as indicated.

.2 Install drain valve at low points in piping systems, at equipment and at section isolating valves.

.3 Pipe each drain valve discharge separately to above floor drain.

.1 Discharge to be visible.

.4 Drain valves: NPS 3/4 gate or globe valves unless indicated otherwise, with hose end male thread, cap and chain.

3.5 AIR VENTS

.1 Install manual air vents to CSA B139 at high points in piping systems.

.2 Install isolating valve at each automatic air valve.

.3 Install drain piping to approved location and terminate where discharge is visible.

3.6 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.

3.7 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 Saddle type branch fittings may be used on mains if branch line is no larger than half size of main.

.1 Hole saw (or drill) and ream main to maintain full inside diameter of branch line prior to welding saddle.

.7 Install exposed piping, equipment, rectangular cleanouts and similar items parallel or perpendicular to building lines.

.8 Install concealed pipework to minimize furring space, maximize headroom, conserve space.

.9 Slope piping, except where indicated, in direction of flow for positive drainage and venting.

.10 Install, except where indicated, to permit separate thermal insulation of each pipe.

.11 Group piping wherever possible and as indicated.

.12 Ream pipes, remove scale and other foreign material before assembly.

.13 Use eccentric reducers at pipe size changes to ensure positive drainage and venting.

.14 Provide for thermal expansion as indicated.

.15 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 or butterfly valves at branch take-offs for isolating purposes except where specified.

.7 Install butterfly valves on chilled water and related condenser water systems only.

.8 Install butterfly valves between weld neck flanges to ensure full compression of liner.

.9 Install plug cocks or ball valves for glycol service.

.10 Use chain operators on valves NPS 2 1/2 and larger where installed more than 2400 mm above floor in Mechanical Rooms.

.16 Check Valves:

.1 Install silent check valves on discharge of pumps and in vertical pipes with downward flow and as indicated.

.2 Install swing check valves in horizontal lines on discharge of pumps and as indicated.

3.8 SLEEVES

.1 General: install where pipes pass through masonry, concrete structures, fire rated assemblies, and as indicated.

.2 Material: schedule 40 black steel pipe.

.3 Construction: use annular fins continuously welded at mid-point at foundation walls and where sleeves extend above finished floors.

.4 Sizes: 6 mm minimum clearance between sleeve and uninsulated pipe or between sleeve and insulation.

.5 Installation:

.1 Concrete, masonry walls, concrete floors on grade: terminate flush with finished surface.

.2 Other floors: terminate 25 mm above finished floor.

.3 Before installation, paint exposed exterior surfaces with heavy application of zinc-rich paint to CAN/CGSB-1.181.

.6 Sealing:

.1 Foundation walls and below grade floors: fire retardant, waterproof non-hardening mastic.

.2 Elsewhere:

.1 Provide space for firestopping.

.2 Maintain fire rating integrity.

.3 Sleeves installed for future use: fill with lime plaster or other easily removable filler.

.4 Ensure no contact between copper pipe or tube and sleeve.

3.9 ESCUTCHEONS

.1 Install on pipes passing through walls, partitions, floors, and ceilings in finished areas.

.2 Construction: one piece type with set screws.

.1 Chrome or nickel plated brass or type 302 stainless steel.

.3 Sizes: outside diameter to cover opening or sleeve.

.1 Inside diameter to fit around pipe or outside of insulation if so provided.

3.10 PREPARATION FOR FIRE STOPPING

.1 Install firestopping within annular space between pipes, ducts, insulation and adjacent fire separation in accordance with Section 07 84 00 - Fire Stopping.

.2 Uninsulated unheated pipes not subject to movement: no special preparation.

.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 Insulated pipes and ducts: ensure integrity of insulation and vapour barriers.

3.11 FLUSHING OUT OF PIPING SYSTEMS

.1 Flush system in accordance with Section 23 08 02 - Cleaning and Start-up of Mechanical Piping Systems.

.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, including replacement of filters in piping systems.

3.12 PRESSURE TESTING OF EQUIPMENT AND PIPEWORK

.1 Advise Construction Manager 48 hours minimum prior to performance of pressure tests.

.2 Pipework: test as specified in relevant sections of heating, ventilating and air conditioning 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 Engineer or his/her designate.

.6 Pay costs for repairs or replacement, retesting, and making good. Engineer to determine whether repair or replacement is appropriate.

.7 Insulate or conceal work only after approval and certification of tests by Engineer.

3.13 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 Section 23 05 05 – Installation of Pipework

1.2 REFERENCES

.1 Latest editions of listed standards to govern.

.2 American National Standards Institute (ANSI)/American Society of Mechanical Engineers (ASME)

.1 ANSI/ASME B1.20.1-1983, Pipe Threads, General Purpose (Inch).

.2 ANSI/ASME B16.18, Cast Copper Alloy Solder Joint Pressure Fittings.

.3 ASTM International

.1 ASTM A 276, Standard Specification for Stainless Steel Bars and Shapes.

.2 ASTM B 62, Standard Specification for Composition Bronze or Ounce Metal Castings.

.3 ASTM B 283, Standard Specification for Copper and Copper Alloy Die Forgings (Hot-Pressed).

.4 ASTM B 505/B 505M, Standard Specification for Copper-Base Alloy Continuous Castings.

.4 Manufacturers Standardization Society of the Valve and Fittings Industry, Inc. (MSS)

.1 MSS-SP-25, Standard Marking System for Valves, Fittings, Flanges and Unions.

.2 MSS-SP-80, Bronze Gate Globe, Angle and Check Valves.

.3 MSS-SP-110, Ball Valves, Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Provide manufacturer's printed product literature and data sheets for equipment and systems and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 02 81 01 - Hazardous Materials.

.3 Shop Drawings:

.1 Submit drawings for review by a professional engineer registered or licensed in the Province of New Brunswick, Canada.

.2 Submit data for valves specified in this Section.

1.4 CLOSEOUT SUBMITTALS

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

1.5 MAINTENANCE MATERIAL SUBMITTALS

.1 Extra Materials/Spare Parts:

.1 Furnish following spare parts:

.1 Valve seats: one for every 10 valves each size, minimum 1.

.2 Discs: one for every 10 valves, each size. Minimum 1.

.3 Stem packing: one for every 10 valves, each size. Minimum 1.

.4 Valve handles: 2 of each size.

.5 Gaskets for flanges: one for every 10 flanged joints.

.2 Tools:

.1 Furnish special tools for maintenance of systems and equipment.

.2 Include following:

.1 Lubricant gun for expansion joints.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements:

.1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

.3 Replace any damaged or worn equipment / products with new prior to turnover to the Owner.

PART 2 - PRODUCTS

2.1 PRODUCT CLARIFICATION

.1 The product information provided in the following sections of this specification in some cases may be generic descriptions and as such do not necessarily reflect the actual make, model, type, and performance characteristics required for this project. The contractor shall refer to equipment schedules and notes on drawings for more detailed information pertaining to equipment performance and capacities specifically required for equipment to be furnished and installed on this project.

2.2 MATERIALS

.1 Valves:

.1 Except for specialty valves, to be single manufacturer.

.2 Products to have CRN registration numbers.

.2 End Connections:

.1 Connection into adjacent piping/tubing:

.1 Steel pipe systems: screwed ends to ANSI/ASME B1.20.1.

.2 Copper tube systems: solder ends to ANSI/ASME B16.18.

.1 Grooved ends to copper tube dimensions and CSA B242

.3 Lockshield Keys:

.1 Where lockshield valves are specified, provide 10 keys of each size: malleable iron cadmium plated.

.4 Gate Valves:

.1 Requirements common to gate valves, unless specified otherwise:

.1 Standard specification: MSS SP-80.

.2 Bonnet: union with hexagonal shoulders.

.3 Connections: screwed with hexagonal shoulders.

.4 Inspection and pressure testing: to MSS SP-80. Tests to be hydrostatic.

.5 Packing: non-asbestos.

.6 Handwheel: non-ferrous.

.7 Handwheel Nut: bronze to ASTM B 62.

.2 NPS 2 and under, non-rising stem, solid wedge disc, Class 125

.1 Body: with long disc guides, screwed bonnet with stem retaining nut.

.2 Operator: Handwheel.

.3 NPS 2 and under, non-rising stem, solid wedge disc, Class 150:

.1 Body: with long disc guides, screwed bonnet with stem retaining nut.

.2 Operator: handwheel.

.4 NPS 2 and under, rising stem, split wedge disc, Class 125:

.1 Body: with long disc guides, screwed bonnet.

.2 Disc: split wedge, bronze to ASTM B 283, loosely secured to stem.

.3 Operator: handwheel.

.5 NPS 2 and under, rising stem, solid wedge disc, Class 125:

.1 Body: with long disc guides, screwed bonnet.

.2 Operator: handwheel.

.3 Aceptable manufacturers: Crane 428, Jenkis 813J, Kitz 24, Milwaukee 148, Red/White 208, Nibco Valves.

.6 NPS 2 and under, rising stem, solid wedge disc, Class 150:

.1 Body: with long disc guides, screwed union bonnet.

.2 Operator: handwheel.

.3 Aceptable manufacturers: Crane 1334, Jenkis 991AJ, Kitz 44, Milwaukee 208C, Red/White 149, Nibco Valves.

.5 Globe Valves:

.1 Requirements common to globe valves, unless specified otherwise:

.1 Standard specification: MSS SP-80.

.2 Bonnet: union with hexagonal shoulders.

.3 Connections: screwed with hexagonal shoulders.

.4 Pressure testing: to MSS SP-80. Tests to be hydrostatic.

.5 Stuffing box: threaded to bonnet with gland follower, packing nut, high grade non-asbestos packing.

.6 Handwheel: non-ferrous.

.7 Handwheel Nut: bronze to ASTM B 62.

.2 NPS 2 and under, composition disc, Class 125:

.1 Body and bonnet: screwed bonnet.

.2 Disc and seat: renewable rotating PTFE disccomposition to suit service conditions, regrindable bronze seat, loosely secured to bronze stem to ASTM B 505.

.3 Operator: handwheel.

.4 Aceptable manufacturers: Dahl Brothers 11042/11041,Kitz 106/107, Red/White 250/253, Nibco Valves.

.3 NPS 2 and under, composition disc, Class 150:

.1 Body and bonnet: union bonnet.

.2 Disc and seat: renewable rotating PTFE disc in easily removable disc holder, regrindable bronze seat, loosely secured to bronze stem to ASTM B 505.

.3 Operator: handwheel.

.4 NPS 2 and under, plug disc, Class 150, screwed ends:

.1 Body and bonnet: union bonnet.

.2 Disc and seat ring: tapered plug type with disc stem ring of AISI S420 stainless steel to ASTM A 276, loosely secured to stem.

.3 Operator: handwheel.

.5 Angle valve, NPS 2 and under, composition disc, Class 150:

.1 Body and bonnet: union bonnet.

.2 Disc and seat: renewable rotating PTFE disc in slip-on easily removable disc holder having integral guides, regrindable bronze seat, loosely secured to stem.

.3 Operator: handwheel.

.6 Check Valves:

.1 Requirements common to check valves, unless specified otherwise:

.1 Standard specification: MSS SP-80.

.2 Connections: screwed with hexagonal shoulders.

.2 NPS 2 and under, swing type, bronze disc, Class 125:

.1 Body: Y-pattern with integral seat at 45 degrees, screw-in cap with hex head.

.2 Disc and seat: renewable rotating disc, two-piece hinge disc construction; seat: regrindable.

.3 NPS 2 and under, swing type, bronze disc:

.1 Body: Y-pattern with integral seat at 45 degrees, screw-in cap with hex head.

.2 Disc and seat: renewable rotating disc, two-piece hinge disc construction; seat: regrindable.

.3 Aceptable manufacturers: Crane 1324, Jenkis 4093J, Kitz 23, Milwaukee 1509, Red/White 237, Nibco Valves.

.4 NPS 2 and under, swing type, composition disc, Class 200:

.1 Body: Y-pattern with integral seat at 45 degrees, screw-in cap with hex head.

.2 Disc: renewable rotating disc of number 6 composition to suit service conditions, bronze two-piece hinge disc construction.

.5 NPS 2 and under, horizontal lift type, composition disc, Class 150:

.1 Body: with integral seat, union bonnet ring with hex shoulders, cap.

.2 Disc: renewable PTFE no. 6 composition rotating disc in disc holder having guides top and bottom, of bronze to ASTM B 62.

.3 Aceptable manufacturers: Crane 27TF, Jenkis 117ATJ, Nibco Valves.

.6 NPS 2 and under, vertical lift type, bronze disc, Class 125:

.1 Disc: rotating disc having guides top and bottom, disc guides, retaining rings.

.2 Aceptable manufacturers: Crane 29, Jenkis 119J, Nibco Valves.

.7 Silent Check Valves:

.1 NPS 2 and under:

.1 Body: cast high tensile bronze to ASTM B 62 with integral seat.

.2 Pressure rating: Class 125.

.3 Connections: screwed ends to ANSI B1.20.1 and with hex. shoulders.

.4 Disc and seat: renewable rotating disc.

.5 Stainless steel spring, heavy duty.

.6 Seat: regrindable.

.8 Ball Valves:

.1 NPS 2 and under:

.1 Body and cap: cast high tensile bronze to ASTM B 62.

.2 Pressure rating: Class125 2760-kPa CWP 4140-kPa CWP, 860 kPa steam.

.3 Connections: screwed ends to ANSI B1.20.1 and with hexagonal shoulders solder ends to ANSI.

.4 Stem: tamperproof ball drive.

.5 Stem packing nut: external to body.

.6 Ball and seat: replaceable stainless steel hard chrome solid ball and Teflon seats.

.7 Stem seal: TFE with external packing nut.

.8 Operator: removable lever handle.

.9 Aceptable manufacturers: Crane 9323B, Jenkis 34J, Kitz 59, Milwaukee BA 150, Red/White 5049A, Nibco Valves.

.9 Butterfly Valves:

.1 NPS 2 1/2 through NPS 6, 2068 kPa with grooved ends.

.1 Body: cast bronze, with copper-tube dimensioned grooved ends.

.2 Disc: elastomer coated ductile iron with integrally cast stem.

.3 Operator: lever.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Install rising stem valves in upright position with stem above horizontal.

.2 Remove internal parts before soldering.

.3 Install valves with unions at each piece of equipment arranged to allow servicing, maintenance, and equipment removal.

3.2 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 REFERENCES

.1 Latest editions of listed standards to govern.

.2 American Society of Mechanical Engineers (ASME)

.1 ASME B31.1, Power Piping.

.3 ASTM International

.1 ASTM A 125-1996, Standard Specification for Steel Springs, Helical, Heat-Treated.

.2 ASTM A 307, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.

.3 ASTM A 563, Standard Specification for Carbon and Alloy Steel Nuts.

.4 Manufacturer's Standardization Society of the Valves and Fittings Industry (MSS)

.1 MSS SP 58, Pipe Hangers and Supports - Materials, Design and Manufacture.

.2 MSS SP 69, Pipe Hangers and Supports - Selection and Application.

.3 MSS SP 89, Pipe Hangers and Supports - Fabrication and Installation Practices.

.5 Underwriter's 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 and data sheets for hangers and supports and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:

.1 Supports shall be designed and submitted, stamped and signed by professional engineer registered or licensed in Province of New Brunswick, Canada.

.2 Submit shop drawings for:

.1 Bases, hangers and supports.

.2 Connections to equipment and structure.

.3 Structural assemblies.

.4 Certificates:

.1 Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.5 Manufacturers' Instructions:

.1 Provide manufacturer's installation instructions.

.6 Indicate on manufacturer’s catalogue literature, the following:

.1 Upper Attachment

.2 Middle Attachment

.3 Pipe Attachment

.4 Riser Clamps

.5 Shields and saddles

1.3 CLOSEOUT SUBMITTALS

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

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements:

.1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

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

.4 Replace any damaged or worn equipment / products with new prior to turnover to the Owner.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

.1 Design Requirements:

.1 Construct pipe hanger and support to manufacturer's recommendations utilizing manufacturer's regular production components, parts and assemblies.

.2 Base maximum load ratings on allowable stresses prescribed by ASME B31.1 or MSS SP 58.

.3 Ensure that supports, guides, anchors do not transmit excessive quantities of heat to building structure.

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

.5 Provide for vertical adjustments after erection and during commissioning. Amount of adjustment in accordance with MSS SP 58.

.2 Performance Requirements:

.1 Design supports, platforms, catwalks, hangers to withstand seismic events as specified Section.

2.2 GENERAL

.1 Fabricate hangers, supports and sway braces in accordance with MSS-SP-58. ANSI/ASME B31.1

.2 Use components for intended design purpose only. Do not use for rigging or erection purposes.

.3 Support from structural members. Where structural members bearing does not exist or inserts are not in suitable locations, provide supplementary structural steel members

2.3 PIPE HANGERS

.1 Finishes:

.1 Pipe hangers and supports: galvanized after manufacture.

.2 Use processhot dipped galvanizing process.

.3 Ensure steel hangers in contact with copper piping are copper plated.

.2 Upper attachment structural: suspension from lower flange of I-Beam:

.1 Cold piping NPS 2 maximum: malleable iron C-clamp with hardened steel cup point setscrew, locknut and carbon steel retaining clip.

.1 Rod: 9 mm UL listed 13 mm FM approved.

.2 Cold piping NPS 2 1/2 or greater, hot piping: malleable iron beam clamp, eye rod, jaws and extension with carbon steel retaining clip, tie rod, nuts and washers, UL listed FM approved to MSS-SP 58 and MSS-SP 69.

.3 Upper attachment structural: suspension from upper flange of I-Beam:

.1 Cold piping NPS 2 maximum: ductile iron top-of-beam C-clamp with hardened steel cup point setscrew, locknut and carbon steel retaining clip, UL listed FM approved to MSS SP 69.

.2 Cold piping NPS 2 1/2 or greater, hot piping: malleable iron top-of-beam jaw-clamp with hooked rod, spring washer, plain washer and nut UL listed FM approved.

.4 Upper attachment to concrete:

.1 Ceiling: carbon steel welded eye rod, clevis plate, clevis pin and cotters with weldless forged steel eye nut. Ensure eye 6 mm minimum greater than rod diameter.

.2 Concrete inserts: wedge shaped body with knockout protector plateUL listed FM approved to MSS SP69.

.5 Hanger rods: threaded rod material to MSS SP 58:

.1 Ensure that hanger rods are subject to tensile loading only.

.2 Provide linkages where lateral or axial movement of pipework is anticipated.

.3 Do not use 22 mm or 28 mm rod.

.4 Carbon steel threaded rod (black) except for electro-galvanized finish for mechanical rooms.

.5 Acceptable material: Grinnell Fig. 146 or an approved alternate.

.6 Pipe attachments: material to MSS SP 58:

.1 Attachments for steel piping: carbon steel black galvanized.

.2 Attachments for copper piping: copper plated black steel.

.3 Use insulation shields for hot pipework.

.4 Oversize pipe hangers and supports to accomodate pipe insulation and shields.

.5 Grinnell Fig. 174/Grinnell Fig. 271 or an approved alternate.

.7 Adjustable clevis: material to MSS SP 69 UL listed FM approved, clevis bolt with nipple spacer and vertical adjustment nuts above and below clevis.

.1 Ensure "U" has hole in bottom for rivetting to insulation shields.

.8 Yoke style pipe roll: carbon steel yoke, rod and nuts with cast iron roll, to MSS SP 69.

.9 U-bolts: carbon steel to MSS SP 69 with 2 nuts at each end to ASTM A 563.

.1 Finishes for steel pipework: galvanized.

.2 Finishes for copper, glass, brass or aluminum pipework: galvanized, with formed portion epoxy coated.

.10 Pipe rollers: cast iron roll and roll stand with carbon steel rod to MSS SP 69.

2.4 RISER CLAMPS

.1 Steel or cast iron pipe: galvanized carbon steel to MSS SP 58, type 42, UL listed FM approved.

.1 Acceptable material: Grinnell Fig. 261 or an approved alternate.

.2 Copper pipe: carbon steel copper plated to MSS SP 58, type 42.

.1 Acceptable material: Grinnell Fig. CT-121 or an approved alternate.

.3 Bolts: to ASTM A 307.

.4 Nuts: to ASTM A 563.

2.5 INSULATION PROTECTION SHIELDS

.1 Insulated cold piping: NPS 1 and under 64 kg/mü density insulation plus insulation protection shield to: MSS SP 69, galvanized sheet carbon steel. Length designed for maximum 3 m span.

.2 Insulated hot piping: NPS 1 and Under

.1 Curved plate 300 mm long, with edges turned up, welded-in centre plate for pipe sizes NPS 12 and over, carbon steel to comply with MSS SP 69.

.3 Cold piping NPS 1 1/4 and over: protection shield with high density insulation under shield with uninterrupted vapor barrier.

.1 Acceptable material: Grinnell Fig. 167, L.E. Taylor Fig. 69 or an approved alternate.

.4 Hot piping NPS 1 1/4 and over protective saddle with insulation under saddle.

.1 Acceptable material: Grinnell Fig. 160 to 166, L.E. Taylor Fig. 70-75 or an approved alternate.

2.6 CONSTANT SUPPORT SPRING HANGERS

.1 Springs: alloy steel to ASTM A 125, shot peened, magnetic particle inspected, with +/-5% spring rate tolerance, tested for free height, spring rate, loaded height and provided with Certified Mill Test Report (CMTR).

.2 Load adjustability: 10% minimum adjustability each side of calibrated load. Adjustment without special tools. Adjustments not to affect travel capabilities.

.3 Provide upper and lower factory set travel stops.

.4 Provide load adjustment scale for field adjustments.

.5 Total travel to be actual travel + 20%. Difference between total travel and actual travel 25 mm minimum.

.6 Individually calibrated scales on each side of support calibrated prior to shipment, complete with calibration record.

2.7 VARIABLE SUPPORT SPRING HANGERS

.1 Vertical movement: 13 mm minimum, 50 mm maximum, use single spring pre-compressed variable spring hangers.

.2 Vertical movement greater than 50 mm: use double spring pre-compressed variable spring hanger with 2 springs in series in single casing.

.3 Variable spring hanger complete with factory calibrated travel stops. Provide certificate of calibration for each hanger.

.4 Steel alloy springs: to ASTM A 125, shot peened, magnetic particle inspected, with +/-5 % spring rate tolerance, tested for free height, spring rate, loaded height and provided with CMTR.

2.8 EQUIPMENT SUPPORTS

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

2.9 EQUIPMENT ANCHOR BOLTS AND TEMPLATES

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

2.10 HOUSE-KEEPING PADS

.1 Provide 100 mm high concrete housekeeping pads for base-mounted equipment; size pads 50 mm larger than equipment; chamfer pad edges.

2.11 OTHER EQUIPMENT SUPPORTS

.1 Fabricate equipment supports from structural grade steel.

.2 Submit structural calculations with shop drawings.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

.1 Install in accordance with:

.1 Manufacturer's instructions and recommendations.

.2 Vibration Control Devices:

.1 Install on piping systems at pumps, boilers, chillers, cooling towers, and as indicated.

.3 Clamps on riser piping:

.1 Support independent of connected horizontal pipework using riser clamps and riser clamp lugs welded to riser.

.2 Bolt-tightening torques to industry standards.

.3 Steel pipes: install below coupling or shear lugs welded to pipe.

.4 Cast iron pipes: install below joint.

.4 Clevis plates:

.1 Attach to concrete with 4 minimum concrete inserts, one at each corner.

.5 Provide supplementary structural steelwork where structural bearings do not exist or where concrete inserts are not in correct locations.

.6 Use approved constant support type hangers where:

.1 Vertical movement of pipework is 13 mm or more,

.2 Transfer of load to adjacent hangers or connected equipment is not permitted.

.7 Use variable support spring hangers where:

.1 Transfer of load to adjacent piping or to connected equipment is not critical.

.2 Variation in supporting effect does not exceed 25 % of total load.

3.3 HANGER SPACING

.1 Plumbing piping: to Canadian Plumbing Code and authority having jurisdiction.

.2 Fire protection: to applicable fire code.

.3 Gas and fuel oil piping: up to NPS 1/2: every 1.8 m.

.4 Copper piping: up to NPS 1/2: every 1.5 m.

.5 Flexible joint roll groove pipe: in accordance with table below for steel, but not less than one hanger at joints. Table listings for straight runs without concentrated loads and where full linear movement is not required.

.6 Within 300 mm of each elbow.

Maximum Pipe Size (NPS)	***Maximum Spacing: Steel (m)***	***Maximum Spacing: Copper (m)***	***Rod Diameter (mm)***

up to 1-1/4	2.1	1.8	10
1-1/2	2.6	2.4	10
2	3.0	2.4	10
2-1/2	3.6	3.0	10
3	3.6	3.0	10
3-1/2	3.7	3.3	10
4	3.7	3.7	16
5	4.3	-	16
6	4.3	-	22
8	4.3	-	22
10	4.9	-	22
12	4.9	-	22

.7 Pipework greater than NPS 12: to MSS SP 69.

3.4 HANGER INSTALLATION

.1 Install hanger so that rod is vertical under operating conditions.

.2 Adjust hangers to equalize load.

.3 Support from structural members. Where structural bearing does not exist or inserts are not in suitable locations, provide supplementary structural steel members.

3.5 HORIZONTAL MOVEMENT

.1 Angularity of rod hanger resulting from horizontal movement of pipework from cold to hot position not to exceed 4 degrees from vertical.

.2 Where horizontal pipe movement is less than 13 mm, offset pipe hanger and support so that rod hanger is vertical in the hot position.

3.6 FINAL ADJUSTMENT

.1 Adjust hangers and supports:

.1 Ensure that rod is vertical under operating conditions.

.2 Equalize loads.

.2 Adjustable clevis:

.1 Tighten hanger load nut securely to ensure proper hanger performance.

.2 Tighten upper nut after adjustment.

.3 C-clamps:

.1 Follow manufacturer's recommended written instructions and torque values when tightening C-clamps to bottom flange of beam.

.4 Beam clamps:

.1 Hammer jaw firmly against underside of beam.

3.7 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 and recycling in accordance with Section 01 74 21

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

.1 Section Includes:

.1 Materials and requirements for the identification of piping systems, duct work, valves and controllers, including the installation and location of identification systems.

.2 Sustainable requirements for construction and verification.

.2 Related Sections:

.1 Section 22 11 16 - Domestic Water Piping Copper

.2 Section 22 13 18 - Drainage Waste And Vent Piping – Plastic

.3 Section 23 05 05 - Installation Of Pipework

.4 Section 23 21 13.01 – Hydronic Systems: Copper

.5 Section 23 21 13.02 – Hydronic Systems: Steel

1.2 REFERENCES

.1 Latest editions of listed standards to govern.

.2 Canadian Gas Association (CGA)

.1 CSA/CGA B149.1, Natural Gas and Propane Installation Code.

.3 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-1.60, Interior Alkyd Gloss Enamel.

.2 CAN/CGSB-24.3, Identification of Piping Systems.

.4 National Fire Protection Association (NFPA)

.1 NFPA 13, Standard for the Installation of Sprinkler Systems.

.2 NFPA 14, Standard for the Installation of Standpipe and Hose Systems.

1.3 SUBMITTALS

.1 Product Data:

.2 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.

.3 Product data to include paint colour chips, other products specified in this section.

.4 Samples:

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

.2 Samples to include nameplates, labels, tags, lists of proposed legends.

1.4 QUALITY ASSURANCE

.1 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling and unloading: Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Waste Management Disposal: Separate waste materials for recycling.

.3 Replace any damaged or worn equipment / products with new prior to turnover to the Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURER'S EQUIPMENT NAMEPLATES

.1 Metal or plastic laminate nameplate mechanically fastened to each piece of equipment by manufacturer.

.2 Lettering and numbers raised or recessed.

.3 Information to include, as appropriate:

.1 Equipment: manufacturer's name, model, size, serial number, capacity.

.2 Motor: voltage, Hz, phase, power factor, duty, frame size.

2.2 SYSTEM NAMEPLATES

.1 Colours:

.2 Hazardous: red letters, white background.

.3 Elsewhere: black letters, white background (except where required otherwise by applicable codes).

.2 Construction:

.1 3 mm thick laminated plastic or white anodized aluminum, matte finish, with square corners, letters accurately aligned and machine engraved into core.

.3 Sizes:

.1 Conform to following table:

Size # (mm)	***Sizes (mm)***	***No. of Lines***	***Height of Letters (mm)***
1	10 x 50	1	3
2	13 x 75	1	5
3	13 x 75	2	3
4	20 x 100	1	8
5	20 x 100	2	5
6	20 x 200	1	8
7	25 x 125	1	12
8	25 x 125	2	8
9	35 x 200	1	20

.2 Use maximum of 25 letters/numbers per line.

.4 Locations:

.1 Terminal cabinets, control panels: use size # 5.

.2 Equipment in Mechanical Rooms: use size # 9.

2.3 PIPING SYSTEMS GOVERNED BY CODES

.1 Identification:

.1 Propane gas: to CSA/CGA B149.1 authority having jurisdiction.

.2 Sprinklers: to NFPA 13.

2.4 IDENTIFICATION OF PIPING SYSTEMS

.1 Identify contents by background colour marking, pictogram (as necessary), legend; direction of flow by arrows. To CAN/CGSB 24.3 except where specified otherwise.

.2 Pictograms:

.1 Where required: Workplace Hazardous Materials Information System (WHMIS) regulations.

.3 Legend:

.1 Block capitals to sizes and colours listed in CAN/CGSB 24.3.

.4 Arrows showing direction of flow:

.1 Outside diameter of pipe or insulation less than 75 mm: 100 mm long x 50 mm high.

.2 Outside diameter of pipe or insulation 75 mm and greater: 150 mm long x 50 mm high.

.3 Use double-headed arrows where flow is reversible.

.5 Extent of background colour marking:

.1 To full circumference of pipe or insulation.

.2 Length to accommodate pictogram, full length of legend and arrows.

.6 Materials for background colour marking, legend, arrows:

.1 Pipes and tubing 20 mm and smaller: waterproof and heat-resistant pressure sensitive plastic marker tags.

.2 Other pipes: pressure sensitive vinyl with protective overcoating, waterproof contact adhesive undercoating, suitable for ambient of 100% RH and continuous operating temperature of 150 degrees C and intermittent temperature of 200 degrees C.

.7 Colours and Legends:

.1 Where not listed, obtain direction from Engineer or Consultant.

.2 Colours for legends, arrows: to following table:

Background Colour	***Legend, Arrows***
Yellow	Black
Green	White
Red	White

.3 Background colour marking and legends for piping systems:

Contents	***Background Colour Marking***	***Legend***
Hot water heating supply	Yellow	HEATING SUPPLY
Hot water heating return	Yellow	HEATING RETURN
Make-up water	Yellow	MAKE-UP WTR
Boiler feed water	Yellow	BLR. FEED WTR
Domestic hot water supply	Green	DOM. HW SUPPLY
Dom. HWS recirculation	Green	DOM. HW RECIRC
Domestic cold water supply	Green	DOM. CWS
Sanitary	Green	SAN
Plumbing vent	Green	SAN. VENT
Refrigeration suction	Yellow	REF. SUCTION
Refrigeration liquid	Yellow	REF. LIQUID
Refrigeration hot gas	Yellow	REF. HOT GAS
Fuel oil supply	Yellow	FUEL OIL SUPPLY
Fuel oil return	Yellow	FUEL OIL RETURN
Fire protection water	Red	FIRE PROT. WTR
Sprinklers	Red	SPRINKLERS
Stormwater	Green	STORM

2.5 IDENTIFICATION DUCTWORK SYSTEMS

.1 50 mm high stencilled letters and directional arrows 150 mm long x 50 mm high.

.2 Colours: back, or co-ordinated with base colour to ensure strong contrast.

.3 Identify Supply, Return, and Exhaust systems with directional arrows.

2.6 VALVES, CONTROLLERS

.1 Brass tags with 12 mm stamped identification data filled with black paint.

.2 Include flow diagrams for each system, of approved size, showing charts and schedules with identification of each tagged item, valve type, service, function, normal position, location of tagged item.

2.7 CONTROLS COMPONENTS IDENTIFICATION

.1 Identify all systems, equipment, components, controls, sensors with system nameplates specified in this section.

.2 Inscriptions to include function and (where appropriate) fail-safe position.

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 TIMING

.1 Provide identification only after painting.

3.3 INSTALLATION

.1 Perform work in accordance with CAN/CGSB-24.3 except as specified otherwise.

.2 Provide ULC and or CSA registration plates as required by respective agency.

3.4 NAMEPLATES

.1 Locations:

.1 In conspicuous location to facilitate easy reading and identification from operating floor.

.2 Standoffs:

.1 Provide for nameplates on hot and/or insulated surfaces.

.3 Protection:

.1 Do not paint, insulate or cover.

3.5 LOCATION OF IDENTIFICATION ON PIPING AND DUCTWORK SYSTEMS

.1 On long straight runs in open areas in boiler rooms, equipment rooms, galleries, tunnels: at not more than 17 m intervals and more frequently if required to ensure that at least one is visible from any one viewpoint in operating areas and walking aisles.

.2 Adjacent to each change in direction.

.3 At least once in each small room through which piping or ductwork passes.

.4 On both sides of visual obstruction or where run is difficult to follow.

.5 On both sides of separations such as walls, floors, partitions.

.6 Where system is installed in pipe chases, ceiling spaces, galleries, confined spaces, at entry and exit points, and at access openings.

.7 At beginning and end points of each run and at each piece of equipment in run.

.8 At point immediately upstream of major manually operated or automatically controlled valves, and dampers. Where this is not possible, place identification as close as possible, preferably on upstream side.

.9 Identification easily and accurately readable from usual operating areas and from access points.

.1 Position of identification approximately at right angles to most convenient line of sight, considering operating positions, lighting conditions, risk of physical damage or injury and reduced visibility over time due to dust and dirt.

3.6 VALVES, CONTROLLERS

.1 Valves and operating controllers, except at plumbing fixtures, radiation, or where in plain sight of equipment they serve: Secure tags with non-ferrous chains or closed "S" hooks.

.2 Install one copy of flow diagrams, valve schedules mounted in frame behind non-glare glass where directed by Engineer Consultant. Provide one copy (reduced in size if required) in each operating and maintenance manual.

.3 Number valves in each system consecutively.

3.7 CLEANING

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

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

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

.1 TAB is used throughout this Section to describe the process, methods and requirements of testing, adjusting and balancing for HVAC.

.2 TAB means to test, adjust and balance to perform in accordance with requirements of Contract Documents and to do other work as specified in this section.

1.2 PROJECT PHASING

.1 This project is being constructed in several phases (Refer to architectural drawings and phasing plan.). Systems must be balanced at the completion of each phase. When a subsequent phase is complete which affects previously balanced systems, the entire system must be re-balanced in its entirety.

1.3 QUALIFICATIONS OF TAB PERSONNEL

.1 Submit names of personnel to perform TAB to Departmental Representative Engineer Consultant within 90 days of award of contract.

.2 Provide documentation confirming qualifications, successful experience.

.3 TAB: performed in accordance with the requirements of standard under which TAB Firm's qualifications are approved:

.1 Associated Air Balance Council, (AABC) National Standards for Total System Balance, MN-1-2002.

.2 National Environmental Balancing Bureau (NEBB) TABES, Procedural Standards for Testing, Adjusting, Balancing of Environmental Systems-1998.

.3 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA), HVAC TAB HVAC Systems - Testing, Adjusting and Balancing-2002.

.4 Recommendations and suggested practices contained in the TAB Standard: mandatory.

.5 Use TAB Standard provisions, including checklists, and report forms to satisfy Contract requirements.

.6 Use TAB Standard for TAB, including qualifications for TAB Firm and Specialist and calibration of TAB instruments.

.7 Where instrument manufacturer calibration recommendations are more stringent than those listed in TAB Standard, use manufacturer's recommendations.

.8 TAB Standard quality assurance provisions such as performance guarantees form part of this contract.

.1 For systems or system components not covered in TAB Standard, use TAB procedures developed by TAB Specialist.

.2 Where new procedures, and requirements, are applicable to Contract requirements have been published or adopted by body responsible for TAB Standard used (AABC, NEBB, or TABB), requirements and recommendations contained in these procedures and requirements are mandatory.

1.4 PURPOSE OF TAB

.1 Test to verify proper and safe operation, determine actual point of performance, evaluate qualitative and quantitative performance of equipment, systems and controls at design, average and low loads using actual or simulated loads

.2 Adjust and regulate equipment and systems to meet specified performance requirements and to achieve specified interaction with other related systems under normal and emergency loads and operating conditions.

.3 Balance systems and equipment to regulate flow rates to match load requirements over full operating ranges.

.4 Advise Engineer if additional sheaves are required to meet the balancing point.

1.5 EXCEPTIONS

.1 TAB of systems and equipment regulated by codes, standards to satisfaction of authority having jurisdiction.

1.6 CO-ORDINATION

.1 Schedule time required for TAB (including repairs, re-testing) into project construction and completion schedule to ensure completion before acceptance of project.

.2 Do TAB of each system independently and subsequently, where interlocked with other systems, in unison with those systems.

1.7 PRE-TAB REVIEW

.1 Review contract documents before project construction is started and confirm in writing to Departmental Representative Engineer Consultant adequacy of provisions for TAB and other aspects of design and installation pertinent to success of TAB.

.2 Review specified standards and report to Departmental Representative Engineer Consultant in writing proposed procedures which vary from standard.

.3 During construction, co-ordinate location and installation of TAB devices, equipment, accessories, measurement ports and fittings.

1.8 START-UP

.1 Follow start-up procedures as recommended by equipment manufacturer unless specified otherwise.

.2 Follow special start-up procedures specified elsewhere in Division 23.

1.9 OPERATION OF SYSTEMS DURING TAB

.1 Operate systems for length of time required for TAB and as required by Departmental Representative Engineer Consultant for verification of TAB reports.

1.10 START OF TAB

.1 Notify Consultant 10 days prior to start of TAB.

.2 Start TAB when building is essentially completed, including:

.1 Installation of ceilings, doors, windows, other construction affecting TAB.

.2 Application of weatherstripping, sealing, and caulking.

.3 Pressure, leakage, other tests specified elsewhere Division 23.

.4 Provisions for TAB installed and operational.

.5 Start-up, verification for proper, normal and safe operation of mechanical and associated electrical and control systems affecting TAB including but not limited to:

.1 Proper thermal overload protection in place for electrical equipment.

.2 Air systems:

.1 Filters in place, clean.

.2 Duct systems clean.

.3 Ducts, air shafts, ceiling plenums are airtight to within specified tolerances.

.4 Correct fan rotation.

.5 Fire, smoke, volume control dampers installed and open.

.6 Coil fins combed, clean.

.7 Access doors, installed, closed.

.8 Outlets installed, volume control dampers open.

.6 Liquid systems:

.1 Flushed, filled, vented.

.2 Correct pump rotation.

.3 Strainers in place, baskets clean.

.4 Isolating and balancing valves installed, open.

.5 Calibrated balancing valves installed, at factory settings.

.6 Chemical treatment systems complete, operational.

1.11 APPLICATION TOLERANCES

.1 Do TAB to following tolerances of design values:

.1 HVAC systems: plus 8 %, minus 8 %.

.2 Hydronic systems: plus or minus 10 %.

1.12 ACCURACY TOLERANCES

.1 Measured values accurate to within plus or minus 2 % of actual values.

1.13 INSTRUMENTS

.1 Prior to TAB, submit to Consultant list of instruments used together with serial numbers.

.2 Calibrate in accordance with requirements of most stringent of referenced standard for either applicable system or HVAC system.

.3 Calibrate within 30 days of TAB. Provide certificate of calibration to Departmental Representative Engineer Consultant.

1.14 SUBMITTALS

.1 Submit, prior to commencement of TAB:

.2 Proposed methodology and procedures for performing TAB if different from referenced standard.

1.15 PRELIMINARY TAB REPORT

.1 Submit for checking and approval by Construction Manager, prior to submission of formal TAB report, sample of rough TAB sheets. Include:

.1 Details of instruments used.

.2 Details of TAB procedures employed.

.3 Calculations procedures.

.4 Summaries.

1.16 TAB REPORT

.1 Format in accordance with referenced standard.

.2 TAB report to show results in SI units and to include:

.1 Project record drawings.

.2 System schematics.

.3 Submit Electronic copies of TAB Report to Consultant for verification and approval, in English.

1.17 VERIFICATION

.1 Reported results subject to verification by Consultant

.2 Provide personnel and instrumentation to verify up to 30 % of reported results.

.3 Number and location of verified results as directed Consultant.

.4 Pay costs to repeat TAB as required to satisfaction of Consultant.

1.18 SETTINGS

.1 After TAB is completed to satisfaction of Construction Manager, replace drive guards, close access doors, lock devices in set positions, ensure sensors are at required settings.

.2 Permanently mark settings to allow restoration at any time during life of facility. Do not eradicate or cover markings.

1.19 COMPLETION OF TAB

.1 TAB considered complete when final TAB Report received and approved by Consultant.

1.20 AIR SYSTEMS

.1 Standard: TAB to most stringent of this section or TAB standards of AABC NEBB SMACNA and ASHRAE.

.2 Do TAB of systems, equipment, components, controls specified Division 23 including but not limited to the following systems, equipment, components, controls:

.1 All air distrubution system.

.2 All air energy recovery system.

.3 All air intake and exhaust systems.

.3 Qualifications: personnel performing TAB current member in good standing of AABC or NEBB qualified to standards of AABC or NEBB.

.4 Quality assurance: perform TAB under direction of supervisor qualified by to standards of AABC or NEBB.

.5 Measurements: to include as appropriate for systems, equipment, components, controls: air velocity, static pressure, flow rate, pressure drop (or loss), temperatures (dry bulb, wet bulb, dewpoint), duct cross-sectional area, RPM, electrical power, voltage, noise, vibration.

.6 Locations of equipment measurements: to include as appropriate:

.1 Inlet and outlet of dampers, filter, coil, humidifier, fan, other equipment causing changes in conditions.

.2 At controllers, controlled device.

.7 Locations of systems measurements to include as appropriate: main ducts, main branch, sub-branch, run-out (or grille, register or diffuser).

.8 Building pressure conditions:

.1 Adjust HVAC systems, equipment, controls to ensure specified pressure conditions during winter summer design conditions at all times.

.2 Standards:

.1 ASHRAE Standard 62

.9 Zone pressure differences:

.1 Adjust HVAC systems, equipment, controls to establish specified air pressure differentials, with systems in every possible combinations of normal operating modes.

.2 Standards:

.1 ASHRAE Standard 62

.10 Smoke management systems:

.1 Test for proper operation of all smoke and fire dampers, sensors, detectors, installed as component parts of air systems specified Division 23.

.2 Emergency evacuation: see post-occupancy TAB activities specified below.

.11 Measurement of noise and vibration from equipment specified in Division 23.

.1 Standards:

.1 ASHRAE Standard 62

.2 CAN/CSA Z317.2-01

.3 CAN/CSA Z318.1

.12 Measurement of spatial noise and vibration:

.1 Standards:

.1 ASHRAE Standard 62

.2 CAN/CSA Z317.2-01

.3 CAN/CSA Z318.1

1.21 HYDRONIC SYSTEMS

.1 General requirements applicable to work specified this paragraph:

.1 Qualifications of TAB personnel: as for air systems specified this section.

.2 Quality assurance: as for air systems specified this section.

.2 Definitions: for purposes of this section, to include low pressure hot water heating, chilled water, condenser water, glycol systems.

.3 Do TAB of systems, equipment, components, controls specified Division 23 following systems, equipment, components, controls:

.1 Water Loop Piping Systems.

.2 Hydronic Circulation Pumps.

.4 Qualifications: Personnel performing TAB to be current member in good standing of AABC or NEBB.

.5 Quality Assurance: perform TAB under direction or supervisor qualified to standards of AABC or NEBB.

.6 Measurements: to include, but not limited to, following as appropriate for systems, equipment, components, controls: Flow rate, static pressure, pressure drop (or loss), temperature, specific gravity, density, RPM, Electric power, voltage, noise, vibration.

.7 Locations of equipment measurement: To include, but not limited to, following as appropriate:

.1 Inlet and outlet of heat exchangers (primary and secondary sides), boiler, coil, humidifier, cooling tower, condenser, pump, PRV, control valve, other equipment causing changed in conditions.

.2 At controllers, controlled devices.

.8 Locations of systems measurements to include, but not be limited to, following as appropriate: Supply and return of primary and secondary loops (main, main branch, branch, sub-branch of all hydronic systems, inlet connections of make up water.

1.22 DHW CIRCULATION SYSTEMS

.1 Meet all requirements as specified for hydronic systems.

.2 Locations of equipment measurements: To include, but not be limited to, following as appropriate: Inlet and outlet of each pump.

.3 Locations of systems measurements to include, but not be limited to, following as appropriate: balancing valves

1.23 POST-OCCUPANCY TAB

.1 Measure DBT, WBT (or %RH), air velocity, air flow patterns, NC levels, in 25% of occupied zones.

.2 Emergency evacuation: participate in full scale emergency evacuation exercises. Repeat smoke management tests at this time.

.3 Participate in systems checks twice during Warranty Period - #1 approximately 3 months after acceptance and #2 within 1 month of termination of Warranty Period.

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 For purposes of this section:

.1 "CONCEALED" - insulated mechanical services and equipment in suspended ceilings and non-accessible chases and furred-in spaces.

.2 "EXPOSED" - means "not concealed" as previously defined.

.3 Insulation systems - insulation material, fasteners, jackets, and other accessories.

.2 TIAC Codes:

.1 CRD: Code Round Ductwork,

.2 CRF: Code Rectangular Finish.

.2 Reference Standards:

.1 Latest editions of listed standards to govern.

.2 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)

.1 ANSI/ASHRAE/IESNA 90.1, SI; Energy Standard for Buildings Except Low-Rise Residential Buildings.

.3 ASTM International Inc.

.1 ASTM B 209M, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric).

.2 ASTM C 335, Standard Test Method for Steady State Heat Transfer Properties of Pipe Insulation.

.3 ASTM C 411, Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.

.4 ASTM C 449/C 449M, Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.

.5 ASTM C 547, Standard Specification for Mineral Fiber Pipe Insulation.

.6 ASTM C 553, Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.

.7 ASTM C 612, Standard Specification for Mineral Fiber Block and Board Thermal Insulation.

.8 ASTM C 795, Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.

.9 ASTM C 921, Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.

.4 Canadian General Standards Board (CGSB)

.1 CGSB 51-GP-52Ma, Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.

.5 Green Seal Environmental Standards (GSES)

.1 Standard GS-36, Commercial Adhesives.

.6 South Coast Air Quality Management District (SCAQMD), California State

.1 SCAQMD Rule 1168, Adhesive and Sealant Applications.

.7 Thermal Insulation Association of Canada (TIAC): National Insulation Standards (2005).

.8 Underwriters Laboratories of Canada (ULC)

.1 CAN/ULC-S102, Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

.2 CAN/ULC-S701, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.

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 and datasheets for duct insulation, and include product characteristics, performance criteria, physical size, finish and limitations.

.1 Description of equipment giving manufacturer's name, type, model, year and capacity.

.2 Details of operation, servicing and maintenance.

.3 Recommended spare parts list.

.3 Samples:

.1 Submit for approval: complete assembly of each type of insulation system, insulation, coating, and adhesive proposed.

.2 Mount sample on 12 mm plywood board.

.3 Affix typewritten label beneath sample indicating service.

.4 Manufacturers' Instructions:

.1 Provide manufacture's written duct insulation jointing recommendations. and special handling criteria, installation sequence, cleaning procedures and.

1.3 QUALITY ASSURANCE

.1 Qualifications:

.1 Installer: specialist in performing work of this section, and have at least 3 years successful experience in this size and type of project, member of TIAC.

1.4 DELIVERY, STORAGE AND HANDLING

.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 and ULC markings.

.3 Replace any damaged or worn equipment / products with new prior to turnover to the Owner.

.4 Packaging Waste Management: remove for reuse and return of packaging materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 - PRODUCTS

2.1 FIRE AND SMOKE RATING

.1 To CAN/ULC-S102:

.1 Maximum flame spread rating: 25.

.2 Maximum smoke developed rating: 50.

2.2 INSULATION

.1 Mineral fibre: as specified includes glass fibre, rock wool, slag wool.

.2 Thermal conductivity ("k" factor) not to exceed specified values at 24 degrees C mean temperature when tested in accordance with ASTM C 335.

.3 TIAC Code C-1: Rigid mineral fibre board to ASTM C 612, with factory applied vapour retarder jacket to CGSB 51-GP-52Ma (as scheduled in PART 3 of this Section).

.4 TIAC Code C-2: Mineral fibre blanket to ASTM C 553 faced with factory applied vapour retarder jacket to CGSB 51-GP-52Ma (as scheduled in PART 3 of this section).

.1 Mineral fibre: to ASTM C 553.

.2 Jacket: to CGSB 51-GP-52Ma.

.3 Maximum "k" factor: to ASTM C 553.

2.3 JACKETS

.1 Canvas:

.1 220 gm/m^2 cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C921.

.2 Lagging adhesive: compatible with insulation.

.2 Aluminum:

.1 To ASTM B 209 with moisture barrier as scheduled in PART 3 of this section.

.2 Thickness: 0.50 mm sheet.

.3 Finish: Smooth.

.4 Jacket banding and mechanical seals: 19 mm wide, 0.5 mm thick stainless steel.

.3 Stainless steel:

.1 Type: 304.

.2 Thickness: 0.50 mm sheet.

.3 Finish: Smooth

.4 Jacket banding and mechanical seals: 19 mm wide, 0.5 mm thick stainless steel.

.4

2.4 ACCESSORIES

.1 ULC Listed Canvas Jacket:

.1 220 gm/m^2 cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C921.

.2 Outdoor Vapour Retarder Mastic:

.1 Vinyl emulsion type acrylic, compatible with insulation.

.2 Reinforcing fabric: Fibrous glass, untreated 305 g/m^2.

.3 Vapour retarder lap adhesive:

.1 Water based, fire retardant type, compatible with insulation.

.4 Outdoor Vapour Retarder Mastic:

.1 Vinyl emulsion type acrylic, compatible with insulation.

.2 Reinforcing fabric: Fibrous glass, untreated 305 g/mý.

.5 Tape: self-adhesive, aluminum, reinforced, 50 mm wide minimum.

.6 Contact adhesive: quick-setting

.7 Tie wire: 1.5 mm stainless steel.

.8 Banding: 19 mm wide, 0.5 mm thick stainless steel.

.9 Facing: 25 mm stainless steel hexagonal wire mesh stitched on both faces of insulation.

.10 Fasteners: 4 mm diameter pins with 35 mm diameter square clips, length to suit thickness of insulation.

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 PRE-INSTALLATION REQUIREMENTS

.1 Pressure test ductwork systems complete, witness and certify.

.2 Ensure surfaces are clean, dry, free from foreign material.

3.3 INSTALLATION

.1 Install in accordance with TIAC National Standards.

.2 Apply materials in accordance with manufacturer’s instructions and as indicated.

.3 Use 2 layers with staggered joints when required nominal thickness exceeds 75 mm.

.4 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.

.1 Ensure hangers, and supports are outside vapour retarder jacket.

.5 Hangers and supports in accordance with Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.

.1 Apply high compressive strength insulation where insulation may be compressed by weight of ductwork.

.6 Fasteners: install at 300 mm on centre in horizontal and vertical directions, minimum 2 rows each side.

3.4 DUCTWORK INSULATION SCHEDULE

.1 All insulated ductwork in mechanical rooms / penthouses or exposed insulated ductwork shall be clad with VentureClad 1577CW-WM or approved alternate.

.2 Insulation types and thicknesses: conform to following table:

Duct Type	TIAC Code	Vapour Retarder	Thickness (mm)
Rectangular cold and dual temperature supply air ducts	C-1	Yes	25
Round cold and dual temperature supply air ducts	C-2	Yes	25
Supply and Exhaust Plenums	C-1	Yes	50
Supply, Exhaust Ducts between louvers and mechanical equipment in mechanical rooms / penthouses	C-1	Yes	50
Exhaust ducts within 4 m of louvers	C-1	Yes	50
Acoustically lined ducts	None	-	-

.3 Exposed round ducts 600 mm and larger, smaller sizes where subject to abuse:

.1 Use TIAC code C-1 insulation, scored to suit diameter of duct.

.1 Finishes: conform to following table:

Duct Type	TIAC Code	
	Rectangular	Round
Indoor, concealed	None	None
Indoor, exposed within mechanical room	CRF/1	CRD/1
Indoor, exposed elsewhere	CRF/1	CRD/1

3.5 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 and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

.1 Section Includes:

.1 Thermal insulation for piping and piping accessories in commercial type applications.

.2 Related Sections:

.1 Section 23 05 05 - Installation of Pipework

.2 Section 22 11 16 - Domestic Water Piping Copper

.3 Section 23 21 13.01 - Hydronic Systems: Copper

.4 Section 23 21 13.02 - Hydronic Systems: Steel

1.2 REFERENCES

.1 Latest editions of listed standards to govern.

.2 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)

.1 ASHRAE Standard 90.1, Energy Standard for Buildings Except Low-Rise Residential Buildings (IESNA co-sponsored; ANSI approved; Continuous Maintenance Standard).

.3 American Society for Testing and Materials International (ASTM)

.1 ASTM B 209M, Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate Metric.

.2 ASTM C 335, Standard Test Method for Steady State Heat Transfer Properties of Horizontal Pipe Insulation.

.3 ASTM C 411, Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.

.4 ASTM C 449/C 449M, Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.

.5 ASTM C 533, Calcium Silicate Block and Pipe Thermal Insulation.

.6 ASTM C 547, Mineral Fiber Pipe Insulation.

.7 ASTM C 795, Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.

.8 ASTM C 921, Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.

.4 Canadian General Standards Board (CGSB)

.1 CGSB 51-GP-52Ma, Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.

.2 CAN/CGSB-51.53, Poly (Vinyl Chloride) Jacketing Sheet, for Insulated Pipes, Vessels and Round Ducts

.5 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

.6 Manufacturer's Trade Associations

.1 Thermal Insulation Association of Canada (TIAC): National Insulation Standards.

.7 . Underwriters' Laboratories of Canada (ULC)

.1 CAN/ULC-S102, Surface Burning Characteristics of Building Materials and Assemblies.

.2 CAN/ULC-S701, Thermal Insulation, Polystyrene, Boards and Pipe Covering.

.3 CAN/ULC-S702, Thermal Insulation, Mineral Fibre, for Buildings

.4 CAN/ULC-S702.2, Thermal Insulation, Mineral Fibre, for Buildings, Part 2: Application Guidelines.

1.3 DEFINITIONS

.1 For purposes of this section:

.1 "CONCEALED" - insulated mechanical services in suspended ceilings and non-accessible chases and furred-in spaces.

.2 "EXPOSED" - will mean "not concealed" as specified.

.2 TIAC :

.1 CRF: Code Rectangular Finish.

.2 CPF: Code Piping Finish.

1.4 SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section01 33 00 - Submittal Procedures. Include product characteristics, performance criteria, and limitations.

.1 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00 - Submittal Procedures.

.3 Shop Drawings:

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

.4 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.

.1 Instructions: submit manufacturer's installation instructions.

.1 Construction Manager will make available 1 copy of systems supplier's installation instructions.

1.5 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, qualified to standards of TIAC.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle in accordance with manufacturer's written instructions.

.2 Storage and Protection:

.1 Protect from weather, construction traffic.

.2 Protect against damage.

.3 Store at temperatures and conditions required by manufacturer.

.3 Replace any damaged or worn equipment / products with new prior to turnover to the Owner.

.4 Construction/Demolition Waste Management and Disposal: separate waste materials for recycling

PART 2 - PRODUCTS

2.1 FIRE AND SMOKE RATING

.1 In accordance with CAN/ULC-S102.

.1 Maximum flame spread rating: 25.

.2 Maximum smoke developed rating: 50.

2.2 INSULATION

.1 Mineral fibre specified includes glass fibre, rock wool, slag wool.

.2 Thermal conductivity ("k" factor) not to exceed specified values at 24°C mean temperature when tested in accordance with ASTM C 335.

.3 TIAC Code A-1: rigid moulded mineral fibre without factory applied vapour retarder jacket.

.1 Mineral fibre: to CAN/ULC-S702.

.2 Maximum "k" factor: to CAN/ULC-S702.

.4 TIAC Code A-3: rigid moulded mineral fibre with factory applied vapour retarder jacket.

.1 Mineral fibre: to CAN/ULC-S702.

.2 Jacket: to CGSB 51-GP-52Ma.

.3 Maximum "k" factor: to CAN/ULC-S702.

.5 TIAC Code C-2: mineral fibre blanket faced with factory applied vapour retarder jacket (as scheduled in PART 3 of this section).

.1 Mineral fibre: to CAN/ULC-S702.

.2 Jacket: to CGSB 51-GP-52Ma.

.3 Maximum "k" factor: to CAN/ULC-S702.

.6 TIAC Code A-6: flexible unicellular tubular elastomer.

.1 Insulation: with vapour retarder jacket.

.2 Jacket: to CGSB 51-GP-52Ma.

.3 Maximum "k" factor: to CAN/ULC-S702.

.4 Certified by manufacturer: free of potential stress corrosion cracking corrodants.

2.3 INSULATION SECUREMENT

.1 Tape: self-adhesive, aluminum, plain, 50 mm wide minimum.

.2 Contact adhesive: quick setting.

.3 Bands: stainless steel, 19 mm wide, 0.5 mm thick.

2.4 CEMENT

.1 Thermal insulating and finishing cement:

.1 Air drying on mineral wool, to ASTM C 449/C 449M.

2.5 VAPOUR RETARDER LAP ADHESIVE

.1 Water based, fire retardant type, compatible with insulation.

2.6 INDOOR VAPOUR RETARDER FINISH

.1 Vinyl emulsion type acrylic, compatible with insulation.

2.7 OUTDOOR VAPOUR RETARDER FINISH

.1 Vinyl emulsion type acrylic, compatible with insulation.

.2 Reinforcing fabric: fibrous glass, untreated 305 g/mý.

2.8 JACKETS

.1 Polyvinyl Chloride (PVC):

.1 One-piece moulded type to CAN/CGSB-51.53 with pre-formed shapes as required.

.2 Colours: White.

.3 Minimum service temperatures: -20°C.

.4 Maximum service temperature: 65°C

.5 Moisture vapour transmission: 0.02 perm.

.6 Thickness: 0.5 mm.

.7 Fastenings:

.1 Use solvent weld adhesive compatible with insulation to seal laps and joints.

.2 Tacks.

.3 Pressure sensitive vinyl tape of matching colour.

2.9 WEATHERPROOF CAULKING FOR JACKETS INSTALLED OUTDOORS

.1 Caulk around jacketing penetrations through walls.

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 Install in accordance with TIAC National Standards.

.2 Apply materials in accordance with manufacturer’s instructions and this specification.

.3 Use two layers with staggered joints when required nominal wall thickness exceeds 75 mm.

.4 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.

.1 Install hangers, supports outside vapour retarder jacket.

.5 Supports, Hangers:

.1 Apply high compressive strength insulation, suitable for service, at oversized saddles and shoes where insulation saddles have not been provided.

3.4 REMOVABLE, PRE-FABRICATED, INSULATION AND ENCLOSURES

.1 Application: at expansion joints, valves, primary flow measuring elements flanges and unions at equipment.

.2 Design: to permit movement of expansion joint and to permit periodic removal and replacement without damage to adjacent insulation.

.3 Insulation:

.1 Insulation, fastenings and finishes: same as system.

.2 Jacket: PVC.

3.5 INSTALLATION OF ELASTOMERIC INSULATION

.1 Insulation to remain dry. Overlaps to manufacturer’s instructions. Ensure tight joints.

.2 Provide vapour retarder as recommended by manufacturer.

3.6 PIPING INSULATION SCHEDULES

.1 Includes valves, valve bonnets, strainers, flanges and fittings unless otherwise specified.

.2 TIAC Code: A-1.

.1 Securements: SS bands or Aluminum Tape at 300 mm on centre.

.2 Seals: lap seal adhesive, lagging adhesive.

.3 Installation: TIAC Code 1501-H.

.3 TIAC Code: A-3.

.1 Securements: SS bands or Aluminum Tape at 300 mm on centre.

.2 Seals: VR lap seal adhesive, VR lagging adhesive.

.3 Installation: TIAC Code: 1501-C.

.4 TIAC Code: A-6.

.1 Insulation securements: SS bands or Aluminum Tape at 300 mm on centre.

.2 Seals: lap seal adhesive, lagging adhesive.

.3 Installation: TIAC Code: 1501-C.

.5 TIAC Code: C-2 with vapour retarder jacket.

.1 Insulation securements: SS bands or Aluminum Tape at 300 mm on centre. .

.2 Seals: lap seal adhesive, lagging adhesive.

.3 Installation: TIAC Code: 1501-C.

.6 Thickness of insulation as listed in following table.

.1 Run-outs to individual units and equipment not exceeding 4000 mm long.

.2 Do not insulate exposed runouts to plumbing fixtures, chrome plated piping, valves, fittings.

Application	***Temperature (Celsius)***	***TIAC Code***	***Pipe Sizes (NPS) and Insulation Thickness (mm)***			
			to ½	***2 to 4***	***5 to 6***	***8 & Over***
Boiler Feed Water	N/A	A-1	25	25	25	25
Hot Water Heating	60-94	A-1	38	38	38	38
Hot Water Heating	Up to 59	A-1	38	38	38	38
Glycol Heating	60-94	A-1	38	38	38	38
Glycol Heating	Up to 59	A-1	38	38	38	38
Domestic HWS	N/A	A-1	25	25	25	25
Domestic CWS	N/A	A-3	13	13	13	13
Domestic HWR	N/A	A-1	25	25	25	25
Domestic CWS with Vapour Retarder	N/A	C-2	13	13	13	13
Refrigerant Hot Gas Liquid Suction	4-13	A-6	25	25	25	25
Refrigerant Hot Gas Liquid Suction	Below 4	A-6	25	25	38	38
RWL and RWP	N/A	C-2	25	25	25	25
Cooling Coil / AC Unit Cond. Drain	N/A	C-2	13	13	13	13

.7 Finishes:

.1 Exposed indoors: PVC jacket.

.2 Any areas where piping is exposed including mechanical rooms, mechanical penthouse, etc.: PVC jacket.

.3 Concealed, indoors: canvas on valves, fittings. No further finish.

.4 Use vapour retarder jacket on TIAC code A-3 insulation compatible with insulation.

.5 Outdoors: water-proof ABS jacket.

.6 Finish attachments: SS bands, at 150 mm on centre. Seals: closed.

.7 Installation: to appropriate TIAC code CRF/1 through CPF/5.

3.7 CLEANING

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

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

.1 Related Sections:

.1 Division 22, Division 23

1.2 REFERENCES

.1 Latest editions of listed standards to govern.

.2 American Society for Testing and Materials International (ASTM)

.1 ASTM E 202, Standard Test Methods for Analysis of Ethylene Glycols and Propylene Glycols.

1.3 CLEANING AND START-UP OF MECHANICAL PIPING SYSTEMS

.1 In accordance with Section 23 08 02 - Cleaning and Start-up of Mechanical Piping Systems.

1.4 HYDRONIC SYSTEMS - PERFORMANCE VERIFICATION (PV)

.1 Perform hydronic systems performance verification after cleaning is completed and system is in full operation.

.2 When systems are operational, perform following tests:

.1 Conduct full scale tests at maximum design flow rates, temperatures and pressures for continuous consecutive period of 48 hours to demonstrate compliance with design criteria.

.2 Verify performance of hydronic system circulating pumps as specified, recording system pressures, temperatures, fluctuations by simulating maximum design conditions and varying.

.1 Pump operation.

.2 Boiler and/or chiller operation.

.3 Pressure bypass open/closed.

.4 Control pressure failure.

.5 Maximum heating demand.

.6 Maximum cooling demand.

.7 Boiler and/or chiller failure.

.8 Outdoor reset. Re-check heat exchanger output supply temperature at 100% and 50% reset, maximum water temperature.

1.5 HYDRONIC SYSTEM CAPACITY TEST

.1 Perform hydronic system capacity tests after:

.1 TAB has been completed

.2 Verification of operating, limit, safety controls.

.3 Verification of primary and secondary pump flow rates.

.4 Verification of accuracy of temperature and pressure sensors and gauges.

.2 Calculate system capacity at test conditions.

.3 Using manufacturer's published data and calculated capacity at test conditions, extrapolate system capacity at design conditions.

.4 When capacity test is completed, return controls and equipment status to normal operating conditions.

.5 Submit sample of system water to approved testing agency to determine if chemical treatment is correct. Include cost.

.6 Heating system capacity test:

.1 Perform capacity test when ambient temperature is within 10% of design conditions. Simulate design conditions by:

.1 Increasing OA flow rates through heating coils (in this case, monitor heating coil discharge temperatures to ensure that coils are not subjected to freezing conditions) or

.2 Reducing space temperature by turning off heating system for sufficient period of time before starting testing.

.2 Test procedures:

.1 Open fully heat exchanger, heating coil and radiation control valves.

.2 With boilers on full firing and hot water heating supply temperature stabilized, record flow rates and supply and return temperatures simultaneously.

.3 Conduct flue gas analysis test on boilers at full load and at low fire conditions.

1.6 CONDENSER WATER AND HUMIDIFICATION SYSTEMS (IF APPLICABLE)

.1 In addition to procedures specified above, perform following:

.1 Add chemicals once per week as required.

.2 Perform TAB as specified Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.

.3 Set up and adjust drip feeders, timer controls, pump strokes as required to maintain required chemical feed rates.

1.7 GLYCOL SYSTEMS (IF APPLICABBLE)

.1 Test to prove concentration will prevent freezing to minus 40 degrees C Test inhibitor strength and include in procedural report. Refer to ASTM E 202.

1.8 GASEOUS FUEL SYSTEMS (IF APPLICABLE)

.1 Operation tests:

.1 Measure gas pressure at gas meter outlet and at burner manifold.

.2 Verify details of temperature and pressure compensation at meter.

.3 Verify settings, operation, venting of high and low pressure cut-outs, alarms.

.4 Check terminals of vents for gas pressure regulators.

1.9 POTABLE WATER SYSTEMS

.1 When cleaning is completed and system filled:

.1 Verify performance of equipment and systems as specified elsewhere in Division 23.

.2 Check for proper operation of water hammer arrestors. Run one outlet for 10 seconds, then shut of water immediately. If water hammer occurs, replace water hammer arrestor or recharge air chambers. Repeat for each outlet and flush valve.

.3 Confirm water quality consistent with supply standards, verifying that no residuals remain resulting from flushing and/or cleaning.

1.10 WET AND DRY PIPE SPRINKLER SYSTEM, STANDPIPE AND HOSE SYSTEMS (IF APPLICABLE)

.1 Cleaning, testing, start-up, performance verification of equipment, systems, components, and devices is specified elsewhere in Division 23.

.2 Verification of controls, detection devices, alarm devices is specified Division 26.

.3 Demonstrate that fire hose will reach to most remote location regardless of partitions, and obstructions.

.4 Verify operation of interlocks between HVAC systems and fire alarm systems.

1.11 SANITARY AND STORM DRAINAGE SYSTEMS

.1 Buried systems: perform tests prior to back-filling. Perform hydraulic tests to verify grades and freedom from obstructions.

.2 Ensure that traps are fully and permanently primed.

.3 Ensure that fixtures are properly anchored, connected to system.

.4 Operate flush valves, tank and operate each fixture to verify drainage and no leakage.

.5 Cleanouts: refer to Section 22 42 00 - Plumbing Fixtures.

1.12 REPORTS

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

1.13 TRAINING

.1 In accordance with Section 01 91 41 - Commissioning: Training, supplemented as specified herein.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

.1 Section Includes:

.1 Procedures and cleaning solutions for cleaning mechanical piping systems.

.2 Related Sections:

.1 Division 23

.3 This section shall apply to the existing heating system as well. Existing heating system shall be cleaned in accordance with the specification prior to being returned into service)

1.2 REFERENCES

.1 Latest editions of listed standards to govern.

.2 American Society for Testing and Materials International (ASTM)

.1 ASTM E 202, Standard Test Methods for Analysis of Ethylene Glycols and Propylene Glycols.

.3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

1.3 SUBMITTALS

.1 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures. Include product characteristics, performance criteria, and limitations.

.2 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.

.1 Instructions: submit manufacturer's installation instructions.

1.4 QUALITY ASSURANCE

.1 Health and Safety:

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Deliver, store and handle in accordance with manufacturer's written instructions

.2 Replace any damaged or worn equipment / products with new prior to turnover to the Owner.

PART 2 - PRODUCTS

2.1 CLEANING SOLUTIONS

.1 Tri-sodium phosphate: 0.40 kg per 100 L water in system.

.2 Sodium carbonate: 0.40 kg per 100 L water in system.

.3 Low-foaming detergent: 0.01 kg per 100 L water in system.

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 CLEANING HYDRONIC SYSTEMS

.1 Timing: systems operational, hydrostatically tested and with safety devices functional, before cleaning is carried out.

.2 Cleaning Agency:

.1 Retain qualified water treatment specialist to perform system cleaning.

.3 Install instrumentation such as flow meters, orifice plates, pitot tubes, flow metering valves only after cleaning is certified as complete by water treatment specialist.

.4 Cleaning procedures:

.1 Provide detailed report outlining proposed cleaning procedures at least 4 weeks prior to proposed starting date. Report to include:

.1 Cleaning procedures, flow rates, elapsed time.

.2 Chemicals and concentrations used.

.3 Inhibitors and concentrations.

.4 Specific requirements for completion of work.

.5 Special precautions for protecting piping system materials and components.

.6 Complete analysis of water used to ensure water will not damage systems or equipment.

.5 Conditions at time of cleaning of systems:

.1 Systems: free from construction debris, dirt and other foreign material.

.2 Control valves: operational, fully open to ensure that terminal units can be cleaned properly.

.3 Strainers: clean prior to initial fill.

.4 Install temporary filters on pumps not equipped with permanent filters.

.5 Install pressure gauges on strainers to detect plugging.

.6 Report on Completion of Cleaning:

.1 When cleaning is completed, submit report, complete with certificate of compliance with specifications of cleaning component supplier.

.7 Hydronic Systems:

.1 Fill system with water, ensure air is vented from system.

.2 Fill expansion tanks 1/3 to 1/2 full, charge system with compressed air to at least 35 kPa (does not apply to diaphragm type expansion tanks).

.3 Use water meter to record volume of water in system to +/- 0.5%.

.4 Add chemicals under direct supervision of chemical treatment supplier.

.5 Closed loop systems: circulate system cleaner at 60 degrees C for at least 36 h. Drain as quickly as possible. Refill with water and inhibitors. Test concentrations and adjust to recommended levels.

.6 Flush velocity in system mains and branches to ensure removal of debris. System pumps may be used for circulating cleaning solution provided that velocities are adequate.

.7 Add chemical solution to system.

.8 Establish circulation, raise temperature slowly to maximum design 82 degrees C minimum. Circulate for 12 h, ensuring flow in all circuits. Remove heat, continue to circulate until temperature is below 38 degrees C. Drain as quickly as possible. Refill with clean water. Circulate for 6 h at design temperature. Drain and repeat procedures specified above. Flush through low point drains in system. Refill with clean water adding to sodium sulphite (test for residual sulphite).

.8 Glycol Systems:

.1 In addition to procedures specified above perform specified procedures.

.2 Test to prove concentration will prevent freezing to minus 40 degrees C. Test inhibitor strength and include in procedural report. Refer to ASTM E 202.

3.3 START-UP OF HYDRONIC SYSTEMS

.1 After cleaning is completed and system is filled:

.1 Establish circulation and expansion tank level, set pressure controls.

.2 Ensure air is removed.

.3 Check pumps to be free from air, debris, possibility of cavitation when system is at design temperature.

.4 Dismantle system pumps used for cleaning, inspect, replace worn parts, install new gaskets and new set of seals.

.5 Clean out strainers repeatedly until system is clean.

.6 Commission water treatment systems as specified in Section 23 25 00 - HVAC Water Treatment Systems.

.7 Check water level in expansion tank with cold water with circulating pumps OFF and again with pumps ON.

.8 Repeat with water at design temperature.

.9 Check pressurization to ensure proper operation and to prevent water hammer, flashing, cavitation. Eliminate water hammer and other noises.

.10 Bring system up to design temperature and pressure over a 48 hour period.

.11 Perform TAB as specified in Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.

.12 Adjust pipe supports, hangers, springs as necessary.

.13 Monitor pipe movement, performance of expansion joints, loops, guides, anchors.

.14 If sliding type expansion joints bind or if bellows type expansion joints flex incorrectly, shut down system, re-align, repeat start-up procedures.

.15 Re-tighten bolts using torque wrench, to compensate for heat-caused relaxation. Repeat several times during commissioning.

.16 Check operation of drain valves.

.17 Adjust valve stem packings as systems settle down.

.18 Fully open balancing valves (except those that are factory-set).

.19 Check operation of over-temperature protection devices on circulating pumps.

.20 Adjust alignment of piping at pumps to ensure flexibility, adequacy of pipe movement, absence of noise or vibration transmission.

3.4 CLEANING

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

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

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

.1 Section Includes.

.1 Materials and installation for steel piping, valves and fittings for hydronic systems in building services piping.

.2 Related Sections.

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 74 21 - Construction/Demolition Waste Management And Disposal.

.3 Section 01 35 29.06 - Health and Safety Requirements.

.4 Section 01 78 00 - Closeout Submittals.

.5 Section 21 05 01 - Common Work Results for Mechanical.

.6 Section 23 05 17 - Pipe Welding.

.7 Section 23 08 02 - Cleaning and Start-up of Mechanical Piping Systems.

.8 Section 23 05 01 - Installation of Pipework.

.9 Section 23 05 23.01 - Valves - Bronze.

.10 Section 23 05 23.02 - Valves - Cast Iron.

.11 Section 23 05 23.03 - Valves - Cast steel.

.12 Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.

.13 Section 23 08 01 - Performance Verification of Mechanical Piping.

1.2 REFERENCES

.1 Latest editions of listed standards to govern.

.2 American Society of Mechanical Engineers (ASME).

.1 ASME B16.1, Cast Iron Pipe Flanges and Flanged Fittings.

.2 ASME B16.3, Malleable Iron Threaded Fittings.

.3 ASME B16.5, Pipe Flanges and Flanged Fittings.

.4 ASME B16.9, Factory-Made Wrought Buttwelding Fittings.

.5 ASME B18.2.1, Square and Hex Bolts and Screws (Inch Series).

.6 ASME B18.2.2, Square and Hex Nuts (Inch Series).

.3 American Society for Testing and Materials International, (ASTM).

.1 ASTM A 47/A 47M, Standard Specification for Ferritic Malleable Iron Castings.

.2 ASTM A 53/A 53M, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless.

.3 ASTM A 536, Standard Specification for Ductile Iron Castings.

.4 ASTM B 61, Standard Specification for Steam or Valve Bronze Castings.

.5 ASTM B 62, Standard Specification for Composition Bronze or Ounce Metal Castings.

.6 ASTM E 202, Standard Test Method for Analysis of Ethylene Glycols and Propylene Glycols.

.4 American Water Works Association (AWWA).

.1 AWWA C111, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

.5 Canadian Standards Association (CSA International).

.1 CSA B242-M1980, Groove and Shoulder Type Mechanical Pipe Couplings.

.2 CAN/CSA W48, Filler Metals and Allied Materials for Metal Arc Welding (Developed in cooperation with the Canadian Welding Bureau).

.6 Manufacturer's Standardization of the Valve and Fittings Industry (MSS).

.1 MSS-SP-67-025, Butterfly Valves.

.2 MSS-SP-70, Cast Iron Gate Valves, Flanged and Threaded Ends.

.3 MSS-SP-71, Cast Iron Swing Check Valves Flanged and Threaded Ends.

.4 MSS-SP-80, Bronze Gate, Globe, Angle and Check Valves.

.5 MSS-SP-85, Cast Iron Globe and Angle Valves, Flanged and Threaded Ends.

1.3 SUBMITTALS

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

.2 Closeout Submittals:

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

.1 Contractor to submit grooved product submittals, Grooved product to be of one manufacture, and must have current CRN #'s

.2 Grooved product Manufacturer to supply on site tool and products installation training.

1.4 MAINTENANCE

.1 Extra Materials.

.1 Provide following spare parts:

.1 Valve seats: one for every ten valves, each size. Minimum one.

.2 Discs: one for every ten valves, each size. Minimum one.

.3 Stem packing: one for every ten valves, each size. Minimum one.

.4 Valve handles: two of each size.

.5 Gaskets for flanges: one for every ten flanges.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle products in accordance with manufacturer’s written instructions

.2 Replace any damaged or worn equipment / products with new prior to turnover to the Owner.

PART 2 - PRODUCTS

2.1 PIPE

.1 Steel pipe: to ASTM A53/A53M, Grade B, as follows:

.1 To NPS 8: Schedule 40

.2 NPS 10: Schedule 80.

.3 NPS12 and over, 10 mm wall thickness.

2.2 PIPE JOINTS

.1 NPS2 and under: screwed fittings with PTFE tape or lead-free pipe dope.

.2 NPS2-1/2 and over: welding fittings and flanges to CAN/CSA W48.

.3 Roll grooved: NPS 2 1/2 and over shall be rigid coupling to CSA B242 with angle bolt pattern. Felxible couplings shall be used where system flexibility is desired at pumps and other mechanical equipment to reduce noise and vibration. 3 Flexible couplings are required near source. All components shall be one manufacturer. systems acceptable provided specifications are met and systems are Engineer Approved.

.1 Roll grooved: standard rigid coupling to CSA B242. Victaulic # 107 Quick Vic couplings 2" to 8" or Victaulic # 07 Couplings 2" and above

.2 Flexible Victaulic Couplings to CSA B242 to be used where noted on Engineers drawings Victaulic # 177 Flexible Couplings

.4 Flanges: plain or raised face, weld neck to AWWA C111.

.5 Orifice flanges: slip-on raised face, 2100 kPa.

.6 Flange gaskets: to ANSI/AWWA C111/A21.11.

.7 Pipe thread: taper.

.8 Bolts and nuts: to ANSI/ASME B18.2.1 and ANSI/ASME B18.2.2.

.9 Roll grooved coupling gaskets: type EPDM, 30* C To + 110*C for continuous operation. Acceptable on Hot Water / Glycol Water / Chilled Water / and Condenser Water in all areas.

2.3 FITTINGS

.1 Screwed fittings: malleable iron, to ASME B16.3, Class 150.

.2 Pipe flanges and flanged fittings:

.1 Cast iron: to ASME B16.1, Class 125.

.2 Steel: to ASME B16.5.

.3 Butt-welding fittings: steel, to ASME B16.9.

.4 Unions: malleable iron, to ASTM A 47/A 47M and ASME B16.3.

.5 Fittings for roll grooved piping: ductile iron to ASTM A 47/A 47M, Victaulic Grooved Fittings.

2.4 VALVES

.1 Connections:

.1 NPS2 and smaller: screwed ends.

.2 NPS2.1/2 and larger: Flanged grooved ends.

.2 Gate valves: to MSS-SP-70 to MSS-SP-80 Application: Isolating equipment, control valves, pipelines:

.1 NPS2 and under:

.1 Mechanical Rooms and Penthouse: Class 125, rising stem, split wedge disc, as specified Section 23 05 23.01 - Valves - Bronze.

.2 Elsewhere: Class 125, non- rising stem, solid wedge disc, as specified Section 23 05 23.01 - Valves - Bronze.

.2 NPS21/2 and over:

.1 Mechanical Rooms and Penthouse: rising stem, split wedge disc, lead free bronze trim, as specified Section 23 05 23.02 - V.lves - Cast Iron: Gate, Globe, Check

.1 Operators: Handle

.2 Elsewhere: Non- rising stem, solid wedge disc, lead free bronze trim, as specified Section 23 05 23.02 - V.lves - Cast Iron: Gate, Globe, Check

.1 Operators: Handle

.3 Butterfly valves: to MSS-SP-67 Application: Isolating cells or section of multiple component equipment (eg. multi-section coils, multi-cell cooling towers):

.1 NPS 21/2 and over: Grooved ends: as specified Section 23 05 17 - Pipe Welding.

.2 Grooved End: Victaulic / Vic 300 Master Seal Butterfly Valves

.4 Globe valves: to MSS-SP- 80 85 Application: Throttling, flow control, emergency bypass:

.1 NPS2 and under:

.1 Mechanical Rooms: with PTFE disc, as specified Section 23 05 23.01 - Valves - Bronze.

.2 Elsewhere: Globe, with composition disc, as specified Section 23 05 23.01 - Valves - Bronze.

.2 NPS21/2 and over:

.1 With composition bronze disc, bronze trim, as specified Section 23 05 23.02 - Valves - Cast Iron: Gate, Globe, Check.

.2 Operators: Hand Wheel

.5 Circuit Balancing Valves:

.1 General:

.1 Y style globe valve, designed to provide precise flow measurement and control, with valved ports for connecting to differential pressure meter.

.2 Accuracy:

.1 Readout to be within plus or minus 2% of actual flow at design flow rate .

.3 NPS 2 and under:

.1 Bronze or brass copper alloy (Ametal) construction; maximum WP: 1700 kPa (246 psi); Max temp: 121°C (250°F), screwed ends, Teflon disc, screwed in bonnet.

.2 Flow control: at least four(4) full turns of hand wheel with digital hand wheel and tamperproof concealed mechanical memory .

.3 For flows less than 3.8 L/min (I ga/min), use a reduced flow type unit.

.4 NPS 2.1/2 and over:

.1 Cast iron construction: bonnet and trim of bronze or brass copper alloy (Ametal); bonnet bolts of stainless steel maximum WP: 1700 kPa (246 psi); Maximum temp: 121 °C (250°F); ANSI Class 125 flanged ends .

.2 Flow control: at least 8 full turns of hand wheel with vernier type ring settings and tamperproof concealed mechanical memory.

.5 Insulation: use prefabricated shipping packaging of 5.4 R polyurethane as insulation for installation.

.6 Drain connection:

.1 NPS 3/4 valved and capped drain connection suitable for hose socket to be incorporated into the valve body or provided as separate item .

.7 Acceptable Manufacturer: B&G or approved alternate.

.6 Drain valves: Gate, Class 125, non-rising stem, solid wedge disc, as specified Section 23 05 23.01 - Valves - Bronze.

.7 Bypass valves on gate glove valves NPS8 and larger: NPS3/4, Globe, with PTFE disc as specified Section 23 05 23.01 - Valves - Bronze.

.8 Swing check valves: to MSS-SP-71.

.1 NPS2 and under:

.1 Class 125, swing, with composition disc, as specified Section 23 05 23.01 - Valves - Bronze.

.2 NPS21/2 and over:

.1 Grooved ends: as specified Section 23 05 23.02 - Valves - Cast Iron: Gate, Globe, Check. Victaulic # 712 Check Valve

.9 Silent check valves:

.1 NPS2 and under:

.1 As specified Section 23 05 23.01 - Valves - Bronze.

.2 NPS21/2 and over:

.1 Grooved ends: as specified Section 23 05 23.02 - Valves - Cast Iron: Gate, Globe, Check. Victaulic # 716 Check Valve.

.10 Ball valves:

.1 NPS2 and under: as specified Section 23 05 23.01 - Valves - Bronze.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

.1 Install pipework in accordance with Section 23 05 01 - Installation of Pipe Work.

.2 Install concealed pipes close to building structure to keep furring space to minimum. Install to conserve headroom and space. Run exposed piping parallel to walls. Group piping wherever practical.

.3 Provide clearance for installation of insulation and access for maintenance of equipment, valves and fittings.

3.2 CIRCUIT BALANCING VALVES

.1 Install flow measuring stations and flow balancing valves as indicated.

.2 Remove handwheel after installation and when TAB is complete.

.3 Tape joints in prefabricated insulation on valves installed in chilled water mains.

3.3 CLEANING, FLUSHING AND START-UP

.1 In accordance with Section 23 08 02 - Cleaning and Start-Up of Mechanical Piping Systems.

3.4 TESTING

.1 Test system in accordance with Section 2. 05 01 - Common Work Results for Mechanical

.2 For glycol systems, retest with ethylene glycol to ASTM E 202, inhibited, for use in building system after cleaning. Repair leaking joints, fittings or valves.

3.5 THERMOWELLS

.1 Install thermowells for sensors in locations indicated or as otherwise directed by the Controls Contractor

3.6 BALANCING

.1 Balance water systems to within plus or minus 5 % of design output.

.2 Refer to Section 23 05 93 - Testing, Adjusting and Balancing for HVAC for applicable procedures.

3.7 FILLING OF SYSTEM

.1 Refill system with domestic water, where applicable.

.2 Refill glycol system with concentration as specified.

3.8 FIELD QUALITY CONTROL

.1 Testing:

.1 Test system in accordance with Section 23 08 01 -Performance Verification of Mechanical Piping.

.2 For glycol systems, retest with as indicated glycol to ASTM E 202, inhibited, for use in building system after cleaning. Repair leaking joints, fittings or valves.

.2 Balancing:

.1 Balance water systems to within plus or minus 5 % of design output.

.2 Refer to Section for applicable procedures.

.3 Glycol Charging:

.1 Provide mixing tank and positive displacement pump for glycol charging (GFT-1).

.1 Acceptable manufacture: Axiom

.2 Retest for concentration to ASTM E 202 after cleaning.

.3 Provide report to Consultant.

.4 Verification requirements in accordance with Section 01 47 17 - Sustainable Requirements: Contractor's Verification, include:

.1 Materials and resources.

.2 Storage and collection of recyclables.

.3 Construction waste management.

.4 Resource reuse.

.5 Recycled content.

.6 Local/regional materials.

.7 Low-emitting materials.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 Latest editions of listed standards to govern.

.2 American Society of Heating Refrigeration and Air-Conditioning Engineers (ASHRAE)

.1 Standard 90.1-2007, Energy Standard for Buildings Except Low-Rise Residential Buildings.

.3 Electrical Equipment Manufacturers Advisory Council (EEMAC)

.4 Canadian Standards Association (CSA International)

.1 CSA-B214-07, Installation Code for Hydronic Heating Systems.

.5 National Electrical Manufacturers' Association (NEMA)

.1 NEMA MG 1-2006, Motors and Generators.

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 and datasheets for pump, circulator, and equipment, and include product characteristics, performance criteria, physical size, finish and limitations indicate point of operation, and final location in field assembly.

.3 Submit manufacturer's detailed composite wiring diagrams for control systems showing factory installed wiring and equipment on packaged equipment or required for controlling devices or ancillaries, accessories and controllers.

1.3 CLOSEOUT SUBMITTALS

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

1.4 MAINTENANCE

.1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle in accordance with manufacturer’s written instructions.

.2 Deliver materials to site in original factory packaging, labeled with manufacturer's name, address.

.3 Replace any damaged or worn equipment / products with new prior to turnover to the Owner.

PART 2 - PRODUCTS

2.1 PRODUCT CLARIFICATION

.1 The product information provided in the following sections of this specification in some cases may be generic descriptions and as such do not necessarily reflect the actual make, model, type, and performance characteristics required for this project. The contractor shall refer to equipment schedules and notes on drawings for more detailed information pertaining to equipment performance and capacities specifically required for equipment to be furnished and installed on this project.

2.2 EQUIPMENT

.1 Size and select components to: CSA-B214.

2.3 VERTICAL IN-LINE CIRCULATORS

.1 Volute: cast iron radially split, with tapped openings for venting, draining and gauge connections, with screwed or flanged suction and discharge connections.

.2 Impeller: as indicated

.3 Shaft: alloy steel with bronze sleeve bearing, integral thrust collar.

.4 Seal assembly: mechanical for service to 135 degrees C.

.5 Motor: Wet rotor - see schedule.

.6 Capacity: as indicated.

.7 Design pressure: 1000 kPa.

.8 Acceptable product: Bell and Gosset, WILO, Grunfoss, Taco,Armstrong, or approved alternate.

2.4 CENTRIFUGAL BASE MOUNT CIRCULATORS

.1 Volute: cast iron radially split, with tapped openings for venting, draining and gauge connections, with screwed or flanged suction and discharge connections.

.2 Impeller: as indicated.

.3 Shaft: alloy steel with bronze sleeve bearing, integral thrust collar.

.4 Seal assembly: mechanical for service to 135 degrees C.

.5 Motor: Wet rotor - see schedule.

.6 Capacity: as indicated.

.7 Design pressure: 1000 kPa.

.8 Acceptable product: Bell and Gosset, WILO, Grunfoss, Taco, Armstrong, or approved alternate.

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 hydronic pumps to: CSA-B214.

.2 In line circulators: install as indicated by flow arrows.

.1 Support at inlet and outlet flanges or unions.

.2 Install with bearing lubrication points accessible.

.3 Ensure that pump body does not support piping or equipment.

.1 Provide stanchions or hangers for this purpose.

.2 Refer to manufacturer's installation instructions for details.

.4 Install volute venting pet cock in accessible location.

.5 Check rotation prior to start-up.

.6 Install pressure gauge test cocks.

3.3 START-UP

.1 General:

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

.2 In accordance with manufacturer's recommendations.

.2 Procedures:

.1 After starting pump, check for proper, safe operation.

.2 Check installation, operation of mechanical seals, packing gland type seals. Adjust as necessary.

.3 Check base for free-floating, no obstructions under base.

.4 Run-in pumps for 12 continuous hours minimum.

.5 Verify operation of over-temperature and other protective devices under low- and no-flow condition.

.6 Eliminate air from scroll casing.

.7 Adjust water flow rate through water-cooled bearings.

.8 Adjust flow rate from pump shaft stuffing boxes to manufacturer's recommendation.

.9 Adjust alignment of piping and conduit to ensure true flexibility.

.10 Eliminate cavitation, flashing and air entrainment.

.11 Adjust pump shaft seals, stuffing boxes, glands.

.12 Measure pressure drop across strainer when clean and with flow rates as finally set.

.13 Replace seals if pump used to degrease system or if pump used for temporary heat.

.14 Verify lubricating oil levels.

3.4 PERFORMANCE VERIFICATION (PV)

.1 General:

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

.2 Verify that manufacturer's performance curves are accurate.

.3 Ensure valves on pump suction and discharge provide tight shut-off.

.4 Net Positive Suction Head (NPSH):

.1 Application: measure NPSH for pumps which operate on open systems and with water at elevated temperatures.

.2 Measure using procedures prescribed in Section 01 91 13 - General Commissioning (Cx) Requirements.

.3 Where procedures do not exist, discontinue PV, report to Consultant and await instructions.

.5 Multiple Pump Installations - Series and Parallel:

.1 Repeat PV procedures specified above for pump performance and pump BHP for combinations of pump operations.

.6 Mark points of design and actual performance at design conditions as finally set upon completion of TAB.

.7 Commissioning Reports: in accordance with Section 01 91 13 - General Commissioning (Cx) Requirements reports supplemented as specified herein. Reports to include:

.1 Record of point(s) of actual performance at maximum and minimum conditions and for single and parallel operation as finally set at completion of commissioning on pump curves.

.2 Use Report Forms specified in Section 01 91 13 - General Commissioning (Cx) Requirements: Report Forms and Schematics.

.3 Pump performance curves (family of curves).

3.5 OPERATION REQUIREMENTS

.1 Operational requirements, include:

.2 Repair and maintenance materials and instructions.

3.6 CLEANING

.1 Remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

.1 Section Includes:

.1 Materials and installation for copper tubing and fittings for refrigerant.

1.2 REFERENCES

.1 Latest editions of listed standards to govern.

.2 American Society of Mechanical Engineers (ASME)

.1 ASME B16.22-01, Wrought Copper and Copper Alloy Solder - Joint Pressure Fittings.

.2 ASME B16.24-02, Cast Copper Pipe Flanges and Flanged Fittings: Class 150, 300, 400, 600, 900, 1500 and 2500.

.3 ASME B16.26-88, Cast Copper Alloy Fittings for Flared Copper Tubes.

.4 ASME B31.5-01, Refrigeration Piping and Heat Transfer Components.

.3 American Society for Testing and Materials International (ASTM)

.1 ASTM A 307-04, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.

.2 ASTM B 280-03, Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.

.4 Canadian Standards Association (CSA International)

.1 CSA B52-99, Mechanical Refrigeration Code.

.5 Environment Canada (EC)

.1 EPS 1/RA/1-96, Environmental Code of Practice for the Elimination of Fluorocarbon Emissions from Refrigeration and Air Conditioning Systems.

.6 Health Canada / Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet for piping, fittings and equipment.

.3 Test Reports: submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.

.4 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.5 Instructions: submit manufacturer's installation instructions.

.6 Closeout submittals: submit maintenance and engineering data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.4 DELIVERY, STORAGE AND HANDLING

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

.2 Deliver, store and handle in accordance with manufacturer’s written instruction.

.3 Deliver materials to site in original factory packaging, labeled with manufacturer's name, address.

.4 Replace any damaged or worn equipment / products with new prior to turnover to the Owner.

PART 2 - PRODUCTS

2.1 TUBING

.1 Processed for refrigeration installations, deoxidized, dehydrated and sealed.

.1 Hard copper: to ASTM B 280, type ACR.

.2 Annealed copper: to ASTM B 280, with minimum wall thickness as per CSA B52 and ASME B31.5.

2.2 FITTINGS

.1 Service: design pressure 2070 kPa and temperature 121 degrees C.

.2 Brazed:

.1 Fittings: wrought copper to ASME B16.22.

.2 Joints: silver solder, 15% Ag-80% Cu-5%P and non-corrosive flux.

.3 Flanged:

.1 Bronze or brass, to ASME B16.24, Class 150 and Class 300.

.2 Gaskets: suitable for service.

.3 Bolts, nuts and washers: to ASTM A 307, heavy series.

.4 Flared:

.1 Bronze or brass, for refrigeration, to ASME B16.26.

2.3 PIPE SLEEVES

.1 Hard copper or steel, sized to provide 6 mm clearance around between sleeve and uninsulated pipe or between sleeve and insulation.

2.4 VALVES

.1 22 mm and under: Class 500, 3.5 Mpa, globe or angle non-directional type, diaphragm, packless type, with forged brass body and bonnet, moisture proof seal for below freezing applications, brazed connections.

.2 Over 22 mm: Class 375, 2.5 Mpa, globe or angle type, diaphragm, packless type, back-seating, cap seal, with cast bronze body and bonnet, moisture proof seal for below freezing applications, brazed connections.

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 GENERAL

.1 Install in accordance with CSA B52, EPS1/RA/1 and ASME B31.5 Section 23 05 01 - Installation of Pipework.

3.3 BRAZING PROCEDURES

.1 Bleed inert gas into pipe during brazing.

.2 Remove valve internal parts, solenoid valve coils, sight glass.

.3 Do not apply heat near expansion valve and bulb.

3.4 PIPING INSTALLATION

.1 General:

.2 Hard drawn copper tubing: do not bend. Minimize use of fittings.

.2 Hot gas lines:

.1 Pitch at least 1:240 down in direction of flow to prevent oil return to compressor during operation.

.2 Provide trap at base of risers greater than 2400 mm high and at each 7600 mm thereafter.

.3 Provide inverted deep trap at top of risers.

.4 Provide double risers for compressors having capacity modulation.

.1 Large riser: install traps as specified.

.2 Small riser: size for 5.1 m/s at minimum load. Connect upstream of traps on large riser.

3.5 PRESSURE AND LEAK TESTING

.1 Close valves on factory charged equipment and other equipment not designed for test pressures.

.2 Leak test to CSA B52 before evacuation to 2MPa and 1MPa on high and low sides respectively.

.3 Test Procedure: build pressure up to 35 kPa with refrigerant gas on high and low sides. Supplement with nitrogen to required test pressure. Test for leaks with electronic or halide detector. Repair leaks and repeat tests.

3.6 FIELD QUALITY CONTROL

.1 Site Tests/Inspection:

.1 Close service valves on factory charged equipment.

.2 Ambient temperatures to be at least 12 degrees C for at least 12 hours before and during dehydration.

.3 Use copper lines of largest practical size to reduce evacuation time.

.4 Use two-stage vacuum pump with gas ballast on 2nd stage capable of pulling 5Pa absolute and filled with dehydrated oil.

.5 Measure system pressure with vacuum gauge. Take readings with valve between vacuum pump and system closed.

.6 Triple evacuate system components containing gases other than correct refrigerant or having lost holding charge as follows:

.1 Twice to 14 Pa absolute and hold for 4 h.

.2 Break vacuum with refrigerant to 14 kPa.

.3 Final to 5 Pa absolute and hold for at least 12 h.

.4 Isolate pump from system, record vacuum and time readings until stabilization of vacuum.

.5 Submit test results to Consultant.

.7 Charging:

.1 Charge system through filter-drier and charging valve on high side. Low side charging not permitted.

.2 With compressors off, charge only amount necessary for proper operation of system. If system pressures equalize before system is fully charged, close charging valve and start up. With unit operating, add remainder of charge to system.

.3 Re-purge charging line if refrigerant container is changed during charging process.

.8 Checks:

.1 Make checks and measurements as per manufacturer's operation and maintenance instructions.

.2 Record and report measurements to Consultant.

.9 .9 Manufacturer's Field Services:

.1 Have manufacturer of products, supplied under this Section, review Work involved in the handling, installation/application, protection and cleaning, of its product[s] and submit written reports, in acceptable format, to verify compliance of Work with Contract.

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

.3 Schedule site visits, to review Work, at stages listed:

.1 After delivery and storage of products, and when preparatory Work, or other Work, on which the Work of this Section depends, is complete but before installation begins.

.2 Twice during progress of Work at 25% and 60% complete.

.3 Upon completion of the Work, after cleaning is carried out.

.4 Obtain reports, within 3 days of review, and submit, immediately, to Consultant.

3.7 CLEANING

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

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

.1 Section Includes:

.1 Materials and installation of low-pressure metallic ductwork, joints and accessories.

.2 Sustainable requirements for construction and verification.

.2 Related Sections:

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 47 13 - Sustainable Requirements: Concept Design.

.3 Section 01 47 15 - Sustainable Requirements: Construction.

.4 Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.5 Section 02 81 01 - Hazardous Materials.

.6 Section 07 84 00 - Fire stopping.

.7 Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.

.8 Section 23 05 94 - Pressure Testing of Ducted Air Systems.

.9 Section 23 41 00 - Particulate Air Filtration.

1.2 REFERENCES

.1 Latest editions of listed standards to govern.

.2 American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE).

.3 American Society for Testing and Materials International, (ASTM).

.1 ASTM A 480/A 480M-03c, Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet and Strip.

.2 ASTM A 635/A 635M-02, Standard Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Carbon, Hot Rolled.

.3 ASTM A 653/A 653M-03, Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.

.4 National Fire Protection Association (NFPA).

.1 NFPA 90A-02, Standard for the Installation of Air-Conditioning and Ventilating Systems.

.2 NFPA 90B-02, Standard for the Installation of Warm Air Heating and Air-Conditioning Systems.

.3 NFPA 96-01, Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.

.5 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA).

.1 SMACNA HVAC Duct Construction Standards - Metal and Flexible, 2nd Edition 1995 and Addendum No. 1, 1997.

.2 SMACNA HVAC Air Duct Leakage Test Manual, 1985, 1st Edition.

.3 IAQ Guideline for Occupied Buildings Under Construction 1995, 1st Edition.

1.3 SUBMITTALS

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

.2 Product Data: submit WHMIS MSDS - Material Safety Data Sheets for the following:

.1 Sealants.

.2 Tape.

.3 Proprietary Joints.

1.4 QUALITY ASSURANCE

.1 Certification of Ratings:

.1 Catalogue or published ratings shall be those obtained from tests carried out by manufacturer or independent testing agency signifying adherence to codes and standards.

.2 Health and Safety:

.3 Indoor Air Quality (IAQ) Management Plan.

.1 Develop and implement an Indoor Air Quality (IAQ) Management Plan in accordance with Section 01 47 15 - Sustainable Requirements: Construction for construction and preoccupancy phases of building.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Protect on site stored or installed absorptive material from moisture damage.

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

.1 Handle and dispose of hazardous materials in accordance with CEPA, TDGA, Regional and Municipal regulations.

.3 Replace any damaged or worn equipment / products with new prior to turnover to the Owner.

PART 2 - PRODUCTS

2.1 SEAL CLASSIFICATION

.1 Classification as follows:

Maximum Pressure (Pa)	*SMACNA Seal Class*
500	C
250	C
125	A

.2 Seal classification:

.1 Class A: longitudinal seams, transverse joints, duct wall penetrations and connections made airtight with sealant and tape.

.2 Class B: longitudinal seams, transverse joints and connections made airtight with sealant tape.

.3 Class C: transverse joints and connections made air tight with gaskets. Longitudinal seams unsealed.

.4 Unsealed seams and joints.

2.2 SEALANT

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

2.3 TAPE

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

2.4 DUCT LEAKAGE

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

2.5 FITTINGS

.1 Fabrication: to SMACNA.

.2 Radiused elbows.

.1 Rectangular: standard radius

.2 Round: smooth radius. Centreline radius: 1.5 times diameter.

.3 Mitred elbows, rectangular:

.1 To 400 mm: with single thickness turning vanes.

.2 Over 400 mm: with double thickness turning vanes.

.4 Branches:

.1 Rectangular main and branch: with radius on branch 1.5 times width of duct 45 degrees entry on branch.

.2 Round main and branch: enter main duct at 45 degrees.

.3 Provide volume control damper in branch duct near connection to main duct.

.4 Main duct branches: with splitter damper.

.5 Transitions:

.1 Diverging: 20 degrees maximum included angle.

.2 Converging: 30 degrees maximum included angle.

.6 Offsets: Full radiused elbows as indicated

.7 Obstruction deflectors: maintain full cross-sectional area.

2.6 FIRE STOPPING

.1 Retaining angles around duct, on both sides of fire separation must be installed.

.2 Fire stopping material and installation must not distort duct.

2.7 GALVANIZED STEEL

.1 Lock forming quality: to ASTM A 653/A 653M, Z90 zinc coating.

.2 Thickness, fabrication and reinforcement: to ASHRAE SMACNA.

.3 Joints: to ASHRAE SMACNA.

2.8 RADON GAS VENTING

.1 150 mm diameter fire/plenum rated PVC XFR Schedule 40 with solvent welded joints. PVC pipe to meet CSA-B 181.1. Solvent weld to ASTM D 2564

2.9 ALUMINUM

.1 Ductwork for condensate hood to be 20 gauge aluminum sheet metal with standard joints/connections. Slope duct back to condensate hood.

2.10 HANGERS AND SUPPORTS

.1 Hangers and Supports: in accordance with Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.

.1 Strap hangers: of same material as duct but next sheet metal thickness heavier than duct.

.1 Maximum size duct supported by strap hanger: 500 mm.

.2 Hanger configuration: to ASHRAE and SMACNA.

.3 Hangers: galvanized steel angle with galvanized steel rods to ASHRAE and SMACNA or following table:

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

.4 Upper hanger attachments:

.1 For concrete: manufactured concrete inserts.

.2 For steel joist:manufactured joist clamp.

.3 For steel beams: manufactured beam clamps:

PART 3 - EXECUTION

3.1 GENERAL

.1 Do work in accordance with NFPA 90A, NFPA 90B, ASHRAE and SMACNA.

.2 Do not break continuity of insulation vapour barrier with hangers or rods.

.3 Support risers in accordance with ASHRAE or SMACNA.

.4 Install breakaway joints in ductwork on sides of fire separation.

.5 Install proprietary manufactured flanged duct joints in accordance with manufacturer's instructions.

.6 Manufacture duct in lengths and diameter to accommodate installation of acoustic duct lining.

3.2 HANGERS

.1 Strap hangers: install in accordance with SMACNA.

.2 Angle hangers: complete with locking nuts and washers.

.3 Hanger spacing: in accordance with the following:

Duct Size (mm)	*Spacing (mm)*
to 1500	3000
1501 and over	2500

3.3 WATERTIGHT DUCT

.1 Provide watertight duct for:

.1 Dishwasher exhaust.

.2 Fresh air intake.

.3 Minimum 3000 mm from all louvers.

.4 Minimum 3000 mm from duct mounted humidifier in all directions.

.5 As indicated.

.2 Form bottom of horizontal duct without longitudinal seams.

.1 Solder weld joints of bottom and side sheets.

.2 Seal other joints with duct sealer.

.3 Slope horizontal branch ductwork down towards fume hoods served.

.1 Slope header ducts down toward risers.

.4 Fit base of riser with 150 mm deep drain sump and 32 mm drain connected, with deep seal trap and trap primer and discharging to open funnel drain.

3.4 RADON GAS VENT PIPING

.1 Slope all horizontal pipe runs downward at 0.5% to the radon suction pit.

.2 Seal the exterior of all pipe joints using a flexible polyurethane sealant.

.3 Label all exposed radon vent pipe at regular intervals. Maximum distance between labels shall be 3m. Label to read “Radon Vent Pipe” .

.4 Seal joint between floor slab and pipe with polyurethane sealant.

.5 Route piping up to underside of roof deck as indicated on drawings and cap for future testing/use.

3.5 SEALING AND TAPING

.1 Apply sealant to outside of joint to manufacturer's recommendations.

.2 Bed tape in sealant and recoat with minimum of one coat of sealant to manufacturers recommendations.

3.6 LEAKAGE TESTS

.1 Refer to Section 23 05 94 - Pressure Testing of Ducted Air Systems.

.2 In accordance with SMACNA HVAC Duct Leakage Test Manual.

.3 Do leakage tests in sections.

.4 Make trial leakage tests as instructed to demonstrate workmanship.

.5 Do not install additional ductwork until trial test has been passed.

.6 Test section minimum of 30 m long with not less than three branch takeoffs and two 90 degrees elbows.

.7 Complete test before performance insulation or concealment Work.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

.1 Section Includes:

.1 Materials and installation for duct accessories including flexible connections, access doors, vanes and collars.

.2 Sustainable requirements for construction and verification.

.2 Related Sections:

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 35 30 - Health and Safety Requirements.

.3 Section 01 45 00 - Quality Control.

.4 Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.5 Section 01 78 00 - Closeout Submittals.

.6 Section 02 81 01 - Hazardous Materials.

1.2 REFERENCES

.1 Latest editions of listed standards to govern.

.2 Health Canada/Workplace Hazardous Materials Information System (WHMIS).

.1 Material Safety Data Sheets (MSDS).

.3 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA).

.1 SMACNA - HVAC Duct Construction Standards - Metal and Flexible, 95.

1.3 SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's printed product literature, specifications and data sheet. Indicate the following:

.1 Flexible connections.

.2 Duct access doors.

.3 Turning vanes.

.4 Instrument test ports.

.2 Submit WHMIS MSDS in accordance with Section 02 81 01 - Hazardous Materials.

.3 Test Reports: submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.

.1 Certification of ratings: catalogue or published ratings to be those obtained from tests carried out by manufacturer or independent testing agency signifying adherence to codes and standards.

.4 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.5 Instructions: submit manufacturer's installation instructions.

.6 Closeout submittals: submit maintenance and engineering data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.4 QUALITY ASSURANCE

.1 Pre-Installation Meetings:

.1 Convene pre-installation meeting one week prior to beginning work of this Section and on-site installations:

.1 Verify project requirements.

.2 Review installation conditions.

.3 Co-ordination with other building subtrades.

.4 Review manufacturer's installation instructions and warranty requirements.

.2 Verification: contractor's verification in accordance with Section 01 47 17 - Sustainable Requirements: Contractor's Verification.

1.5 DELIVERY, STORAGE AND HANDLING

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

.1 Collect and separate for disposal paper plastic polystyrene corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan (WMP).

.2 Replace any damaged or worn equipment / products with new prior to turnover to the Owner.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Materials and resources in accordance with Section 01 47 15 - Sustainable Requirements: Construction.

2.2 GENERAL

.1 Manufacture in accordance with SMACNA - HVAC Duct Construction Standards.

2.3 FLEXIBLE CONNECTIONS

.1 Frame: galvanized sheet metal frame 0.66 mm thick with fabric clenched by means of double locked seams.

.2 Material:

.1 Fire resistant, self extinguishing, neoprene coated glass fabric, temperature rated at minus 40 degrees C to plus 90 degrees C, density of 1.3 kg/m^2.

2.4 ACCESS DOORS IN DUCTS

.1 Non-Insulated Ducts: sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 0.6 mm thick complete with sheet metal angle frame.

.2 Insulated Ducts: sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 0.6 mm thick complete with sheet metal angle frame and 25 mm thick rigid glass fibre insulation.

.3 Gaskets: neoprene.

.4 Hardware:

.1 Up to 300 x 300 mm: two sash locks complete with safety chain.

.2 301 to 450 mm: four sash locks complete with safety chain.

.3 451 to 1000 mm: piano hinge and minimum two sash locks.

.4 Doors over 1000 mm: piano hinge and two handles operable from both sides.

.5 Hold open devices.

.6 300 x 300 mm glass viewing panels.

2.5 TURNING VANES

.1 Factory or shop fabricated single thickness with trailing edge, to recommendations of SMACNA and as indicated.

2.6 INSTRUMENT TEST

.1 Plastic plugs fitted to holes to maintain integrity of duct leakage classification.

2.7 COLLARS

.1 Spin-in collars are unacceptable. Square-to-round collars shall be used.

.2 Sheet metal thickness to co-responding round duct standards.

2.8 TAKE-OFFS ON BRANCH DUCTS

.1 Prefabricated eccentric conical branch takeoff with flange to main duct

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

.1 Flexible Connections:

.1 Install in following locations:

.1 Inlets and outlets to supply air units and fans.

.2 Inlets and outlets of exhaust and return air fans.

.3 As indicated.

.2 Length of connection: 100 mm.

.3 Minimum distance between metal parts when system in operation: 75 mm.

.4 Install in accordance with recommendations of SMACNA.

.5 When fan is running:

.1 Ducting on sides of flexible connection to be in alignment.

.2 Ensure slack material in flexible connection.

.2 Access Doors and Viewing Panels:

.1 Locations:

.1 Fire and smoke dampers.

.2 Control dampers.

.3 Devices requiring maintenance.

.4 Required by code.

.5 Heat coils. Both sides of the coils.

.6 Humidifier distributors

.7 Louver intake plenums

.8 Elsewhere as indicated.

.3 Instrument Test Ports:

.1 General:

.1 Install in accordance with recommendations of SMACNA and in accordance with manufacturer's instructions.

.2 Locate to permit easy manipulation of instruments.

.3 Install insulation port extensions as required.

.4 Locations:

.1 For traverse readings:

.1 Ducted inlets to roof and wall exhausters.

.2 Inlets and outlets of other fan systems.

.3 Main and sub-main ducts.

.4 And as indicated.

.2 For temperature readings:

.1 At outside air intakes.

.2 In mixed air applications in locations as approved by Consultant.

.3 At inlet and outlet of coils.

.4 Downstream of junctions of two converging air streams of different temperatures.

.5 And as indicated.

.4 Turning vanes:

.1 Install in accordance with recommendations of SMACNA and as indicated.

3.3 FIELD QUALITY CONTROL

.1 Verification requirements in accordance with Section 01 47 17 - Sustainable Requirements: Contractor's Verification, include:

.1 Materials and resources.

.2 Storage and collection of recyclables.

.3 Construction waste management.

.4 Resource reuse.

.5 Recycled content.

.6 Local/regional materials.

.7 Certified Wood.

.8 Low-emitting materials.

3.4 CLEANING

.1 Perform cleaning operations as specified in tender documents and in accordance with manufacturer's recommendations.

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

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

.1 Section Includes:

.1 Balancing dampers for mechanical forced air ventilation and air conditioning systems.

1.2 REFERENCES

.1 Latest editions of listed standards to govern.

.2 Sheet Metal and Air Conditioning National Association (SMACNA)

.1 SMACNA HVAC Duct Construction Standards, Metal and Flexible-1985.

1.3 SUBMITTALS

.1 Submit product data in accordance with tender documents.

.2 Provide maintenance data for incorporation into operation and maintenance manual at project completion.

1.4 QUALITY ASSURANCE

.1 Health and Safety Requirements:

.2 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Deliver, store and handle in accordance with manufacturer's written instructions.

.2 Waste Management and Disposal: separate waste materials for reuse and recycling

.3 Replace any damaged or worn equipment / products with new prior to turnover to the Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

.1 Acceptable manufacturers:

.1 NCA

.2 Ventech

.3 Nailor

.4 Carnes

.5 Approved alternate

2.2 GENERAL

.1 Manufacture to SMACNA standards.

2.3 SPLITTER DAMPERS

.1 Fabricate from same material as duct but one sheet metal thickness heavier, with appropriate stiffening.

.2 Single thickness construction.

.3 Control rod with locking device and position indicator.

.4 Rod configuration to prevent end from entering duct.

.5 Pivot: piano hinge.

.6 Folded leading edge.

2.4 SINGLE BLADE DAMPERS

.1 Fabricate from same material as duct, but one sheet metal thickness heavier. V-groove stiffened.

.2 Size and configuration to recommendations of SMACNA, except maximum height as indicated.

.3 Locking quadrant with shaft extension to accommodate insulation thickness.

.4 Inside and outside nylon end bearings.

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

2.5 MULTI-BLADED DAMPERS

.1 Factory manufactured of material compatible with duct.

.2 Opposed blade: configuration, metal thickness and construction to recommendations of SMACNA.

.3 Maximum blade height: 100 mm as indicated.

.4 Bearings: self-lubricating nylon.

.5 Linkage: shaft extension with locking quadrant.

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

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

.1 Locate balancing dampers in every branch duct, for supply, return and exhaust systems.

.2 Install in accordance with recommendations of SMACNA and in accordance with manufacturer's instructions.

.3 Where possible install dampers in locations where the are easily accessible or provide access panels, as required.

.4 Locate balancing dampers in every branch duct, for supply, return and exhaust systems.

.5 Install balancing dampers in all runouts to registers and diffusers: install single blade damper located as close as possible to main ducts.

.6 Dampers: vibration free.

.7 Ensure damper operators are observable and accessible.

3.3 FIELD QUALITY CONTROL

.1 Tests:

.1 Tests to cover period of not less than indicated number of days and demonstrate that system is functioning as specified.

3.4 CLEANING

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

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

END OF SECTION

PART 1 - - GENERAL

1.1 SUMMARY

.1 Section Includes:

.1 Operating dampers for mechanical forced air ventilation and air conditioning systems.

1.2 REFERENCES

.1 Latest editions of listed standards to govern.

.2 American Society for Testing and Materials International (ASTM)

.1 ASTM A 653/A 653M-04a, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by Hot-Dip Process.

.3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

1.3 SUBMITTALS

.1 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures. Include product characteristics, performance criteria, and limitations.

.1 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00 - Submittal Procedures.

.2 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.

.1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.2 Instructions: submit manufacturer's installation instructions.

.1 Consultant will make available 1 copy of systems supplier's installation instructions.

.3 Closeout Submittals

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

1.4 QUALITY ASSURANCE

.1 Certificates:

.2 Catalogue or published ratings those obtained from tests carried out by manufacturer or those ordered by manufacturer from independent testing agency.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Waste Management and Disposal: separate waste materials for reuse and recycling

.3 Replace any damaged or worn equipment / products with new prior to turnover to the Owner.

PART 2 - PRODUCTS

2.1 PRODUCT CLARIFICATION

.1 The product information provided in the following sections of this specification in some cases may be generic descriptions and as such do not necessarily reflect the actual make, model, type, and performance characteristics required for this project. The contractor shall refer to equipment schedules and notes on drawings for more detailed information pertaining to equipment performance and capacities specifically required for equipment to be furnished and installed on this project.

2.2 SUSTAINABLE REQUIREMENTS

.1 Materials and products in accordance with Section 01 47 15 - Sustainable Requirements: Construction.

2.3 MULTI-LEAF DAMPERS

.1 Opposed blade type as indicated.

.2 Extruded aluminum, interlocking blades, complete with extruded vinyl seals, spring stainless steel side seals, extruded aluminum frame.

.3 Pressure fit self-lubricated bronze bearings.

.4 Linkage: plated steel tie rods, brass pivots and plated steel brackets, complete with plated steel control rod.

.5 Operator: to Section 25 30 02 – EMCS Field Control Devices. By Controls Contractor

.6 Insulated aluminum dampers:

.1 Frames: insulated with extruded polystyrene foam with RSI 0.88.

.2 Blades: constructed from aluminum extrusions with internal hollows insulated with polyurethane or polystyrene foam, RSI 0.88.

.3 Performance: leakage in closed position to be less than I% of rated airflow at 2.5 kPa (10" w.g.) differential across damper. Pressure drop at full open position to be less than 25 Pa (1/10" w.g.) differential at maximum air flow.

.7 Outside air intake or exhaust dampers shall be designed and constructed for an operating temperature of -40 C to 70C (-40 F to 158 F)

.1 Acceptable Manufacturer: Tamco, Ruskin, Ventex, Carnes or approved alternate.

2.4 DISC TYPE DAMPERS

.1 Frame: brake formed, welded, 1.6 mm thick, galvanized steel to ASTM A 653/A 653M.

.2 Disc: spin formed, 1.6 mm thick, galvanized steel to ASTM A 653/A 653M.

.3 Gasket: extruded neoprene, field replaceable, with 10 year warranty.

.4 Bearings: roller self lubricated and sealed.

.5 Operator: compatible with damper, linear stroke operator, spring loaded actuator, zinc-aluminum foundry alloy casting cam follower.

.6 Performance:

.1 Leakage: in closed position less than 0.001 % of rated air flow at kPa pressure differential across damper.

.2 Pressure drop: at full open position less than kPa differential across damper at m/s.

.7 Acceptable Manufacturer: Ruskin, Ventex, Tamco, & Greenheck , Carnes , or approved alternate.

2.5 BACK DRAFT DAMPERS

.1 Automatic gravity operated, multi single leaf, aluminum construction with nylon bearings, as indicated.

.2 Acceptable Manufacturer: Ruskin, Ventex, Tamco, & Greenheck , Carnes , or approved alternate.

2.6 RELIEF DAMPERS

.1 Automatic multi-leaf aluminum dampers with ball bearing centre pivoted and counter-weights set to open, as indicated.

.2 Acceptable Manufacturer: Ventex, Tamco, & Greenheck , Carnes, or approved alternate.

2.7 INSULATED OPPOSED AND PARALLEL BLADE DAMPERS

.1 Extruded aluminum, interlocking blades, complete with extruded vinyl seals, extruded aluminum frame.

.2 Pressure-fit self-lubricated bronze bearings.

.3 Linkage: plated steel tie rods, brass pivots and plated steel brackets, complete with plated steel control rod.

.4 Performance Characteristics:

.1 Leakage: in closed position to be less than 2% of rated air flow at 1.0 kPa differential across damper.

.2 Pressure drop: at full open position to be less than 8.0 Pa differential across damper at 5.08 m/s.

.5 Opposed blade damper for all modulating services unless otherwise indicated.

.6 Parallel blade dampers for all two position services unless otherwise indicated.

.7 Frames: insulated with extruded polystyrene foam with R factor of 5.0.

.8 Blades: constructed from aluminum extrusions with internal hollows insulated with polyurethane or polystyrene foam, R factor of 5.0 parallel or opposed as indicated on schematics.

.9 Acceptable Manufacturer: TA Morrison, AutoDamp, Carnes or approved alternate.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

.1 Install where indicated.

.2 Install in accordance with recommendations of SMACNA and manufacturer's instructions.

.3 Seal multiple damper modules with silicon sealant.

.4 Install access door adjacent to each damper. S.e Section 23 33 00 - Air Duct Accessories

.5 Ensure dampers are observable and accessible.

3.3 CLEANING

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

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

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

.1 Section Includes:

.1 Fire and smoke dampers, and fire stop flaps.

1.2 REFERENCES

.1 Latest editions of listed standards to govern.

.2 American National Standards Institute/National Fire Protection Association (ANSI/NFPA)

.1 ANSI/NFPA 90A-2002, Standard for the Installation of Air Conditioning and Ventilating Systems.

.3 Underwriters Laboratories of Canada (ULC)

.1 CAN4-S112-M1990, Fire Test of Fire Damper Assemblies.

.2 CAN4-S112.2-M84, Standard Method of Fire Test of Ceiling Firestop Flap Assemblies.

.3 ULC-S505-1974, Fusible Links for Fire Protection Service.

1.3 SUBMITTALS

.1 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures. Include product characteristics, performance criteria, and limitations.

.2 Indicate the following:

.1 Fire dampers.

.2 Smoke dampers.

.3 Fire stop flaps.

.4 Operators.

.5 Fusible links.

.6 Design details of break-away joints.

.2 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.

.1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.2 Instructions: submit manufacturer's installation instructions.

.1 Consultant will make available 1 copy of systems supplier's installation instructions.

.3 Closeout Submittals:

.1 Provide maintenance data for incorporation into manual specified in Section01 78 00 - Closeout Submittals.

1.4 QUALITY ASSURANCE

.1 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

.2 Certificates:

.1 Catalogue or published ratings those obtained from tests carried out by manufacturer or those ordered by manufacturer from independent testing agency signifying adherence to codes and standards.

1.5 MAINTENANCE

.1 Extra Materials:

.1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.

.2 Provide following:

.1 6 fusible links of each type.

1.6 DELIVERY, STORAGE, AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Waste Management and Disposal: separate waste materials for reuse and recycling

.3 Replace any damaged or worn equipment / products with new prior to turnover to the Owner.

PART 2 - PRODUCTS

2.1 FIRE DAMPERS

.1 Fire dampers: arrangement listed and bear label of ULC UL, meet requirements of provincial fire authority and ANSI/NFPA 90A authorities having jurisdiction. Fire damper assemblies fire tested in accordance with CAN4-S112.

.2 All fire dampers shall be dynamic type

.3 Mild steel, factory fabricated for fire rating requirement to maintain integrity of fire wall and/or fire separation.

.1 Fire dampers: 1-1/2 hour fire rated unless otherwise required.

.1 Refer to architectural drawings for required fire separation rating of each duct penetration.

.2 Fire dampers: automatic operating type and have dynamic rating suitable for maximum air velocity and pressure differential to which it will be subjected.

.4 Top hinged: offset single damper, round or square; multi-blade hinged sized to maintain full duct cross section.

.5 Fusible link actuated, weighted to close and lock in closed position when released or having negator-spring-closing operator for multi-leaf type or roll door type in horizontal position with vertical air flow.

.6 retaining angle iron frame, on full perimeter of fire damper, on both sides of fire separation being pierced.

.7 Equip fire dampers with steel sleeve or frame installed disruption ductwork or impair damper operation.

.8 Equip sleeves or frames with perimeter mounting angles attached on both sides of wall or floor opening. Construct ductwork in fire-rated floor-ceiling or roof-ceiling assembly systems with air ducts that pierce ceiling to conform with ULC.

.9 Design and construct dampers to not reduce duct or air transfer opening cross-sectional area.

.10 Dampers shall be installed so that the centerline of the damper depth or thickness is located in the centerline of the wall, partition of floor slab depth or thickness.

.11 Unless otherwise indicated, the installation details given in SMACNA Install Fire Damp HVAC and in manufacturer's instructions for fire dampers shall be followed.

.12 Fire damper installed in dishwasher exhaust ductwork to be of stainless steel construction .

2.2 STAINLESS STEEL FIRE DAMPER

.1 Round, stainless steel fire damper for use in condensate hood exhaust system. Damper shall be c/w fusible link and retaining plate assembly.

.2 Acceptable Manufacturer: Greenheck, or approved alternate.

2.3 SMOKE DAMPERS

.1 Smoke Dampers: to be ULC or UL listed and labeled.

.2 Normally closed reverse action smoke vent (S/D-RASV): folding blade type, opening by gravity upon detection of smoke. Two flexible stainless steel blade edge seals to provide required constant sealing pressure.

.3 Normally open smoke/seal (S/D-SSSD): folding blade type, closing when actuated by means of electro thermal link. Blade edge seals of flexible stainless steel to provide required constant sealing pressure. Provide stainless steel negator springs with locking devices to ensure positive closure for units mounted horizontally in vertical ducts.

2.4 COMBINATION FIRE AND SMOKE DAMPERS

.1 Damper: similar to smoke dampers specified above.

.2 . Combined actuator: electrical control system actuated from smoke sensor or smoke detection system and from fusible link.

2.5 FIRE STOP FLAPS

.1 Fire smoke flaps: ULC listed and labelled and fire tested in accordance with CAN4-S112.2.

.2 Construct of minimum 1.5 mm thick sheet steel with 1.6 mm thick non-asbestos ULC listed insulation and corrosion-resistant pins and hinges.

.3 Flaps held open with fusible link conforming to ULC-S505 and close at 74 degrees C.

2.6 ACCEPTABLE MANUFACTURERS

.1 Approved manufacturers

.1 Halton

.2 NCA

.3 Nailor

.4 Air Management

.5 EH Price

.6 Greenheck

.7 Ruskin

.8 Carnes

.9 Ventex / Alumavent

.10 Approved alternate

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

.1 Install in accordance with ANSI/NFPA 90A and in accordance with conditions of ULC listing.

.2 Maintain integrity of fire separation.

.3 After completion and prior to concealment obtain approvals of complete installation from authority having jurisdiction.

.4 Install access door adjacent to each damper. S.e Section 23 33 00 - Air Duct Accessories

.5 Co-ordinate with installer of firestopping.

.6 Ensure access doors/panels, fusible links, damper operators are easily observed and accessible.

.7 Install break-away joints of approved design on each side of fire separation.

3.3 CLEANING

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

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

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

.1 Section Includes:

.1 Materials and installation of flexible ductwork, joints and accessories.

.2 Sustainable requirements for construction and verification.

.3 Related Sections:

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 35 29.06 - Health and Safety Requirements.

.3 Section 01 47 15 - Sustainable Requirements: Construction.

.4 Section 01 47 17 - Sustainable Requirements: Contractor's Verification.

.5 Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.6 Section 02 81 01 - Hazardous Materials.

1.2 REFERENCES

.1 Latest editions of listed standards to govern.

.2 American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE).

.3 Department of Justice Canada (Jus).

.1 Canadian Environmental Protection Act (CEPA), 1999, c. 33.

.2 Transportation of Dangerous Goods Act, 1992 (TDGA), c. 34.

.4 Health Canada/Workplace Hazardous Materials Information System (WHMIS).

.1 Material Safety Data Sheets (MSDS).

.5 National Fire Protection Association (NFPA).

.1 NFPA 90A-02, Standard for the Installation of Air-Conditioning and Ventilating Systems.

.2 NFPA 90B-02, Standard for Installation of Warm Air Heating and Air-Conditioning Systems.

.6 Sheet Metal and Air-Conditioning Contractors' National Association (SMACNA).

.1 SMACNA HVAC Duct Construction Standards - Metal and Flexible, 95 (Addendum No.1, November 1997).

.2 SMACNA IAQ Guideline for Occupied Buildings under Construction, 1st Edition 1995.

.7 Underwriters' Laboratories Inc. (UL).

.1 UL 181-96, Standard for Factory-Made Air Ducts and Air Connectors.

.8 Underwriters' Laboratories of Canada (ULC).

.1 CAN/ULC-S110-1986(R2001), Fire Tests for Air Ducts.

1.3 SUBMITTALS

.1 Make submittals in accordance with tender documents.

.1 Thermal properties.

.2 Friction loss.

.3 Acoustical loss.

.4 Leakage.

.5 Fire rating.

1.4 QUALITY ASSURANCE

.1 Certification of Ratings:

.1 Catalogue or published ratings to be those obtained from tests carried out by manufacturer or independent testing agency signifying adherence to codes and standards.

.2 Health and Safety:

.1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Protect on site stored or installed absorptive material from moisture damage.

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

.1 Handle and dispose of hazardous materials in accordance with Regional and Municipal regulations.

.3 Replace any damaged or worn equipment / products with new prior to turnover to the Owner.

PART 2 - PRODUCTS

2.1 GENERAL

.1 Factory fabricated to CAN/ULC-S110.

.2 Pressure drop coefficients listed below are based on relative sheet metal duct pressure drop coefficient of 1.00.

.3 Flame spread rating not to exceed 25. Smoke developed rating not to exceed 50.

2.2 METALLIC - UNINSULATED

.1 Type 1: spiral wound flexible aluminum.

.2 Performance:

.1 Factory tested to 2.5 kPa without leakage.

.2 Maximum relative pressure drop coefficient: 3

.3 Acceptable manufacturer:

.1 Flexmaster Canada Ltd., M-KE, or approved alternate

2.3 METALLIC - INSULATED

.1 Type 2: spiral wound flexible aluminum with factory applied, 37 mm thick flexible glass fibre thermal insulation with vapour barrier and reinforced mylar/neoprene laminate jacket.

.2 Performance:

.1 Factory tested to 2.5 kPa without leakage.

.2 Maximum relative pressure drop coefficient: 3.

.3 Acceptable manufacturer:

.1 Flexmaster Canada Ltd., M-KE, or approved alternate

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

.1 Install in accordance with the following:

.1 Manufacturer's recommendations.

.2 Extend duct straight for several inches from a connection before beinding.

.3 Support the flexible duct such that the sag in the duct does not exceed 42 mm per meter.

.4 Bend radius for flexible ducts shall not be less than two times the duct diameter

.5 Flexible duct runs shall not exceed 1.8 m (6 ft)

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

.1 Section Includes:

.1 Fans, window ventilators, exterior, wall and ceiling mounted discharge fans for domestic use.

1.2 REFERENCES

.1 Latest editions of listed standards to govern.

.2 Air Conditioning and Mechanical Contractors Association (AMCA)

.1 AMCA 201-02, Fans and Systems.

.2 AMCA 300-2005, Reverberant Room Method for Sound Testing of Fans.

.3 AMCA 301-2005, Methods for Calculating Fan Sound Ratings from Laboratory Test Data.

.4 AMCA 302-73, Application of Sone Ratings for Non-Ducted Air Moving Devices.

.5 AMCA 303-79, Application of Sound Power Level Ratings for Fans.

.3 American National Standards Institute (ANSI)/American Society of Mechanical Engineers (ASME)

.1 ANSI/AMCA 210-1999, Laboratory Methods of Testing Fans for Aerodynamic Performance Rating.

.4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

1.3 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 in force.

1.4 SUBMITTALS

.1 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures. Include product characteristics, performance criteria, and limitations.

.1 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00 - Submittal Procedures.

.2 Shop Drawings:

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

.1 Shop Drawings: submit drawings stamped and signed by professional engineer registered or licensed in Province s Territory ies of, Canada.

.2 Indicate following:

.3 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.

.1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.2 Instructions: submit manufacturer's installation instructions.

.1 Departmental Representative Engineer Consultant will make available 1 copy of systems supplier's installation instructions.

.4 Closeout Submittals

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

1.5 MAINTENANCE

.1 Extra Materials:

.1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.

.2 Furnish list of individual manufacturer's recommended spare parts for equipment, include:

.1 Bearings and seals.

.2 Addresses of suppliers.

.3 List of specialized tools necessary for adjusting, repairing or replacing.

1.6 DELIVERY, STORAGE, AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Waste Management and Disposal: separate waste materials for reuse and recycling.

.3 Replace any damaged or worn equipment / products with new prior to turnover to the Owner.

PART 2 - PRODUCTS

2.1 PRODUCT CLARIFICATION

.1 The product information provided in the following sections of this specification in some cases may be generic descriptions and as such do not necessarily reflect the actual make, model, type, and performance characteristics required for this project. The contractor shall refer to equipment schedules and notes on drawings for more detailed information pertaining to equipment performance and capacities specifically required for equipment to be furnished and installed on this project.

2.2 ACCEPTABLE PRODUCTS

.1 Approved Manufacturers: Greenheck, Fantech, Twin City, Carnes, or approved alternate.

2.3 FANS - GENERAL

.1 Standard of rating:

.1 AMCA 201 for fan application.

.2 AMCA 302 for application of sone loudness ratings for non-ducted air moving devices.

.3 AMCA 303 for application of sound power ratings for ducted air moving devices.

.4 Performance: to ANSI/AMCA 210. Unit to bear AMCA certified seal.

.2 Sound level ratings to comply with AMCA 301, tested to AMCA 300 Unit to bear AMCA certified sound rating seal.

.3 Maximum loudness: 5 sones.

2.4 WALL TRANSFER FANS

.1 Propeller, direct drive, plug-in type, electric motor, 200 mm diameter telescoping type metal housing, zinc coated.

.2 Sizes and capacity: as indicated L/s, Pa.

.3 Control: pull chain toggle timer thermostatically operated.

.4 Filters: washable aluminum-mesh filter.

.5 Grille: silver anodized aluminum chrome plated.

2.5 EXTERIOR MOUNTED DISCHARGE FANS

.1 Roof mounted, direct driven centrifugal fan, 93 W electric ball bearing thermally protected motor.

.2 Sizes and capacity: as indicated.

.3 Control: switch thermostatically operated.

.4 Rust resistant aluminum Zinc coated steel, baked-on enamel finish with aluminum backdraft damper, spring loaded complete with foam cushioned frame.

2.6 CEILING DISCHARGE FANS

.1 Bath Fan with Fluorescent Light: Propeller Centrifugal direct drive, with plug-in type electric motor suitable for ceiling installation, zinc coated rectangular metal housing complete with 14 W florescent light. UL Listed for wet locations.

.1 Sizes and capacity: as indicated.

.2 Toggle switch Timer operated complete with integral electrical outlet box with plug-in type receptacle.

.3 Side 102 mm (4") diameter duct outlet with integral backdraft damper.

.4 Roof jack Wall cap complete with spring backdraft damper and bird screen.

.5 White polymeric grille.

.6 Acceptable Manufacturer: Fantech, Penn Barry, Greenheck, Cook, ACME Manufacturing & Engineering, Twin City, or aproved alternate.

.2 Ceiling Exhaust Ventilators 100 to 300 CFM: Propeller Centrifugal direct drive, with plug-in type electric motor suitable for ceiling installation, 20 gauge galvanized steel rectangular housing.

.1 Sizes and capacity: as indicated.

.2 Side duct outlet diameter as indicated.

.3 Wall cap complete with backdraft damper and bird screen.

.4 White polymeric grille.

.5 Acceptable Manufacturer: Fantech, Penn Barry, Greenheck, Cook, ACME Manufacturing & Engineering, Twin City, or aproved alternate.

.3 Inline Mount Exhaust Ventilators 400 to 700 CFM: Propeller Centrifugal direct drive, with plug-in type electric motor suitable for ceiling installation, 20 gauge galvanized steel rectangular housing.

.1 Sizes and capacity: as indicated.

.2 Side duct outlet, size as indicated.

.3 Wall cap complete with backdraft damper and bird screen, where indicated.

.4 Acceptable Manufacturer: Fantech, Penn Barry, Greenheck, Cook, ACME Manufacturing & Engineering, Twin City, or aproved alternate.

.4 Multi-port Exhaust Duct Fan: External rotor motor with backward-curved polyamide centrifugal fan wheel, internal scroll, permanently lubricated sealed ball bearings, galvanized steel housing.

.1 Size and Capacity: 220 CFM at .2" WG

.2 Two inlet and one outlet ventilation points, 127 mm (5") diameter.

.3 Wall cap complete with backdraft damper and bird screen, where indicated.

.4 Acceptable Manufacturer: Fantech, Penn Barry, Greenheck, Cook, ACME Manufacturing & Engineering, Twin City, or aproved alternate.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

.1 Install in accordance with manufacturer's recommendations.

3.3 ANCHOR BOLTS AND TEMPLATES

.1 Supply for installation by other divisions.

.2 Size anchor bolts to withstand seismic acceleration and velocity forces as specified in Section.

3.4 CLEANING

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

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

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

.1 Section Includes:

.1 Supply, return and exhaust grilles and registers, diffusers and linear grilles, for commercial and residential use.

1.2 REFERENCES

.1 Latest editions of listed standards to govern.

.2 American National Standards Institute (ANSI)/ National Fire Protection Association (NFPA)

.1 ANSI/NFPA 96-04, Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.

.3 American Society for Testing and Materials International (ASTM)

.1 ASTM E 90-04, Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

.4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

.5 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)

1.3 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.

1.4 SUBMITTALS

.1 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures. Include product characteristics, performance criteria, and limitations.

.1 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00 - Submittal Procedures.

.2 Indicate following:

.1 Capacity.

.2 Throw and terminal velocity.

.3 Noise criteria.

.4 Pressure drop.

.5 Neck velocity.

.2 Samples:

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

.3 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.

.1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.2 Instructions: submit manufacturer's installation instructions.

1.5 QUALITY ASSURANCE

.1 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Waste Management and Disposal: separate waste materials for reuse and recycling .

.3 Replace any damaged or worn equipment / products with new prior to turnover to the Owner.

1.7 MAINTENANCE

.1 . Extra Materials:

.1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.

.2 Include:

.1 Keys for volume control adjustment.

.2 Keys for air flow pattern adjustment.

PART 2 - PRODUCTS

2.1 PRODUCT CLARIFICATION

.1 The product information provided in the following sections of this specification in some cases may be generic descriptions and as such do not necessarily reflect the actual make, model, type, and performance characteristics required for this project. The contractor shall refer to equipment schedules and notes on drawings for more detailed information pertaining to equipment performance and capacities specifically required for equipment to be furnished and installed on this project.

2.2 GENERAL

.1 To meet capacity, pressure drop, terminal velocity, throw, noise level, neck velocity as indicated.

.2 Frames:

.1 Full perimeter gaskets.

.2 Plaster frames where set into plaster or gypsum board and as specified.

.3 Concealed fasteners.

.3 Concealed manual volume control damper operators.

.4 Colour: standard as directed Consultant .

2.3 MANUFACTURED UNITS

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

.2 Standard of Acceptance for this section shall be “Titus” with pertinent models noted on drawings. Others, including E.H. Price, Nailor, Tuttle & Bailey, Carnes will be considered equivalent, provided the specifications are met.

2.4 SUPPLY GRILLES AND REGISTERS

.1 General: Grilles and registers shall have opposed blade dampers where indicated.

.2 Refer to schedule on drawings.

2.5 RETURN AND EXHAUST GRILLES AND REGISTERS

.1 General: Return and exhaust grilles and registers shall have opposed blade dampers unless noted otherwise.

.2 Refer to schedule on drawings.

2.6 DIFFUSERS

.1 General: Diffusers shall have volume control dampers with flow straightening devices and gaskets where no duct damper provided.

.2 Refer to schedule on drawings.

2.7 EQUIVALENT MANUFACTURERS

.1 Titus, E.H. Price, Nailor, Tuttle & Bailey or approved alternate

2.8 DAMPERS AND ACTUATORS

.1 Dampers shall be provided where indicated. Consult appropriate mechanical drawings and schedules for grilles requiring dampers

.2 All actuators for dampers required on grilles shall be furnished and installed by the controls contractor. Actuators shall operate in accordance with the required sequence of operation for HVAC equipment as detailed in Division 25 - EMCS.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

.1 Install in accordance with manufacturers instructions.

.2 Install with flat head oval head stainless steel cadmium plated screws in countersunk holes where fastenings are visible.

.3 Bolt grilles, registers and diffusers, in place, in gymnasium and similar game rooms.

.4 Provide concealed safety chain on each grille, register and diffuser in gymnasium and similar game rooms and elsewhere as indicated

3.3 FIELD QUALITY CONTROL

.1 Verification requirements in accordance with Section 01 47 17 - Sustainable Requirements: Contractor's Verification, include:

.1 Materials and resources.

.2 Storage and collection of recyclables.

.3 Construction waste management.

.4 Resource reuse.

.5 Recycled content.

.6 Local/regional materials.

.7 Low-emitting materials.

3.4 CLEANING

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

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

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

.1 Section Includes:

.1 Mechanical louvers; intakes; vents; and reinforcement and bracing for air vents, intakes and gooseneck hoods.

1.2 REFERENCES

.1 Latest editions of listed standards to govern.

.2 American National Standards Institute (ANSI)/ National Fire Protection Association (NFPA)

.1 ANSI/NFPA 96-04, Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.

.3 American Society for Testing and Materials International (ASTM)

.1 ASTM E 90-04, Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

.4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

.5 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)

1.3 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.

1.4 SUBMITTALS

.1 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with tender documents. Include product characteristics, performance criteria, and limitations.

.2 Indicate following:

.1 Pressure drop.

.2 Face area.

.3 Free area.

.2 Quality assurance submittals: submit following in accordance with tender documents.

.1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

1.5 QUALITY ASSURANCE

.1 Health and Safety Requirements: do construction occupational health and safety in accordance with tender documents.

1.6 DELIVERY, STORAGE, AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Waste Management and Disposal: separate waste materials for reuse and recycling

.3 Replace any damaged or worn equipment / products with new prior to turnover to the Owner.

PART 2 - PRODUCTS

2.1 PRODUCT CLARIFICATION

.1 The product information provided in the following sections of this specification in some cases may be generic descriptions and as such do not necessarily reflect the actual make, model, type, and performance characteristics required for this project. The contractor shall refer to equipment schedules and notes on drawings for more detailed information pertaining to equipment performance and capacities specifically required for equipment to be furnished and installed on this project.

2.2 GOOSENECK HOODS

.1 Thickness: to ASHRAE and SMACNA.

.1 Kitchen: to ANSI/NFPA 96.

.2 Elsewhere: to ASHRAE and SMACNA.

.2 Fabrication: to ASHRAE and SMACNA.

.1 Kitchen: to ANSI/NFPA 96.

.2 Elsewhere: to ASHRAE andSMACNA.

.3 Joints: to ASHRAE and SMACNA and or proprietary manufactured duct joint.

.4 Supports: as indicated and as required.

.5 Complete with integral birdscreen of 2.7 mm diameter aluminum wire. Use 12 mm mesh on exhaust 19 mm mesh on intake.

.6 Acceptable Manufacturer : Carnes

2.3 FIXED LOUVRES - ALUMINUM

.1 Refer to schedule on drawings.

.2 Acceptable Manufacturer: Ventex/Alumavent, EH Price, Titus, Nailor, or approved alternate

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

.1 In accordance with manufacturer's and SMACNA recommendations.

.2 Reinforce and brace as indicated.

.3 Anchor securely into opening. Seal with caulking to ensure weather tightness.

3.3 CLEANING

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

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

END OF SECTION

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 This section covers items common to section 26. This section supplements the requirements of Division 1.

1.2 REFERENCES

.1 CSA C22.1, Canadian Electrical Code, Part I, Latest Edition

1.3 DEFINITIONS

.1 Electrical and electronic terms: unless otherwise specified or indicated, terms used in these specifications, and on drawings, are those defined by IEEE SP1122.

1.4 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 and labels for control items in English.

1.5 SUBMITTALS

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

.2 Shop drawings:

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

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

.1 Provide CSA certified equipment and material.

.2 Where CSA certified equipment and material is not available, submit such equipment and material to authority having jurisdiction 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, upon completion of Work, load balance report as described in PART 3 - LOAD BALANCE.

.6 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to Construction Manager.

1.6 QUALITY ASSURANCE

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

.2 Qualifications: electrical Work to be carried out by qualified, licensed electricians who hold valid Master Electrical Contractor license or apprentices in accordance with authorities having jurisdiction as per the conditions of Provincial Territorial Act respecting manpower vocational training and qualification.

.1 Employees registered in provincial apprentices program: permitted, under direct supervision of qualified licensed electrician, to perform specific tasks.

.2 Permitted activities: determined based on training level attained and demonstration of ability to perform specific duties.

.3 Site Meetings:

.1 In accordance with Section 01 31 19 - Project Meetings.

.2 Site Meetings: as part of Manufacturer's Field Services described in Part 3 - FIELD QUALITY CONTROL, schedule site visits, to review Work, at stages listed.

.1 After delivery and storage of products, and when preparatory Work is complete but before installation begins.

.2 Twice during progress of Work at 25% and 60% complete.

.3 Upon completion of Work, after cleaning is carried out.

1.7 DELIVERY, STORAGE AND HANDLING

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

1.8 SYSTEM STARTUP

.1 Instruct operating personnel in operation, care and maintenance of systems, system equipment and components.

.2 Arrange and pay for services of manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance and calibrate components and instruct operating personnel.

.3 Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant will aspects of its care and operation.

1.9 OPERATING INSTRUCTIONS

.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 the 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.

PART 2 - PRODUCTS

2.1 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 - SUBMITTALS.

.3 Factory assemble control panels and component assemblies.

2.2 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 and as shown on mechanical drawings.

2.3 WARNING SIGNS

.1 Warning Signs: in accordance with requirements of Construction Manager.

.2 Lamicoid signs, minimum size 175 x 250 mm.

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 Permanently affixed identification labels/nameplates are required for all electrical equipment. Identification shall be in English.

.2 All switchboards, panels, disconnect switches, transformers, control panels, magnetic and manual starters, and time clocks are to be provided with ‘lamicoid’ nameplates. Nameplates are to be mechanically affixed to all metal surfaces with metal type “pop rivets” if possible.

.3 Nameplates are to be affixed to other surfaces with contact type cement. Contact type cement is to be applied to complete back side of plate, as opposed to several points or locations on same.

.4 Nameplates are to be affixed to building exterior surfaces with nylon inserts and self tapping screws unless specifically indicated otherwise.

.5 Lamicoid nameplates installed on distribution panelboards, motor control centres, splitter troughs, transformers, shall indicate the following information in the following order:

.1 Designated name of equipment.

.2 Voltages, number of phases and wires.

.3 Designation of power source and circuit #.

Example:

PANEL N – 150A
120/208V – 3PH – 4W
FED FROM PNL CDP-A, CCT #1,3,5

.6 Lamicoid nameplates installed on combination starters, magnetic starters, manual starters and all various system controls, control panels, and disconnect switches shall contain the following information in the following order:

.1 Designated name of equipment.

.2 Voltage(s), number of phases and wires.

.3 Branch circuit breaker number(s).

.7 All junction and/or pull boxes shall be marked with an indelible ink marker to designate the circuit number of enclosed wiring, the designated panel name and electrical characteristics where applicable.

.8 Identify branch circuit wiring including neutral conductors at both ends, including in all junction boxes located in between, with permanent indelible identifying markings, indicating panel and circuit number; i.e. A1-25.

.9 Install an additional “Lamicoid” nameplate on all, or any piece of electrical equipment, or apparatus, i.e. Main Switchboard, CDP panels, panelboards, motor control centres, and fusible switches, etc. that may contain overcurrent devices, i.e. circuit breakers and/or fuses, that have been designed for, and incorporate an interrupting capacity sized ‘larger” than 10 kAIC.

Example:

.1 Minimum interrupting capacity of breakers installed in this panel is to be not less than 22 kAIC.

.2 Minimum interrupting capacity of fuses installed in this MCC is to be not less than 100 kAIC.

.10 Throughout the building, provide lamicoid nameplates indicating circuit number above all receptacles. Nameplates shall be mechanically fastened to the wall using screws.

2.6 WIRING IDENTIFICATION

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

System	***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		

2.8 FINISHES

.1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.

.1 Paint outdoor electrical equipment "equipment green" finish.

.2 Paint indoor switchgear and distribution enclosures light gray.

PART 3 - EXECUTION

3.1 INSTALLATION

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

3.2 NAMEPLATES AND LABELS

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

3.3 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.

3.4 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.

3.5 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: 1050 mm.

.2 Wall receptacles:

.1 General: 450 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: 1200 mm.

.3 Panelboards: as required by Code or as indicated.

.4 Telephone and interphone outlets: 450mm.

.5 Wall mounted telephone and interphone outlets: 1200 mm.

.6 Fire alarm stations: 1200 mm.

.7 Fire alarm bells: 2350 mm.

.8 Television outlets: 450 mm.

.9 Wall mounted speakers: 2100 mm.

.10 Clocks: 2100 mm.

.11 Doorbell pushbuttons: 1200 mm.

3.6 COORDINATION OF PROTECTIVE DEVICES

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

3.7 FIELD QUALITY CONTROL

.1 Load Balance: Measure phase current to panelboards with normal loads operating at time of acceptance; adjust branch circuit connections as required to obtain best balance of current between phases and record changes.

.1 Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment.

.2 Provide upon completion of work, load balance report as directed in PART 1 - SUBMITTALS: phase and neutral currents on panelboards, dry-core transformers and motor control centres, operating under normal load, as well as hour and date on which each load was measured, and voltage at time of test.

.2 Conduct following tests in accordance with Section 01 45 00 - Quality Control.

.1 Power generation and distribution system including phasing, voltage, grounding and load balancing.

.2 Circuits originating from branch distribution panels.

.3 Lighting and its control.

.4 Motors, heaters and associated control equipment including sequenced operation of systems where applicable.

.5 Insulation resistance testing:

.1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.

.2 Megger 350-600 V circuits, feeders and equipment with a 1000 V instrument.

.3 Check resistance to ground before energizing.

.3 Carry out tests in presence of Construction Manager

.4 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.

.5 . Manufacturer's Field Services:

.1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.

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

.3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

3.8 COORDINATION WITH OTHER TRADES

.1 Where equipment is to be installed by other trades (i.e., kitchen equipment, mechanical equipment, etc.) and requires electrical connections, ensure a complete seamless job including any final connections and assistance to have all equipment commissioned and operational to the users and consultant's satisfaction.

3.9 CLEANING

.1 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.

.2 Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

.1 Materials and installation for wire and box connectors.

1.2 REFERENCES

.1 CSA C22.2 No. 65-2013 Wire Connectors

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Pressure type wire connectors to: CSA C22.2 No.65, with current carrying parts of copper alloy aluminum alloy sized to fit copper aluminum conductors as required.

.2 Fixture type splicing connectors to: CSA C22.2 No.65, with current carrying parts of copper alloy sized to fit copper conductors 10 AWG or less.

.3 Bushing stud connectors: to EEMAC 1Y-2 NEMA to consist of:

.1 Connector body and stud clamp for stranded round copper aluminum conductors tube bar.

.2 Clamp for stranded round copper conductors bar.

.3 Clamp for stranded aluminum ACSR conductors round aluminum bar.

.4 Stud clamp bolts.

.5 Bolts for copper conductors bar.

.6 Bolts for aluminum conductors bar.

.7 Sized for conductors tubes bars as indicated.

.4 Clamps or connectors for armoured cable, aluminum sheathed cable, mineral insulated cable, flexible conduit, non-metallic sheathed cable as required to: CAN/CSA-C22.2 No.18.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Remove insulation carefully from ends of conductors and:

.1 Apply coat of zinc joint compound on aluminum conductors prior to installation of connectors.

.2 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CSA C22.2 No.65.

.3 Install fixture type connectors and tighten. Replace insulating cap.

.4 Install bushing stud connectors in accordance with EEMAC 1Y-2 NEMA.

END OF SECTION

PART 1 - GENERAL

1.1 PRODUCT DATA

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

1.2 DELIVERY, STORAGE AND HANDLING

.1 Packaging Waste Management: remove for reuse pallets crates paddling and packaging materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 - PRODUCTS

2.1 BUILDING WIRES

.1 Power feeders and branch circuit wiring shall be RW9O—XLPE wire, minimum wire size shall be #12 AWG solid for power and lighting loads, and for continuous loads over 8A. Stranded conductors will be permitted for conductors sized #8 AWG and larger. Minimum wire size for control circuit wiring exceeding 50 volts to ground shall be #14 AWG. Systems rated for 600 volts and less shall have the conductor insulation rated for 600 volts.

.2 Cables are sized for copper.

2.2 ARMOURED CABLES

.1 Conductors: insulated, copper, size as indicated.

.2 Type: AC90; in patient care areas. AC90 to be ISOBX with a #12 AWG Bond wire. No bond smaller than #12 ISO-BX may be used in resident rooms.

.3 Armour: interlocking type fabricated from aluminum strip.

.4 Connectors: anti short connectors.

2.3 CONTROL CABLES

.1 Type: LVT: 2 soft annealed copper conductors, sized as indicated:

.1 Insulation: thermoplastic.

.2 Sheath : thermoplastic jacket, and armour of closely wound aluminum wire.

.2 Type: low energy 300 V control cable: stranded annealed copper conductors sized as indicated LVT: 2 soft annealed copper conductors, sized as indicated:

.1 Insulation: TWH.

.2 Shielding: tape coated with paramagnetic material.

.3 Overall covering: polyethylene jackets aluminum sheath interlocked armour of aluminum strip.

.3 Type: 600 V stranded annealed copper conductors, sizes as indicated:

.1 Insulation: RW90 (x-link).

.2 Shielding: braid over each pair of conductors.

.3 Overall covering: thermoplastic jacket of aluminum.

2.4 MANUFACTURERS

.1 Acceptable Manufacturers:

.1 Canada Wire and Cable

.2 Phillips Cable

.3 Pireli

.4 Southwire

.5 General 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 using method appropriate to site conditions and to approval of authority having jurisdiction over installation.

.3 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 Branch circuit work to be RW9O wire in conduit or AC-90 cable where its use is acceptable in accordance with the CEC installed in accordance with the following guidelines:

.1 RW9O wire in EMT must be used for all horizontal work above accessible ceilings (T-bar) and where exposed.

.2 AC-90 cable may be used for fixture drops, above non-accessible ceilings and in wall partitions. When used for fixture drops install only from junction box to fixture. Loops between fixtures are not acceptable.

.3 Maximum exposed length of AC-90 cable from junction box in accessible ceiling is 1500mm.

.4 Conduit and armoured cable are to be:

.1 Installed concealed in finished areas, parallel and perpendicular to building lines and adequately secured at not less than 1500mm intervals and as required by the CEC or as

otherwise indicated, and in a manner to ensure they are protected from potential types of mechanical damage occurring.

.2 Installed on independent supports specifically installed for cabling directly from the building structure. In ceiling spaces, do not use supports of other trades. Do not secure cables to mechanical systems piping, ducts, or suspended ceiling support wires.

.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 All wire and cables shall be installed on the warm side of the vapour barrier where possible with vapour barrier penetrations kept to a minimum.

.7 All cables are to be secured to concrete, concrete block, brick, and metal decking/siding; with inserts complete with self-tapping metal screws. Cables must be installed a minimum of 38mm below the bottom of roof decking. Pliable type cables are to be secured to building structure at 1220mm intervals and tye-wrapped together at mid-point between each structure support.

.8 Voltage drop: in no instance shall the voltage drop exceed 3% of the line voltage for branch circuit runs. Voltage drop shall be based on the connected load or at 80% of the overcurrent device rating where the load is not known.

3.3 INSTALLATION OF BUILDING WIRES

.1 Install wiring as follows:

.1 In conduit systems in accordance with Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

.2 In underground ducts in accordance with Section 33.

.3 RW90 in EMT for all horizontal work above accessible ceilings (T-Bar) and where exposed.

.4 Feeder conductors are to be installed in Rigid Conduit.

3.4 INSTALLATION OF ARMOURED CABLES

.1 Group cables wherever possible on channels.

.2 Use only for fixture drops, above non-accessible ceilings and in wall partitions.

.3 When used for fixture drops install only from junction box to fixture. Loops between fixtures are not acceptable

.4 The exposed length of AC-90 cable from the junction box in an accessible ceiling shall not exceed 1500 mm

3.5 INSTALLATION OF CONTROL CABLES

.1 Install control cables in conduit.

.2 Ground control cable shield to one end only.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

.1 Materials and installation for connectors and terminations.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CSA C22.2 Latest edition

.2 CSA C22.2 No.41-M1987(R1999), Grounding and Bonding Equipment.

1.3 PRODUCT DATA

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

1.4 CERTIFICATES

.1 Obtain inspection certificate of compliance covering high voltage stress coming from inspection authority and include it with as-built drawings maintenance manuals.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal.

.2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.

PART 2 - PRODUCTS

2.1 CONNECTORS AND TERMINATIONS

.1 Copper long barrel compression connectors to CSA C22.2 No. as required sized for conductors.

.2 Contact aid for aluminum cables where applicable.

.3 2 way joint boxes submarine dry location type in accordance with Section 26 05 33 - Raceway and Boxes for Electrical Systems.

.4 2 way junction boxes with respective pothead for 2, 3, or 4 conductor cables for enclosing stress - cone within with allowance for stress - cone beyond for x- linked polyethylene butyl rubber cable with copper sheath, and overall jacket in accordance with Section 26 05 33 - Raceway and Boxes for Electrical Systems.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Install stress cones, terminations, and splices in accordance with manufacturer's instructions.

.2 Bond and ground as required to CSA C22.2 No.41.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 American National Standards Institute (ANSI)/Institute of Electrical and Electronics Engineers (IEEE)

.1 ANSI/IEEE 837-1989(R1996), Qualifying Permanent Connections Used in Substation Grounding.

.2 Canadian Standards Association, (CSA International)

1.2 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal.

.2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper plastic polystyrene corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

.4 Divert unused metal materials from landfill to metal recycling facility as approved by Construction Manager.

.5 Fold up metal banding, flatten and place in designated area for recycling.

PART 2 - PRODUCTS

2.1 EQUIPMENT

.1 Clamps for grounding of conductor: size as indicated to electrically conductive underground water pipe.

.2 Copper conductor: minimum 6 m long for each concrete encased electrode, bare, stranded, soft annealed, size as indicated.

.3 Plate electrodes: copper, surface area 0.2 mý, 1.6 mm thick.

.4 Grounding conductors: bare stranded copper, soft annealed, size as indicated.

.5 Bonding and grounding conductors shall be copper with a green insulation covering. Bonding and grounding conductors up to and including #10 AWG shall be solid and have RW9O X-link insulation. For sizes of #8 AWG and larger, stranded TW75 green insulation is acceptable.

.6 Ground bus: copper, size as indicated, complete with insulated supports, fastenings, connectors.

.7 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 Thermit welded type conductor connectors.

.5 Bonding jumpers, straps.

.6 Pressure wire connectors.

.8 All feeders and branch circuit conductors installed in conduits shall include a separate green bond wire, sized in accordance with the CEC, minimum size #14 (solid) AWG except as follows:

.1 Where bond wire sizes larger than #14 AWG are required, they are to be increased as required by Table 16A of the CEC, or as otherwise noted.

.9 Minimum size #14 AWG (solid) green insulated conductors are acceptable for bonding purposes associated with various control systems rated 50 volts or less.

2.2 MANUFACTURER

.1 Acceptable Manufacturers:

.1 Burndy Ltd.

.2 McGraw – Edison (Canada) Ltd.

.3 Erico Inc. – Cadweld Div.

.4 Ilsco

PART 3 - EXECUTION

3.1 INSTALLATION GENERAL

.1 The main service entrance and distribution shall be a solidly grounded system.

.2 Indicate grounding details on drawings including conductor sizes and insulation type, and the quantity and type of grounding electrodes for the incoming service and distribution transformers.

.3 All grounding and bonding requirements shall be in accordance with the Canadian Electrical Code, Part 1.

.4 Bonding and grounding conductors shall be copper with a green insulation covering. Bonding and grounding conductors up to and including #10 AWG shall be solid and have RW9O X-link insulation. For sizes of #8 AWG and larger, stranded TW75 green insulation is acceptable.

.5 All feeders and branch circuit conductors installed in conduits shall include a separate green bond wire, sized in accordance with the CEC, minimum size #14 (solid) AWG except as follows:

.1 Where bond wire sizes larger than #14 AWG are required, they are to be increased as required by Table 16 of the CEC, or as otherwise noted.

.6 Minimum size #14 AWG (solid) green insulated conductors are acceptable for bonding purposes associated with various control systems rated 50 volts or less.

.7 Isolated ground systems and/or isolated ground type receptacles shall not be used unless prior approval is obtained from the consultant

.8 Where structural steel is used as part of the construction, the building steel is to be bonded to ground. The connection of the bonding conductor to the steel shall be by exothermic welding.

.9 Communication systems such as telephone, data, cable T.V., sound, and fire alarm are to be grounded in accordance with the Canadian Electrical Code, ANSI J 5607 A and manufacturers requirements Provide a minimum #6 AWG green insulated conductor in EMT from the main ground bus to the telephone and cable TV service entrance locations and to the main data communication racks

.10 Coordinate additional grounding and bonding requirements of communications systems with service provider to ensure compliance.

3.2 FIELD QUALITY CONTROL

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

.2 Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of Consultant and local authority having jurisdiction over installation.

.3 Perform tests before energizing electrical system.

.4 Disconnect ground fault indicator during tests.

END OF SECTION

PART 1 - GENERAL

1.1 WASTE MANAGEMENT AND DISPOSAL

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

.2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

.4 Divert unused metal materials from landfill to metal recycling facility as approved by Construction Manager.

.5 Fold up metal banding, flatten and place in designated area for recycling.

PART 2 - PRODUCTS

2.1 SUPPORT CHANNELS

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

2.2 MANUFACTURERS

.1 Acceptable Manufacturers:

.1 B-Line

.2 Burndy

.3 Unistrut

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Secure equipment to hollow solid masonry, tile and plaster surfaces with lead anchors or nylon shields.

.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 malleable iron 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 1.5m on centre spacing. Or spaced according to requirements of materials in use.

.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 C22.1-12, Canadian Electrical Code, Part 1, 20th Edition.

1.2 SUBMITTALS

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

1.3 DELIVERY, STORAGE AND HANDLING

.1 Waste Management and Disposal:

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

PART 2 - PRODUCTS

2.1 SPLITTERS

.1 Construction: sheet metal enclosure, welded corners and formed hinged cover suitable for locking in closed position.

.2 Terminations: main and branch lugs connection blocks to match required size and number of incoming and outgoing conductors as indicated.

.3 Spare Terminals: minimum three spare terminals or lugs on each connection or lug block sized less than 400 A.

2.2 JUNCTION AND PULL BOXES

.1 Construction: welded steel enclosure.

.2 Covers Flush Mounted: 25 mm minimum extension all around.

.3 Covers Surface Mounted: screw-on flat turned edge covers.

2.3 CABINETS

.1 Construction: welded sheet steel aluminum as indicated hinged door, handle, latch lock 2 keys and catch

.2 Type E Empty: surface return flange flush overlapping sides mounting as indicated.

.3 Type T Terminal: surface return flange or flush overlapping sides mounting as indicated containing 19 mm G1S fir plywood sheet steel backboard.

PART 3 - EXECUTION

3.1 SPLITTER INSTALLATION

.1 Mount plumb, true and square to building lines. Install only where indicated on drawings.

.2 Extend splitters full length of equipment arrangement except where indicated otherwise.

3.2 JUNCTION, PULL BOXES AND CABINETS INSTALLATION

.1 Install pull boxes in inconspicuous but accessible locations.

.2 Mount cabinets with top not higher than 2 m above finished floor except where indicated otherwise.

.3 Install terminal block as indicated in Type T cabinets.

.4 Only main junction and pull boxes are indicated. Install additional pull boxes as required by CSA C22.1.

3.3 IDENTIFICATION

.1 Equipment Identification: to Section 26 05 00 - Common Work Results for Electrical.

.2 Identification Labels: size 2 indicating system name, voltage and phase or as indicated.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CSA C22.1, Canadian Electrical Code, Part 1, Latest Edition in force.

1.2 SUBMITTALS

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

.2 Submit samples for floor box in accordance with Section 01 33 00 - Submittal Procedures

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 plaster 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 FLOOR BOXES

.1 Concrete tight electro-galvanized sheet steel floor boxes with adjustable finishing rings to suit floor finish with brass brushed aluminum faceplate. Device mounting plate to accommodate short or long ear duplex single receptacles. Minimum depth: 73 mm for receptacles and communication outlets.

.2 Adjustable, watertight, concrete tight, cast floor boxes with openings drilled and tapped for 16, 21 and 27 mm conduit. Minimum size: 73 mm deep.

2.6 CONDUIT BOXES

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

2.7 OUTLET BOXES FOR NON-METALLIC SHEATHED CABLE

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

2.8 FITTINGS - GENERAL

.1 Bushing and connectors with nylon insulated throats.

.2 Knock-out fillers to prevent entry of debris.

.3 Conduit outlet bodies for conduit up to 35 mm and pull boxes for larger conduits.

.4 Double locknuts and insulated bushings on sheet metal boxes.

.5 Extension rings to be installed on devices on exterior walls as required.

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.

.7 Extension rings to be installed on devices on exterior walls as required.

END OF SECTION

PART 1 - GENERAL

1.1 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.

.6 CAN/CSA C22.2 No. 227.3-05, Nonmetallic Mechanical Protection Tubing (NMPT), A National Standard of Canada (February 2006).

1.2 SUBMITTALS

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

.2 Product data: submit manufacturer's printed product literature, specifications and datasheets.

.1 Submit cable manufacturing data.

.3 Quality assurance submittals:

.1 Test reports: submit certified test reports.

.2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.3 Instructions: submit manufacturer's installation instructions.

1.3 WASTE MANAGEMENT AND DISPOSAL

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

.2 Place materials defined as hazardous or toxic waste in designated containers.

.3 Ensure emptied containers are sealed and stored safely for disposal away from children.

PART 2 - PRODUCTS

2.1 CABLES AND REELS

.1 Provide cables on reels or coils.

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

.2 Each coil or reel of cable to contain only one continuous cable without splices.

.3 Identify cables for exclusively dc applications.

.4 Reel and mark shielded cables rated 2,001 volts and above.

2.2 CONDUITS

.1 Rigid metal conduit: to CSA C22.2 No. 45, galvanized steel hot dipped galvanized steel threaded.

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

.3 Rigid pvc conduit: to CSA C22.2 No. 211.2.

.4 Flexible metal conduit: to CSA C22.2 No. 56, steel aluminum liquid-tight flexible metal.

2.3 CONDUIT FASTENINGS

.1 One hole steel straps to secure surface conduits NPS 2 and smaller.

.1 Two hole steel straps for conduits larger than NPS 2.

.2 Beam clamps to secure conduits to exposed steel work.

.3 Channel type supports for two or more conduits at code rated spacing on centre.

.4 Threaded rods, 6 mm diameter, to support suspended channels.

2.4 CONDUIT FITTINGS

.1 Fittings: to CAN/CSA C22.2 No. 18, manufactured for use with conduit specified. Coating: same as conduit.

.2 Ensure factory "ells" where 90 degrees bends for NPS 1 25 mm and larger conduits.

.3 Connectors and Couplings: Steel setscrew type. Watertight connectors and couplings where moisture may be present.

2.5 EXPANSION FITTINGS FOR RIGID CONDUIT

.1 Weatherproof expansion fittings with internal bonding assembly suitable for 200 mm linear expansion.

.2 Watertight expansion fittings with integral bonding jumper suitable for linear expansion and 19 mm deflection.

.3 Weatherproof expansion fittings for linear expansion at entry to panel.

2.6 FISH CORD

.1 Polypropylene.

2.7 MANUFACTURER

.1 Acceptable Manufacturers:

.1 Alcan Canada

.2 Scepter Mfg. Co.

.3 Steel Co. of Canada

.4 Cooper Crouse-Hinds

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 Where conduit is used for interior wiring it shall be in EMT, except where prohibited by code, unless noted otherwise. Panel feeders must be installed in conduit. Branch circuit power and lighting circuits, fire alarm, security and sound systems, communications and control wiring may be installed in conduit. All conduits shall be concealed except in electrical or mechanical rooms. Conduits shall be run parallel and perpendicular to building lines.

.2 EMT connectors and couplings shall be the steel setscrew type. Where the probability of moisture exists, steel compression type fittings are acceptable or PVC conduit may be substituted provided it is installed in accordance with the latest Edition of the NBC. Aluminum conduits are not acceptable. Concrete embedded and under ground floor slab conduit shall be PVC or rigid conduit. Solvent cement for PVC duct joints to have a VOC content which meets or exceeds SCAQMD.

.3 Flexible metal conduit, liquid tight flexible metal conduit and armoured cable are acceptable for short drops to motors, ceiling mounted equipment, etc. Anti-short insulators are required at each termination.

.4 All EMT stubs are to be bonded to ground in accordance with the CEC.

.5 Where metal type Q-Deck is being used, all conduits are to be installed on room sides of upper portions of same (directly above tops of, and at right angles to steel joists) and secured directly to sides of metal flutes and/or structure except for roofs. For roofs, conduits must be installed 38mm from bottom of decking in accordance with New Brunswick Electrical Inspection Bulletin No.2-1-10.

.6 All conduits to be installed on the warm side of the vapour barrier where possible with vapour barrier penetrations kept to a minimum.

.7 Conduit Fastenings shall be:

.1 One hole steel straps to secure surface conduits 53mm and smaller. Two hole steel straps for conduits larger than 53mm.

.2 Beam clamps to secure conduits to exposed steel work.

.3 Channel type supports for two or more conduits spaced at 1.5m o.c.; minimum 6mm diameter threaded rods to support suspended channels.

.8 Conduit Fittings shall be:

.1 Fittings manufactured for use with conduit specified Coating shall be same as conduit

.2 Factory LBs where 90 deg bends are required for conduits larger than 40mm.

.3 Fish Cord shall be polypropylene.

3.3 CONDUITS UNDERGROUND

.1 Slope conduits to provide drainage.

.2 Waterproof joints (pvc excepted) with heavy coat of bituminous paint.

3.4 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 Canadian Standards Association (CSA International)

.1 CSA C22.2 No.184.1-96(R2001), Solid-State Dimming Controls (Bi-national standard with UL 1472 Updated 2003).

1.2 SUBMITTALS

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

1.3 WASTE MANAGEMENT AND DISPOSAL

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

PART 2 - PRODUCTS

.1 See specification 26 27 26 paragraph 2.4.

2.2 COMMERCIAL DIMMERS

.1 Commercial electronic dimmers: to CSA C22.2, designed to control brightness of incandescent lamps up to kW shown on drawings and consisting of:

.1 Power sections:

.2 Power sections:

.1 Basic dimmer control.

.2 Lamp debuzzing coil to eliminate lamp buzzing and radio frequency interference.

.3 Rated: as shown on drawings at 120 V, 60 Hz, with status light.

.3 Manual control for dimming from single location as indicated.

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 dimmers control stations in accordance with manufacturer's instructions.

.2 Connect lamp circuits to dimmer power sections.

3.3 FIELD QUALITY CONTROL

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

.2 Demonstrate that dimming systems are installed as indicated.

.3 Demonstrate that dimming systems:

.1 Operate as intended.

.2 That there are no problems in starting lamps, nor in keeping them lit.

.3 That they flicker-free at any setting of dimming intensity control.

.4 Demonstrate that no audio, radio or TV interference is carried by system.

.5 Commissioning:

.1 Commission system using commissioning agent, when installation has been completed.

.2 Perform commissioning after ballasts and controls have been installed and wiring has been connected and checked for proper continuity.

.3 Commissioning agent to calibrate and verify system operation for specified functions and controls.

3.4 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 SECTION INCLUDES

.1 Materials and installation for standard and custom breaker type panelboards.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CSA C22.2 No.29-M1989(R2000), Panelboards and enclosed Panelboards.

1.3 SHOP DRAWINGS

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

.2 Drawings to include electrical detail of panel, branch breaker type, quantity, ampacity and enclosure dimension.

1.4 WASTE MANAGEMENT AND DISPOSAL

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

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper plastic polystyrene corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

.4 Divert unused metal and wiring materials from landfill to metal recycling facility approved by Construction Manager.

PART 2 - PRODUCTS

2.1 PANELBOARDS

.1 Panelboards: to CSA C22.2 No.29 and product of one manufacturer.

.1 Install circuit breakers in panelboards before shipment.

.2 In addition to CSA requirements manufacturer's nameplate must show fault current that panel including breakers has been built to withstand.

.2 208/600 V panelboards: bus and breakers rated for 10kA/14kA (symmetrical), respectively interrupting capacity or as indicated.

.3 Sequence phase bussing with odd numbered breakers on left and even on right, with each breaker identified by permanent number identification as to circuit number and phase.

.4 Panelboards: mains, number of circuits, and number and size of branch circuit breakers as indicated.

.5 Two keys for each panelboard and key panelboards alike.

.6 Copper or Aluminum bus with neutral of same ampere rating as mains.

.7 Mains: suitable for bolt-on breakers.

.8 Trim with concealed front bolts and hinges.

.9 Trim and door finish: baked grey enamel air dried grey enamel as per colour schedule.

.10 Door: Key locked, c/w 2 keys. All panelboards shall be keyed alike.

.11 Allow 25% space in all types of panelboards for future growth.

.12 Where more than one bonding terminal strip is present in any one panelboard, both shall be hard-wired together using identical size bonding conductor as the one accompanying the panel feeder conductors.

.13 Where two panels serve the same area they are to be bonded together using #6 AWG minimum.

2.2 BREAKERS

.1 Breakers: to Section 26 28 21 - Moulded Case Circuit Breakers. Bolt-on type.

.2 Breakers with thermal and magnetic tripping in panelboards except as indicated otherwise.

.3 Main breaker (where shown): separately mounted on top or bottom of panel to suit cable entry. When mounted vertically, down position should open breaker.

.4 Lock-on devices for 10% of 15 to 30 A breakers installed as indicated. Turn over unused lock-on devices to Owner/Owners Representative.

.5 Lock-on devices for circuits supplying safety equipment (i.e. fire alarm, emergency, door supervisory, intercom, stairway, exit and night light circuits).

.6 All panelboards shall have bolt on breakers.

2.3 SURGE PROTECTION DEVICES

.1 Provide phase 120/240 V, 3 wire and ground transient voltage surge protection, a stand-alone system connected to each panel that provides power for computers and data. Refer to panel schedules for panel schedules for panels that require protection.

2.4 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results - Electrical.

.2 Nameplate for each panelboard size 4 engraved as indicated.

.3 Nameplate for each circuit in distribution panelboards size 2 engraved as indicated.

.4 Complete circuit directory with typewritten legend showing location and load of each circuit.

2.5 MANUFACTURER

.1 Acceptable Manufacturers:

.1 Eation

.2 Schnieder

.3 Siemens

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Locate panelboards as indicated and mount securely, plumb, true and square, to adjoining surfaces.

.2 Mount panelboards to height specified in Section 26 05 00 - Common Work Results - Electrical or as indicated.

.3 Connect loads to circuits.

.4 Connect neutral conductors to common neutral bus with respective neutral identified

END OF SECTION

GENERAL

1.1 SECTION INCLUDES

.1 Switches, receptacles, wiring devices, cover plates and their installation.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CSA-C22.2 No.42-99(R2004), General Use Receptacles, Attachment Plugs and Similar Devices.

.2 CSA-C22.2 No.42.1-00, Cover Plates for Flush-Mounted Wiring Devices (Bi-national standard, with UL 514D).

.3 CSA-C22.2 No.55-M1986(July 2003), Special Use Switches.

.4 CSA-C22.2 No.111-00, General-Use Snap Switches (Bi-national standard, with UL 20, twelfth edition).

1.3 SHOP DRAWINGS AND PRODUCT DATA

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

1.4 WASTE MANAGEMENT AND DISPOSAL

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

.2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.

PART 2 - PRODUCTS

2.1 SWITCHES

.1 15 A, 120 V, single pole, double pole, three-way, four-way switches to: CSA-C22.2 No.55 and CSA-C22.2 No.111.

.2 Manually-operated general purpose ac switches with following features:

.1 Terminal holes approved for No. 10 AWG wire.

.2 Silver alloy contacts.

.3 Urea or melamine moulding for parts subject to carbon tracking.

.4 Suitable for back and side wiring.

.5 White toggle.

.3 Toggle operated locking fully rated for tungsten filament and fluorescent lamps, and up to 80% of rated capacity of motor loads.

.4 Switches of one manufacturer throughout project.

.5 Acceptable materials: Commercial grade. See table below for acceptable products.

2.2 RECEPTACLES

.1 Duplex receptacles, CSA type 5-15 R, 125 V, 15 A, U ground, to: CSA-C22.2 No.42 with following features:

.1 White urea moulded housing.

.2 Suitable for No. 10 AWG for back and side wiring.

.3 Break-off links for use as split receptacles.

.4 Eight back wired entrances, four side wiring screws.

.5 Triple wipe contacts and rivetted grounding contacts.

.2 Single receptacles CSA type 5-15 R, 125 V, 15 A, U ground with following features:

.1 White urea moulded housing.

.2 Suitable for No. 10 AWG for back and side wiring.

.3 Four back wired entrances, 2 side wiring screws.

.3 Duplex receptacles for cleaning equipment, CSA type 5-20 R, 125 V, combination 15/20 A, U ground, to: CSA-C22.2 No.42 with following features:

.1 White urea moulded housing.

.2 Suitable for No. 10 AWG for back and side wiring.

.3 Break-off links for use as split receptacles.

.4 Eight back wired entrances, four side wiring screws.

.5 Triple wipe contacts and rivetted grounding contacts.

.4 15A, 120V receptacles located within 1.5m of a sink or washbasin shall be GFCI protected.

.5 120V exterior duplex receptacles shall be GFCI protected c/w lockable cover.

.6 Other receptacles with ampacity and voltage as indicated.

.7 Receptacles of one manufacturer throughout project.

.8 Acceptable materials: Commercial grade receptacles except as indicated. See table below for acceptable products.

2.3 COVER PLATES

.1 Cover plates for wiring devices to: CSA-C22.2 No.42.1.

.2 Cover plates from one manufacturer throughout project.

.3 Sheet steel utility box cover for wiring devices installed in surface-mounted utility boxes.

.4 White nylon cover plates, thickness 2.5 mm for wiring devices mounted in flush-mounted outlet box.

.5 Sheet metal cast cover plates for wiring devices mounted in surface-mounted FS or FD type conduit boxes.

.6 Weatherproof spring-loaded cast aluminum cover plates complete with gaskets for single receptacles or switches.

2.4 ACCEPTABLE WIRING DEVICES

.1 Table of wiring devices

ITEM	DESCRIPTION	MANUFACTURER	PART NO.	MANUFACTURER	PART NO.	MANUFACTURER	PART NO.	NOTES
LED DIMMER	600W 120V	LEVITON	IPE04-1 LZ (elv)	HUBBELL	S13I	ARROW HART	RF9537	DECORA STYLE USE ON LED A RETROFIT LAMP
RECEPTACLE	15A 120V	LEVITON	CR15-W	HUBBELL	BR15WI	ARROW HART	BR15	STANDARD STYLE SPEC. GRADE
T SLOT RECEPT	15/20 120V	LEVITON	CR20-W	HUBBELL	BR20WHI	ARROW HART	BR20	STANDARD STYLE
RECEPTACLE GFI	15A 120V	LEVITON	8599	HUBBELL	GF15WLA	ARROW HART	VGF15F	STANDARD STYLE SPEC. GRADE
RECEPTACLE T SLOT GFI	15/20A 120V	LEVITON	N7899	HUBBELL	GF20WLA	ARROW HART	VFGF20	
EXTERIOR GFI 120V	15A 120V	LEVITON	N7599	HUBBELL	GFTR15W	ARROW HART	WRBR15	PROTECTED WHEN OPENED
LIGHTING TOGGLE SW	15A 120V	LEVITON	1201	HUBBELL	1201W	ARROW HART	AH1201	
LIGHTING 3 WAY	15A 120V	LEVITON	1203	HUBBELL	1203W	ARROW HART	AH1203	
LIGHTING 4 WAY	15A 120V	LEVITON	1204	HUBBELL	1204W	ARROW HART	AH1204	
LIGHTING MOTION	15A 120V	LEVITON	ODS10/15	HUBBELL	WS120W	ARROW HART	VSIRO4	

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Switches:

.1 Install single throw switches with handle in "UP" position when switch closed.

.2 Install switches in gang type outlet box when more than one switch is required in one location.

.3 Mount toggle switches at height in accordance with Section 26 05 01 - Common Work Results - Electrical as indicated.

.2 Receptacles:

.1 Install receptacles in gang type outlet box when more than one receptacle is required in one location.

.2 Mount receptacles at height in accordance with Section 26 05 01 - Common Work Results - Electrical as indicated.

.3 Where split receptacle has one portion switched, mount vertically and switch upper portion.

.3 Cover plates:

.1 Protect cover plate finish with paper or plastic film until painting and other work is finished.

.2 Install suitable common cover plates where wiring devices are grouped.

.3 Do not use cover plates meant for flush outlet boxes on surface-mounted boxes.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

.1 Materials for moulded-case circuit breakers.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International).

.1 CSA-C22.2 No. 5-02, Moulded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, tenth edition, and the second edition of NMX-J-266-ANCE).

1.3 SUBMITTALS

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

.2 Include time-current characteristic curves for breakers with ampacity of 400A and over or with interrupting capacity of 22,000 A symmetrical (rms) and over at system voltage.

1.4 WASTE MANAGEMENT AND DISPOSAL

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

PART 2 - PRODUCTS

2.1 BREAKERS GENERAL

.1 Moulded-case circuit breakers, Circuit breakers, and Ground-fault circuit-interrupters, Fused circuit breakers, and Accessory high-fault protectors: to CSA C22.2 No. 5

.2 Bolt-on moulded case circuit breaker: quick- make, quick-break type, for manual and automatic operation with temperature compensation for 40 degrees C ambient.

.3 Common-trip breakers: with single handle for multi-pole applications.

.4 Magnetic instantaneous trip elements in circuit breakers to operate only when value of current reaches setting.

.1 Trip settings on breakers with adjustable trips to range from 3-8 times current rating.

.5 Circuit breakers with interchangeable trips as indicated.

.6 Circuit breakers to have minimum 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

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 0l 33 00 - Submittal Procedures.

.2 Section 01 74 2 1 – Construction/Demolition Waste Management And Disposal.

.3 Section 01 45 00 - Quality Control.

.4 Section 26 05 00 - Common Work Results - Electrical

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CAN/CSA-C22.2 No.144-M91(R2006), Ground Fault Circuit Interrupters.

.2 National Electrical Manufacturers Association (NEMA)

.1 NEMA PG 2.2-1999, Application Guide for Ground Fault Protection Devices for Equipment.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management And Disposal.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Equipment and components for ground fault circuit interrupters (GFCI): to CAN/CSA-C22.2 No.144 NEMA PG 2.2.

.2 . Components comprising ground fault protective system to be of same manufacturer.

2.2 BREAKER TYPE GROUND FAULT INTERRUPTER

.1 Single or Two pole ground fault circuit interrupter for 15 A, 120 V, 1 phase circuit c/w test and reset facilities.

2.3 MANUFACTURERS

.1 . Acceptable Manufacturers:

.1 Arrow Hart

.2 Hubbell

.3 Leviton

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Connect supply and load wiring to equipment in accordance with manufacturer's recommendations.

3.2 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 01 - Common Work Results - Electrical and co-ordinate with Section 01 45 00 - Quality Control if required.

.2 Arrange for field testing of ground fault equipment before commissioning service.

.3 Demonstrate simulated ground fault tests.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 Canadian Standards Association (CSA International).

.1 CAN/CSA C22.2 No.4-M89 (R2000), Enclosed Switches.

.2 CSA C22.2 No.39-M89 (R2003), Fuseholder Assemblies.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

1.3 WASTE MANAGEMENT AND DISPOSAL

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

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper plastic polystyrene corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

.4 Separate for reuse and recycling and place in designated containers Steel Metal Plastic waste in accordance with Waste Management Plan.

.5 Fold up metal banding, flatten and place in designated area for recycling.

PART 2 - PRODUCTS

2.1 DISCONNECT SWITCHES

.1 Fusible, or non-fusible, horsepower rated disconnect switch in CSA Enclosure 1, to CAN/CSA C22.2 No.4 size as indicated.

.2 Provision for padlocking in on-off switch position by three locks.

.3 Mechanically interlocked door to prevent opening when handle in ON position.

.4 Fuses: size as indicated or as recommended by manufacture.

.5 Fuseholders: to CSA C22.2 No.39relocatable and suitable without adaptors, for type and size of fuse indicated.

.6 Quick-make, quick-break action.

.7 ON-OFF switch position indication on switch enclosure cover.

2.2 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results - Electrical.

.2 Indicate name of load controlled on size 4 nameplate.

2.3 MANUFACTURER

.1 Acceptable Manufacturers:

.1 Eaton

.2 Schneider

.3 Siemens

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Install disconnect switches complete with fuses if applicable.

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, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Provide complete photometric data prepared by independent testing laboratory for luminaires where specified, for approval review Consultant.

.3 Photometric data to include: VCP Table where applicable spacing criterion.

PART 2 - PRODUCTS

2.1 LAMPS

.1 LED Lamps - Initial luminous efficacy of min 70 lm/w, 4000 K colour temperature.

.2 See lighting schedule on electrical drawings for approved manufacturer.

2.2 BALLASTS

.1 Fluorescent ballast: CBM and CSA certified, high performance and high energy efficient type, IC electronic IC electronic dimmable. Ballasts shall be listed by Consortium of Energy Efficiency. For a list of qualifying products, refer to www.cee1.org.

.1 Rating: V, 60 Hz voltage as indicated, for use with 2-32W, rapid start lamps.

.2 Totally encased and designed for 40 degrees Celsius ambient temperature.

.3 Power factor: minimum 95 % with 95% of rated lamp lumens.

.4 Current crest factor: 1.7 maximum.

.5 Harmonics: 10 % maximum THD.

.6 Operating frequency of electronic ballast: 40 kHz minimum.

.7 Total circuit power: 62 Watts.

.8 Ballast factor: greater than 0.88.

.9 Sound rated: Class A.

.10 Mounting: Integral with luminaire.

.2 Metal halide ballast:

.1 Rating:Pulse start, multitap 120V,347V, 60 Hz voltage as indicated, for use with 1-250W metal halide lamp or wattage as indicated.

.2 Totally encased and designed for 40 degrees Celsius ambient temperature.

.3 Power factor: minimum 95 % with 95% of rated lamp lumens.

.4 Type: constant wattage autotransformer isolated secondary solid state.

.5 Input voltage range: plus or minus 10% of nominal.

.6 Minimum starting temperature: minus 30 degrees Celsius at 90% line voltage.

.7 Mounting: Integral with luminaire.

.8 Current crest factor: 1.7 maximum current.

.3 Acceptable Manufacturers or approved equal:

.1 General Electric

.2 Osram-Sylvania

.3 Philips Lighting

2.3 FINISHES

.1 Light fixture finish and construction to meet ULC listings and CSA certifications related to intended installation.

2.4 OPTICAL CONTROL DEVICES

.1 Occupancy sensor, as indicated in luminaire schedule.

2.5 LUMINAIRES

.1 As indicated in luminaire schedule.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Locate and install luminaires as indicated.

.2 Provide adequate support to suit ceiling system.

3.2 WIRING

.1 Connect luminaires to lighting circuits:

.1 Install flexible or rigid conduit for luminaires as indicated.

3.3 LUMINAIRE SUPPORTS

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

.1 Remove surplus materials, excess materials, rubbish, tools and equipment.

.2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

.1 Materials and installation for emergency lighting systems.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CSA C22.2 No.141-M1985(R1999), Unit Equipment for Emergency Lighting.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 21 Construction/Demolition Waste Management And Disposal.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

.4 Fold up metal banding, flatten and place in designated area for recycling.

1.5 WARRANTY

.1 For batteries, the 12 months warranty period prescribed in subsection GC32.1 of General Conditions "C" is extended to 120 months, with no-charge replacement during the first 5 years and pro-rate charge on the second 5 years.

PART 2 - PRODUCTS

2.1 EQUIPMENT

.1 Emergency lighting equipment: to CSA C22.2 No.141.

.2 Supply voltage: 120V, ac.

.3 Output voltage: 12V dc.

.4 Operating time: 60 min.

.5 Battery: sealed, maintenance free.

.6 Charger: solid state, multi-rate, voltage/current regulated, inverse temperature compensated, short circuit protected with regulated output of plus or minus 0.01V for plus or minus 10% input variations.

.7 Solid state transfer circuit.

.8 Low voltage disconnect: solid state, modular, operates at 80% battery output voltage.

.9 Signal lights: solid state, life expectancy 100,000 hours minimum for 'AC Power ON' and 'High Charge'.

.10 Dual Lamp heads: integral on unit, 345 degrees horizontal and 180 degrees vertical adjustment. Lamp type: mini halogen, 8W.

.11 Cabinet: suitable for direct or shelf mounting to wall and c/w knockouts for conduit. Removable or hinged front panel for easy access to batteries.

.12 Finish: White baked enamel.

.13 Auxiliary equipment:

.1 Test switch.

.2 Battery disconnect device.

.3 AC input and DC output terminal blocks inside cabinet.

.4 Auto-test self diagnostics.

2.2 WIRING

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

.2 Conductors: RW90 in accordance with Section 26 05 21 - Wires and Cables 0-1000 V, sized as indicated in accordance with manufacturer's recommendations, minimum size is #12 AWG.

2.3 MANUFACTURER

.1 See lighting schedule on electrical drawings for approved manufacturers.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Install wall mounted units 2400 mm from finished floor or at ceiling level when floor to ceiling height is less than 2400 mm.

.2 Install units as indicated.

.3 Direct heads as indicated.

.4 Test each unit for 60 minutes on emergency.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CSA C22.2 No.141-02, Unit Equipment for Emergency Lighting.

.2 CSA C860-01(December 2002), Performance of Internally-Lighted Exit Signs.

1.2 SUBMITTALS

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

1.3 WASTE MANAGEMENT AND DISPOSAL

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

PART 2 - PRODUCTS

2.1 STANDARD UNITS

.1 Exit lights: to CSA C22.2 No.141 and CSA C860.

.2 Housing: extruded aluminum housing, brush aluminum finish.

.3 Face and back plates: extruded aluminum.

.4 Lamps: LED

.5 Operation: designed for 100,000 hours of continuous operation without re-lamping.

.6 Pictogram per 2010 national building code.

.7 Mounting and directional arrows as indicated.

.8 Downlight: white glass translucent acrylic in bottom of unit.

2.2 LUMINAIRES

.1 As indicated on lighting fixture schedule on drawings.

2.3 MANUFACTURER

.1 See lighting schedule on electrical drawings for approved manufacturers.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Install exit signs to manufacturer’s recommendations, listing requirements, NFPA standards and local regulatory requirements.

.2 Connect fixtures to exit light circuits.

.3 Test exit lights on emergency power.

.4 Ensure that exit light circuit breaker is locked in ‘ON’ position.

3.2 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 RELATED SECTIONS

.1 Section 26 05 31 - Splitters, Junction, Pull Boxes and Cabinets.

.2 Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

1.2 SYSTEM DESCRIPTION

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

1.3 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management And Disposal.

.2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper plastic polystyrene corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

.4 Divert unused metal conduit and wiring materials from landfill to metal recycling facility as approved by Construction Manager.

.5 Fold up metal banding, flatten and place in designated area for recycling.

PART 2 - PRODUCTS

2.1 MATERIAL

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

.2 Junction boxes: in accordance with Section 26 05 31 - Splitters, Junction, Pull Boxes and Cabinets.

.3 Outlet boxes type, conduit boxes size, and fittings: in accordance with Section 26 05 31 - Splitters, Junction, Pull Boxes and Cabinets.

.4 Fish wire: polypropylene type.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Install empty raceway system, including, fish wire, outlet boxes, floor boxes, pull boxes, cover plates, conduit, sleeves and caps, miscellaneous and positioning material to constitute complete system.

END OF SECTION