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S P E C I F I C A T I O N S

FOR

GENERAL CONTRACT

INTERIOR RENOVATIONS
319 1st AVENUE
MEADOW LAKE, SASKATCHEWAN

25 JUL 18 SET NO. _____

FILE: 18-01

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END OF SECTION

1 GENERAL

1.01 WORK COVERED BY CONTRACT DOCUMENTS

.1 Work of this Contract comprises renovation of existing front administration and storage areas, replacement of existing doors & door hardware in select locations, replacement of existing penal fixtures and light fixtures in existing detainment cells, and rough-in of new surveillance system. All associated mechanical and electrical is included.

1.02 CONTRACT METHOD

.1 Construct Work under stipulated price contract.

.2 Relations and responsibilities between Contractor and subcontractors are as defined in Conditions of Contract.

1.03 WORK SEQUENCE

.1 Work in existing detainment cells to be sequenced to minimize disruption of normal building operations, see Section 01 14 00 – Work Restrictions.

.2 Co-ordinate Progress Schedule and co-ordinate with Departmental Representative's Occupancy during construction.

.3 Maintain fire and security access/control throughout duration of project. Contractor to coordinate with Departmental Representative.

1.04 CONTRACTOR USE OF PREMISES

.1 Restricted use of site will be enforced throughout the Work.

.2 Limit use of premises for Work, for storage, and for access, to allow:
- .1 Departmental Representative occupancy.
- .2 Minimal interruptions to building operations, as defined by the Departmental Representative.

.3 Co-ordinate use of premises under direction of Departmental Representative.

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

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

.6 Repair or replace portions of existing work which have been altered during construction operations to match existing or adjoining work, as directed by Departmental Representative.

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

1.05 OWNER OCCUPANCY

.1 Departmental Representative will occupy premises during entire construction period for execution of normal operations.

.2 Co-operate with Departmental Representative in scheduling operations to minimize conflict and to facilitate Departmental Representative usage.

1.06 ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING BUILDING

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

1.07 EXISTING SERVICES

.1 Notify, Departmental Representative and utility companies of intended interruption of services and obtain required permission.

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

.3 Provide alternative routes for personnel traffic.

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

.5 Submit schedule to and obtain approval from Departmental Representative for any shut-down or closure of active service or facility including power and communications services. Adhere to approved schedule and provide notice to affected parties.

.6 Provide temporary services as directed by Departmental Representative to maintain critical building systems.

.7 Where unknown services are encountered, immediately advise Departmental Representative and confirm findings in writing.

.8 Protect, relocate or maintain existing active services. When inactive services are encountered, cap off in manner approved by authorities having jurisdiction.

.9 Record locations of maintained, re-routed and abandoned service lines.

.10 Construct barriers in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.

1.08 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.

2 PRODUCTS

2.01 NOT USED

.1 Not used.

3 EXECUTION

3.01 NOT USED

.1 Not used.

END OF SECTION

1 GENERAL

1.01 ACCESS AND EGRESS

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

1.02 USE OF SITE AND FACILITIES

.1 Execute work with least possible interference or disturbance to normal use of premises. Make arrangements with Departmental Representative to facilitate work as stated.

.2 Maintain existing services to building and provide for personnel and vehicle access.

.3 Where security is reduced by work provide temporary means to maintain security.

.4 Sanitary facilities for use by Contractor's personnel to be provided by Contractor. Building facilities will not be available for use.

.5 Closures: protect work temporarily until permanent enclosures are completed.

1.03 ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING BUILDING

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

1.04 EXISTING SERVICES

.1 Notify, Departmental Representative and utility companies of intended interruption of services and obtain required permission.

.2 Where Work involves breaking into or connecting to existing services, give Departmental Representative 48 hours of notice for necessary interruption of mechanical or electrical service throughout course of work. Keep duration of interruptions minimum. Carry out interruptions after normal working hours of occupants, preferably on weekends.

.3 Provide for personnel and vehicular traffic.

.4 Construct barriers in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.

1.05 SPECIAL REQUIREMENTS

.1 Construct Work in stages to accommodate Departmental Representative’s continued use of premises during construction. Existing detainment cells are to remain in operation during construction. Contractor will be provided access to a maximum of two (2) cells at one time to carry out Work. Cells to be turned over to Departmental Representative upon completion of Work in each cell for continued operation of building. Contractor to coordinate with Departmental Representative.

.2 Carry out noise generating Work Monday to Friday from 7:00 to 18:00 hours.

.3 Upon receipt of a written request from the Contractor noting the reason for the exception, anticipated duration and scope of work included. Work may proceed during exception periods only upon receipt by the Contractor of written approval from the Departmental Representative.

.4 Submit schedule in accordance with Section 01 32 16.07 - Construction Progress Schedule - Bar (GANTT) Chart.

.5 Ensure Contractor's personnel employed on site become familiar with and obey regulations including safety, fire, traffic and security regulations.

.6 Keep within limits of work and avenues of ingress and egress.

.7 Ingress and egress of Contractor vehicles at site will be determined at project start-up meeting.

.8 Delivery of materials to occur within normal working hours 08:00 to 17:00 and shall be received by the Contractor only.

1.06 SECURITY CLEARANCES

.1 Contractor personnel must submit to local law enforcement verification by RCMP, prior to admittance to the facility site. All personnel employed on the site must have an Identification Card (Government-issued photo I.D.) and have passed a security clearance. The Owner reserves the right to deny access to any facility / site or part thereof, to any Contractor personnel, at any time.

.2 All access to the building is to be through a designated entrance. Personnel will be signed in daily at start of work shift, and provided with a pass which must be worn at all times. Pass must be returned at end of work shift and personnel checked out.

.3 Security clearance documents will be provided.

1.07 SECURITY

.1 Where security has been reduced by Work of Contract, provide temporary means to maintain security, coordinate with Departmental Representative.

1.08 BUILDING SMOKING ENVIRONMENT

.1 Comply with smoking restrictions. No smoking or vaping will be allowed in or around the building. Smoking is allowed only in areas indicated by Departmental Representative.

.2 Idling of vehicles adjacent building when not in use is not permitted.

2 PRODUCTS

2.01 NOT USED

.1 Not Used.

3 EXECUTION

3.01 NOT USED

.1 Not Used.

END OF SECTION

1 GENERAL

1.01 ADMINISTRATIVE

.1 Schedule and administer project meetings throughout the progress of the work at the call of Departmental Representative.

.2 Prepare agenda for meetings.

.3 Distribute written notice of each meeting four days in advance of meeting date to Departmental Representative.

.4 Provide physical space and make arrangements for meetings.

.5 Preside at meetings.

.6 Record the meeting minutes. Include significant proceedings and decisions. Identify actions by parties.

.7 Reproduce and distribute copies of minutes within three days after meetings and transmit to meeting participants and, affected parties not in attendance.

.8 Representative of Contractor, Subcontractor and suppliers attending meetings will be qualified and authorized to act on behalf of party each represents.

1.01 PRECONSTRUCTION MEETING

.1 Within 15 days after award of Contract, request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.

.2 Departmental Representative, Contractor, major Subcontractors will be in attendance.

.3 Establish time and location of meeting and notify parties concerned minimum 5 days before meeting.

.4 Incorporate mutually agreed variations to Contract Documents into Agreement, prior to signing.

.5 Agenda to include:

- .1 Appointment of official representative of participants in the Work.
- .2 Schedule of Work: in accordance with Section 01 32 16.07 - Construction Progress Schedules - Bar (GANTT) Chart.
- .3 Schedule of submission of shop drawings. Submit submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .4 Requirements for temporary facilities, site sign, offices, storage sheds, utilities, fences in accordance with Section 01 52 00 - Construction Facilities.
- .5 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements.
- .6 Record drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .7 Maintenance manuals in accordance with Section 01 78 00 - Closeout Submittals.
- .8 Monthly progress claims, administrative procedures, photographs, hold backs.

.9 Insurances, transcript of policies.

1.02 PROGRESS MEETINGS

.1 During course of Work and one week prior to project completion, schedule progress meetings monthly.

.2 Contractor, major Subcontractors involved in Work, and Departmental Representative are to be in attendance. Notify parties minimum seven days prior to meetings.

.3 Record minutes of meetings and circulate to attending parties and affected parties not in attendance within 10 days after meeting.

.4 Agenda to include the following:
- .1 Review, approval of minutes of previous meeting.
- .2 Review of Work progress since previous meeting.
- .3 Field observations, problems, conflicts.
- .4 Problems which impede construction schedule.
- .5 Corrective measures and procedures to regain projected schedule.
- .6 Revision to construction schedule.
- .7 Progress schedule, during succeeding work period.
- .8 Review submittal schedules: expedite as required.
- .9 Maintenance of quality standards.
- .10 Review proposed changes for affect on construction schedule and on completion date.

2 PRODUCTS

2.01 NOT USED

.1 Not Used.

3 EXECUTION

3.01 NOT USED

.1 Not Used.

END OF SECTION

1 GENERAL

1.01 DEFINITIONS

.1 Activity: element of Work performed during course of Project. Activity normally has expected duration, and expected cost and expected resource requirements. Activities can be subdivided into tasks.

.2 Bar Chart (GANTT Chart): graphic display of schedule-related information. In typical bar chart, activities or other Project elements are listed down left side of chart, dates are shown across top, and activity durations are shown as date-placed horizontal bars. Generally Bar Chart should be derived from commercially available computerized project management system.

.3 Baseline: original approved plan (for project, work package, or activity), plus or minus approved scope changes.

.4 Construction Work Week: Monday to Friday, inclusive, will provide five day work week and define schedule calendar working days as part of Bar (GANTT) Chart submission.

.5 Duration: number of work periods (not including holidays or other nonworking periods) required to complete activity or other project element. Usually expressed as workdays or workweeks.

.6 Master Plan: summary-level schedule that identifies major activities and key milestones.

.7 Milestone: significant event in project, usually completion of major deliverable.

.8 Project Schedule: planned dates for performing activities and the planned dates for meeting milestones. Dynamic, detailed record of tasks or activities that must be accomplished to satisfy Project objectives. Monitoring and control process involves using Project Schedule in executing and controlling activities and is used as basis for decision making throughout project life cycle.

.9 Project Planning, Monitoring and Control System: overall system operated by Consultant to enable monitoring of project work in relation to established milestones.

1.02 REQUIREMENTS

.1 Ensure Master Plan and Detail Schedules are practical and remain within specified Contract duration.

.2 Plan to complete Work in accordance with prescribed milestones and time frame.

.3 Limit activity durations to maximum of approximately 10 working days, to allow for progress reporting.

.4 Ensure that it is understood that Award of Contract or time of beginning, rate of progress, Interim Certificate and Final Certificate as defined times of completion are of essence of this contract.

1.03 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Submit to Consultant within 14 working days of Award of Contract Bar (GANTT) Chart as Master Plan for planning, monitoring and reporting of project progress.

.3 Submit Project Schedule Consultant within 5 working days of receipt of acceptance of Master Plan.

1.04 PROJECT MILESTONES

.1 Project milestones form interim targets for Project Schedule.
- .1 Substantial Completion on date determined after Award of Contract date.

1.05 MASTER PLAN

.1 Structure schedule to allow orderly planning, organizing and execution of Work as Bar Chart (GANTT).

.2 Consultant will review and return revised schedules within 5 working days.

.3 Revise impractical schedule and resubmit within 5 working days.

.4 Accepted revised schedule will become Master Plan and be used as baseline for updates.

1.06 PROJECT SCHEDULE

.1 Develop detailed Project Schedule derived from Master Plan.

.2 Ensure detailed Project Schedule includes as minimum milestone and activity types as follows:
- .1 Award.
- .2 Shop Drawings, Samples.
- .3 Permits.
- .4 Mobilization.
- .5 Roofing.

1.07 PROJECT SCHEDULE REPORTING

.1 Update Project Schedule on weekly basis reflecting activity changes and completions, as well as activities in progress.

.2 Include as part of Project Schedule, narrative report identifying Work status to date, comparing current progress to baseline, presenting current forecasts, defining problem areas, anticipated delays and impact with possible mitigation.

1.08 PROJECT MEETINGS

.1 Discuss Project Schedule at regular site meetings, identify activities that are behind schedule and provide measures to regain slippage. Activities considered behind schedule are those with projected start or completion dates later than current approved dates shown on baseline schedule.

.2 Weather related delays with their remedial measures will be discussed and negotiated.

2 PRODUCTS

2.01 NOT USED

.1 Not used.

3 EXECUTION

3.01 NOT USED

.1 Not used.

END OF SECTION

1 GENERAL

1.01 ADMINISTRATIVE

.1 Submit to Departmental Representative submittals listed for review. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.

.2 Do not proceed with Work affected by submittal until review is complete.

.3 Present shop drawings, product data, samples and mock-ups in SI Metric units.

.4 Where items or information is not produced in SI Metric units, converted values are acceptable.

.5 Review submittals prior to submission to Departmental Representative. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and coordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and considered rejected.

.6 Notify Departmental Representative, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.

.7 Verify field measurements and affected adjacent Work are coordinated.

.8 Contractor's responsibility for errors and omissions in submission is not relieved by Departmental Representative's review of submittals.

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

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

1.02 SHOP DRAWINGS AND PRODUCT DATA

.1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.

.2 Submit drawings stamped and signed by professional engineer registered or licensed in the Province of Saskatchewan, Canada.

.3 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been coordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.

.4 Allow 10 calendar days for Departmental Representative's review of each submission.

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

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

.7 Accompany submissions with transmittal letter, containing:
- .1 Date.
- .2 Project title and number.
- .3 Contractor's name and address.
- .4 Identification and quantity of each shop drawing, product data and sample.
- .5 Other pertinent data.

.8 Submissions include:
- .1 Date and revision dates.
- .2 Project title and number.
- .3 Name and address of:
  - .1 Subcontractor.
  - .2 Supplier.
  - .3 Manufacturer.
- .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
- .5 Details of appropriate portions of Work as applicable:
  - .1 Fabrication.
  - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
  - .3 Setting or erection details.
  - .4 Capacities.
  - .5 Performance characteristics.
  - .6 Standards.
  - .7 Operating weight.
  - .8 Wiring diagrams.
  - .9 Single line and schematic diagrams.
  - .10 Relationship to adjacent work.

.9 After Departmental Representative's review, distribute copies.

.10 Submit electronic copy of shop drawings for each requirement requested in specification Sections and as Departmental Representative may reasonably request.

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

.12 Submit electronic copies of test reports for requirements requested in specification Sections and as requested by Departmental Representative.
- .1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.
- .2 Testing must have been within 3 years of date of contract award for project.

.13 Submit electronic copies of certificates for requirements requested in specification Sections and as requested by Departmental Representative.
- .1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.
- .2 Certificates must be dated after award of project contract complete with project name.

.14 Submit electronic copies of manufacturers instructions for requirements requested in specification Sections and as requested by Departmental Representative.
- .1 Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.

.15 Submit electronic copies of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Departmental Representative.

.16 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.

.17 Submit electronic copies of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Departmental Representative.

.18 Delete information not applicable to project.

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

.19 If upon review by Departmental Representative, no errors or omissions are discovered or if only minor corrections are made, revised electronic documents 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.

1.03 SAMPLES

.1 Submit for review samples in duplicate as requested in respective specification Sections. Label samples with origin and intended use.

.2 Deliver samples prepaid to Departmental Representative's business address office.

.3 Notify Departmental Representative in writing, at time of submission of deviations in samples from requirements of Contract Documents.

.4 Where colour, pattern or texture is criterion, submit full range of samples.

.5 Adjustments made on samples by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.

.6 Make changes in samples which Departmental Representative may require, consistent with Contract Documents.

.7 Reviewed and accepted samples will become standard of workmanship and material

against which installed Work will be verified.

1.04 PHOTOGRAPHIC DOCUMENTATION

.1 Submit electronic copy of colour digital photography in .jpg format, minimum resolution of 3000 pixels x 2000 pixels, monthly with progress statement and as directed by Departmental Representative.

.2 Project identification: name and number of project and date of exposure indicated.

.3 Number of viewpoints: 2 locations.
- .1 Viewpoints and their location to show overall context of objects photographed.

.4 Frequency of photographic documentation: as directed by Departmental Representative.
- .1 Upon completion of: framing and services before concealment of Work, and as directed by Departmental Representative.

1.05 CERTIFICATES AND TRANSCRIPTS

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

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

2 PRODUCTS

2.01 NOT USED

.1 Not Used.

3 EXECUTION

3.01 NOT USED

.1 Not Used.

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

.1 Not used.

1.02 REFERENCE STANDARDS

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

.2 Province of Saskatchewan
- .1 Occupational Health and Safety Act, 1993, S.S. - Updated [2012].

1.03 ACTION AND INFORMATIONAL SUBMITTALS

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

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

.3 Submit one copy of Contractor's authorized representative's work site health and safety inspection reports to Departmental Representative 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 Departmental Representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within seven days after receipt of plan. Revise plan as appropriate and resubmit plan to Departmental Representative within seven days after receipt of comments from Departmental Representative.

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

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

1.04 FILING OF NOTICE

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

.2 Contractor shall be responsible and assume the Principal Contractor role for each work zone location and not the entire complex. Contractor shall provide a written acknowledgement of this responsibility with 3 weeks of contract award.

.3 Contractor shall agree to install proper site separation and identification in order to maintain time and space at all times throughout life of project.

1.05 SAFETY ASSESSMENT

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

1.06 MEETINGS

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

1.07 REGULATORY REQUIREMENTS

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

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

1.09 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 Contractor will be responsible and assume the role Constructor as described in the Saskatchewan Occupational Health and Safety Act and Regulations for Construction Projects.

.3 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 Regulations, 1996.

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

1.12 UNFORSEEN HAZARDS

.1 When unforeseen or peculiar safety-related factors, hazards, or conditions occur during performance of Work, follow procedures in place for Employee's Right to Refuse Work in accordance with Acts and Regulations of Saskatchewan and advise Departmental Representative verbally and in writing.

.2 When unforeseen or peculiar safety-related factors, hazards, or conditions occur during performance of Work, advise Safety Officer and follow procedures in accordance with Acts and Regulations of Saskatchewan and advise Departmental Representative verbally and in writing.

1.13 HEALTH AND SAFETY CO-ORDINATOR

.1 Employ and assign to Work, competent and authorized representative as Health and Safety Co-ordinator. Health and Safety Co-ordinator must:
- .1 Have site-related working experience specific to activities associated with commercial construction.
- .2 Have working knowledge of occupational safety and health regulations.
- .3 Be responsible for completing Contractor's Health and Safety Training Sessions and ensuring that personnel not successfully completing required training are not permitted to enter site to perform Work.
- .4 Be responsible for implementing, enforcing daily and monitoring site-specific Contractor's Health and Safety Plan.
- .5 Be on site during execution of Work and report directly to and be under direction of site supervisor.

1.14 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 Saskatchewan, and in consultation with Departmental Representative.

1.15 CORRECTION OF NON-COMPLIANCE

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

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

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

1.16 BLASTING

.1 Blasting or other use of explosives is not permitted without prior receipt of written instruction by Departmental Representative.

1.17 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.

2 PRODUCTS

2.01 NOT USED

.1 Not used.

3 EXECUTION

3.01 NOT USED

.1 Not used.

END OF SECTION

1 GENERAL

1.01 SUMMARY

.1 This Section references to laws, by laws, ordinances, rules, regulations, codes, orders of Authority Having Jurisdiction, and other legally enforceable requirements applicable to Work and that are; or become, in force during performance of Work.

1.02 RELATED REQUIREMENTS

.1 Not used.

1.03 REFERENCES TO REGULATORY REQUIREMENTS

.1 Perform Work in accordance with 2015 National Building Code of Canada (NBC) including amendments up to tender closing date and other codes of provincial or local application provided that in case of conflict or discrepancy, more stringent requirements apply.

.2 Specific design and performance requirements listed in specifications or indicated on Drawings may exceed minimum requirements established by referenced Building Code; these requirements will govern over the minimum requirements listed in Building Code
- .1 Meet or exceed requirements of:
  - .1 Contract documents.
  - .2 Specified standards, codes and referenced documents.

1.04 BUILDING SMOKING ENVIRONMENT

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

.2 Smoking on site is not permitted, including on roof areas and in vehicles.

1.05 QUALITY ASSURANCE

.1 Regulatory Requirements: Except as otherwise specified, Contractor will apply for, obtain, and pay fees associated with, permits, licenses, certificates, and approvals required by regulatory requirements and Contract Documents, based on General Conditions of Contract and the following:
- .1 Regulatory requirements and fees in force on date of Bid submission, and
- .2 A change in regulatory requirements or fees scheduled to become effective after date of tender submission and of which public notice has been given before date of tender submission

2 PRODUCTS

2.01 NOT USED

.1 Not Used.

2.02 EASEMENTS AND NOTICES

.1 Owner will obtain permanent easements and rights of servitude that may be required for performance of Work.

.2 Contractor will give notices required by regulatory requirements.

2.03 PERMITS

.1 Building Permit:
- .1 Contractor will apply for, obtain and pay for building permit on behalf of Owner, and other permits required for Work and its various parts.
- .3 Contractor will require that specific Subcontractor's obtain and pay for permits required by authorities having jurisdiction, where their Work is affected by Work requiring permits.
- .4 Contractor will display building permit and other permits in a conspicuous location at Place of Work.

.2 Occupancy Permit:
- .1 Contractor will apply for, obtain, and pay for occupancy permits, including partial occupancy permits where required by authority having jurisdiction.
- .2 Departmental Representative will issue appropriate instructions to Contractor for correction to Work where Contract Document deficiencies are required to be corrected in order to obtain occupancy permits, including partial occupancy permits.
- .3 Contractor will correct deficiencies in accordance with Departmental Representative instructions. Where deficiency is not corrected, Departmental Representative reserves the right to make correction and charge Contractor for costs incurred.
- .4 Contractor will turn occupancy permits over to Departmental Representative.

3 EXECUTION

3.01 NOT USED

.1 Not Used.

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

.1 Not used.

1.02 INSPECTION

.1 Allow Departmental Representative access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.

.2 Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by Departmental Representative instructions, or law of Place of Work.

.3 If Contractor covers or permits to be covered Work that has been designated for special tests, inspections or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.

.4 Departmental Representative will order part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction. If such Work is found in accordance with Contract Documents, Departmental Representative shall pay cost of examination and replacement.

1.03 PROCEDURES

.1 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.

.2 Provide labour and facilities to obtain and handle samples and materials on site. Provide sufficient space to store and cure test samples.

1.04 REJECTED WORK

.1 Remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by Departmental Representative as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.

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

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

1.05 REPORTS

.1 Submit electronic copies of inspection and test reports to Departmental Representative.

.2 Provide copies to subcontractor of work being inspected or tested and manufacturer or fabricator of material being inspected or tested.

1.06 TESTS AND MIX DESIGNS

.1 Furnish test results and mix designs as requested.

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

1.07 EQUIPMENT AND SYSTEMS

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

2 PRODUCTS

2.01 NOT USED

.1 Not Used.

3 EXECUTION

3.01 NOT USED

.1 Not Used.

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

.1 Not used.

1.02 REFERENCE STANDARDS

.1 Not used.

1.03 ACTION AND INFORMATIONAL SUBMITTALS

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

1.04 INSTALLATION AND REMOVAL

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

.2 Remove from site all such work after use.

1.05 DEWATERING

.1 Provide temporary drainage and pumping facilities to keep excavations and site free from standing water.

1.06 WATER SUPPLY

.1 Provide continuous supply of potable water for construction use.

.2 Arrange for connection with appropriate utility company and pay costs for installation, maintenance and removal.

.3 Pay for utility charges at prevailing rates.

1.07 TEMPORARY HEATING AND VENTILATION

.1 Provide temporary heating required during construction period, including attendance, maintenance and fuel.

.2 Construction heaters used inside building must be vented to outside or be non-flameless type. Solid fuel salamanders are not permitted.

.3 Provide temporary heat and ventilation in enclosed areas as required to:
- .1 Facilitate progress of Work.
- .2 Protect Work and products against dampness and cold.
- .3 Prevent moisture condensation on surfaces.
- .4 Provide ambient temperatures and humidity levels for storage, installation and curing of materials.
- .5 Provide adequate ventilation to meet health regulations for safe working environment.

.4 Maintain temperatures of minimum 10 degrees C in areas where construction is in

progress.

.5 Ventilating:
- .1 Prevent accumulations of dust, fumes, mists, vapours or gases in areas occupied during construction.
- .2 Provide local exhaust ventilation to prevent harmful accumulation of hazardous substances into atmosphere of occupied areas.
- .3 Dispose of exhaust materials in manner that will not result in harmful exposure to persons.
- .4 Ventilate storage spaces containing hazardous or volatile materials.
- .5 Ventilate temporary sanitary facilities.
- .6 Continue operation of ventilation and exhaust system for time after cessation of work process to assure removal of harmful contaminants.

.6 Contractor to confirm with Departmental Representative if permanent heating system of building, can be used when available. Be responsible for damage to heating system if use is permitted.

.7 On completion of Work for which permanent heating system is used, replace filters, clean (vacuum) duct work and grilles.

.8 Ensure Date of Substantial Performance and Warranties for heating system do not commence until entire system is in as near original condition as possible and is certified by Departmental Representative.

.9 Pay costs for maintaining temporary heat, when using permanent heating system.

.10 Maintain strict supervision of operation of temporary heating and ventilating equipment to:
- .1 Conform with applicable codes and standards.
- .2 Enforce safe practices.
- .3 Prevent abuse of services.
- .4 Prevent damage to finishes.
- .5 Vent direct-fired combustion units to outside.

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

1.08 TEMPORARY POWER AND LIGHT

.1 Provide and pay for temporary power during construction for temporary lighting and operating of power tools.

.2 Arrange for connection with appropriate utility company. Pay costs for installation, maintenance and removal.

.3 Provide and maintain temporary lighting throughout project. Ensure average level of illumination at all floors and stair treads is not less than 162lx and minimum level at these locations is 32lx.

.4 Electrical power and lighting systems installed under this Contract may be used for construction requirements only with prior approval of Departmental Representative provided that guarantees are not affected. Make good damage to electrical system caused by use under this Contract. Replace lamps which have been used for more than

3 months.

1.09 FIRE PROTECTION

.1 Provide and maintain temporary fire protection equipment during performance of Work required by governing codes, regulations and bylaws.

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

2 PRODUCTS

2.01 NOT USED

.1 Not Used.

3 EXECUTION

3.01 NOT USED

.1 Not Used.

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

.1 Not used.

1.02 REFERENCE STANDARDS

.1 Not used.

1.03 ACTION AND INFORMATIONAL SUBMITTALS

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

1.04 INSTALLATION AND REMOVAL

.1 Prepare site plan indicating proposed location and dimensions of area to be fenced and used by Contractor, number of trailers to be used, avenues of ingress/egress to fenced area and details of fence installation.

.2 Identify areas which have to be gravelled to prevent tracking of mud.

.3 Indicate use of supplemental or other staging area.

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

.5 Remove from site all such work after use.

1.05 SITE STORAGE/LOADING

.1 Confine work and operations of employees by Contract Documents. Do not unreasonably encumber premises with products.

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

1.06 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.

1.07 SECURITY

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

1.08 OFFICES

.1 Provide office sufficiently heated, ventilated and lighted, of sufficient size to accommodate site meetings and furnished with drawing laydown table.

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

.3 Subcontractors to provide their own offices as necessary. Direct location of these offices.

1.09 EQUIPMENT, TOOL AND MATERIALS STORAGE

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

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

1.10 SANITARY FACILITIES

.1 Provide sanitary facilities for work force in accordance with governing regulations and ordinances.

.2 Post notices and take precautions as required by local health authorities. Keep area and premises in sanitary condition.

1.11 CONSTRUCTION SIGNAGE

.1 Signage and advertisements, other than site safety and directional signage, are not permitted.

1.12 PROTECTION AND MAINTENANCE OF TRAFFIC

.1 Provide access and temporary relocated roads as necessary to maintain traffic.

.2 Maintain and protect traffic on affected roads during construction.

.3 Provide measures for protection and diversion of traffic, including provision of watch-persons and flag-persons, erection of barricades, placing of lights around and in front of equipment and work, and erection and maintenance of adequate warning, danger, and direction signs

.4 Protect travelling public from damage to person and property.

.5 Contractor's traffic on roads selected for hauling material to and from site to interfere as little as possible with public traffic.

.6 Verify adequacy of existing roads and allowable load limit on these roads. Contractor: responsible for repair of damage to roads caused by construction operations.

.7 Construct access and haul roads necessary.

.8 Provide necessary lighting, signs, barricades, and distinctive markings for safe movement of traffic.

.9 Dust control: adequate to ensure safe operation at all times.

.10 Provide snow removal during period of Work.

.11 Remove, upon completion of work, haul roads designated by Departmental Representative.

1.13 CLEAN-UP

.1 Remove construction debris, waste materials, packaging material from work site daily.

.2 Clean dirt or mud tracked onto paved or surfaced roadways.

.3 Stack stored new or salvaged material not in construction facilities.

2 PRODUCTS

2.01 NOT USED

.1 Not Used.

3 EXECUTION

3.01 NOT USED

.1 Not Used.

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

.1 Not used.

1.02 REFERENCE STANDARDS

.1 Not used.

1.03 INSTALLATION AND REMOVAL

.1 Provide temporary controls in order to execute Work expeditiously.

.2 Remove from site all such work after use.

1.04 HOARDING

.1 Erect temporary site enclosures using 38 x 89 mm construction grade lumber framing at 600 mm centres and 1200 x 2400 x 13 mm exterior grade fir plywood to CSA O121.

1.05 WEATHER ENCLOSURES

.1 Provide weather tight closures to unfinished door and window openings, tops of shafts and other openings in floors and roofs.

.2 Close off floor areas where walls are not finished; seal off other openings; enclose building interior work for temporary heat.

.3 Design enclosures to withstand wind pressure and snow loading.

1.06 DUST TIGHT SCREENS

.1 Provide dust tight screens or insulated] partitions to localize dust generating activities, for protection of workers and finished areas of Work.

.2 Maintain and relocate protection until such work is complete.

1.07 ACCESS TO SITE

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

1.08 PUBLIC TRAFFIC FLOW

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

1.09 FIRE ROUTES

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

1.10 PROTECTION FOR OFF-SITE AND PUBLIC PROPERTY

.1 Protect surrounding private and public property from damage during performance of Work.

.2 Be responsible for damage incurred.

1.11 PROTECTION OF BUILDING FINISHES

.1 Provide protection for finished and partially finished building finishes and equipment during performance of Work.

.2 Provide necessary screens, covers, and hoardings.

.3 Confirm with Departmental Representative locations and installation schedule 5 days prior to installation.

.4 Be responsible for damage incurred due to lack of or improper protection.

2 PRODUCTS

2.01 NOT USED

.1 Not Used.

3 EXECUTION

3.01 NOT USED

.1 Not Used.

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

.1 Not used.

1.02 REFERENCE STANDARDS

.1 Conform to these reference standards, in whole or in part as specifically requested in specifications.

.2 If there is question as to whether products or systems are in conformance with applicable standards, Departmental Representative reserves right to have such products or systems tested to prove or disprove conformance.

.3 Cost for such testing will be born by Departmental Representative in event of conformance with Contract Documents or by Contractor in event of non-conformance.

1.03 QUALITY

.1 Products, materials, equipment and articles incorporated in Work shall be new, not damaged or defective, and of best quality for purpose intended. If requested, furnish evidence as to type, source and quality of products provided.

.2 Procurement policy is to acquire, in cost effective manner, items containing highest percentage of recycled and recovered materials practicable consistent with maintaining satisfactory levels of competition. Make reasonable efforts to use recycled and recovered materials and in otherwise utilizing recycled and recovered materials in execution of work.

.3 Defective products, whenever identified prior to completion of Work, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is precaution against oversight or error. Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.

.4 Should disputes arise as to quality or fitness of products, decision rests strictly with Departmental Representative based upon requirements of Contract Documents.

.5 Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout building.

.6 Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations, except where required for operating instructions, or when located in mechanical or electrical rooms.

1.04 AVAILABILITY

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

.2 In event of failure to notify Departmental Representative at commencement of Work and should it subsequently appear that Work may be delayed for such reason, Departmental Representative reserves right to substitute more readily available products of similar character, at no increase in Contract Price or Contract Time.

1.05 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 drywall on flat, solid supports and keep clear of ground. Slope to shed moisture.

.7 Store and mix paints in heated and ventilated room. Remove oily rags and other combustible debris from site daily. Take every precaution necessary to prevent spontaneous combustion.

.8 Remove and replace damaged products at own expense and to satisfaction of Departmental Representative.

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

1.06 TRANSPORTATION

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

1.07 MANUFACTURER'S INSTRUCTIONS

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

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

.3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes Departmental Representative to require removal and re-installation at no increase in Contract Price or Contract Time.

1.08 QUALITY OF WORK

.1 Ensure Quality of Work is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed. Immediately notify Departmental Representative if required Work is such as to make it impractical to produce required results.

.2 Do not employ anyone unskilled in their required duties. Departmental Representative reserves right to require dismissal from site, workers deemed incompetent or careless.

.3 Decisions as to standard or fitness of Quality of Work in cases of dispute rest solely with Departmental Representative, whose decision is final.

1.09 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.

1.10 CONCEALMENT

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

.2 Before installation, inform Departmental Representative if there is interference. Install as directed by Departmental Representative.

1.11 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.

1.12 LOCATION OF FIXTURES

.1 Consider location of fixtures, outlets, and mechanical and electrical items indicated as approximate.

.2 Inform Departmental Representative of conflicting installation. Install as directed.

1.13 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.

1.14 FASTENINGS - EQUIPMENT

.1 Use fastenings of standard commercial sizes and patterns with material and finish suitable for service.

.2 Use heavy hexagon heads, semi-finished unless otherwise specified. Use No. 304 stainless steel for exterior areas.

.3 Bolts may not project more than one diameter beyond nuts.

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

1.15 PROTECTION OF WORK IN PROGRESS

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

1.16 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 pedestrian and vehicular traffic.

.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.

2 PRODUCTS

2.01 NOT USED

.1 Not Used.

3 EXECUTION

3.01 NOT USED

.1 Not Used.

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

.1 Not used.

1.02 REFERENCE STANDARDS

.1 Not used.

1.03 LOCATION OF EQUIPMENT AND FIXTURES

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

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

.3 Inform Departmental Representative of impending installation and obtain approval for actual location.

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

2 PRODUCTS

2.01 NOT USED

.1 Not Used.

3 EXECUTION

3.01 NOT USED

.1 Not Used.

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

.1 Not used.

1.02 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Submit written request in advance of cutting or alteration which affects:
- .1 Structural integrity of elements of project.
- .2 Integrity of weather-exposed or moisture-resistant elements.
- .3 Efficiency, maintenance, or safety of operational elements.
- .4 Visual qualities of sight-exposed elements.
- .5 Work of Owner or separate contractor.

.3 Include in request:
- .1 Identification of project.
- .2 Location and description of affected Work.
- .3 Statement on necessity for cutting or alteration.
- .4 Description of proposed Work, and products to be used.
- .5 Alternatives to cutting and patching.
- .6 Effect on Work of Owner or separate contractor.
- .7 Written permission of affected separate contractor.
- .8 Date and time work will be executed.

1.03 MATERIALS

.1 Required for original installation.

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

1.04 PREPARATION

.1 Inspect existing conditions, including elements subject to damage or movement during cutting and patching.

.2 After uncovering, inspect conditions affecting performance of Work.

.3 Beginning of cutting or patching means acceptance of existing conditions.

.4 Provide supports to assure structural integrity of surroundings; provide devices and methods to protect other portions of project from damage.

.5 Provide protection from elements for areas which are to be exposed by uncovering work; maintain excavations free of water.

1.05 EXECUTION

.1 Execute cutting, fitting, and patching including excavation and fill, to complete Work.

.2 Fit several parts together, to integrate with other Work.

.3 Uncover Work to install ill-timed Work.

.4 Remove and replace defective and non-conforming Work.

.5 Provide openings in non-structural elements of Work for penetrations of mechanical and electrical Work.

.6 Execute Work by methods to avoid damage to other Work, and which will provide proper surfaces to receive patching and finishing.

.7 Employ original installer to perform cutting and patching for weather-exposed and moisture-resistant elements, and sight-exposed surfaces.

.8 Cut rigid materials using masonry saw or core drill. Pneumatic or impact tools not allowed on masonry work without prior approval.

.9 Restore work with new products in accordance with requirements of Contract Documents.

.10 Fit Work to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

.12 At penetration of fire rated wall, ceiling, or floor construction, completely seal voids with firestopping material in accordance with Section 07 84 00 – Firestopping, full thickness of the construction element.

.13 Refinish surfaces to match adjacent finishes: Refinish continuous surfaces to nearest intersection. Refinish assemblies by refinishing entire unit.

.14 Conceal pipes, ducts and wiring in floor, wall and ceiling construction of finished areas except where indicated otherwise.

2 PRODUCTS

2.01 NOT USED

.1 Not Used.

3 EXECUTION

3.01 NOT USED

.1 Not Used.

END OF SECTION

1 GENERAL

1.01 REFERENCE STANDARDS

.1 Not used.

1.02 PROJECT CLEANLINESS

.1 Maintain Work in tidy condition, free from accumulation of waste products and debris.

.2 Remove waste materials from site at daily regularly scheduled. Do not burn waste materials on site.

.3 Clear snow and ice from access to building.

.4 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris. Dispose of waste materials and debris at designated dumping areas.

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

.6 Clean interior areas prior to start of finishing work, and maintain areas free of dust and other contaminants during finishing operations.

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

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

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

1.03 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 Remove waste products and debris including that caused by other Contractors.

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

.5 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.

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

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

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

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

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

.11 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.

.12 Remove dirt and other disfiguration from exterior surfaces.

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

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

.15 Remove snow and ice from access to building.

2 PRODUCTS

2.01 NOT USED

.1 Not Used.

3 EXECUTION

3.02 NOT USED

.1 Not Used.

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

.1 Not used.

1.02 ADMINISTRATIVE REQUIREMENTS

.1 Acceptance of Work Procedures:
- .1 Contractor's Inspection: Contractor: conduct inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents.
  - .1 Notify Departmental Representative in writing of satisfactory completion of Contractor's inspection and submit verification that corrections have been made.
  - .2 Request Departmental Representative inspection.
- .2 Departmental Representative Inspection:
  - .1 Departmental Representative and Contractor to inspect Work and identify defects and deficiencies.
  - .2 Contractor to correct Work as directed.
- .3 Completion Tasks: submit written certificates in English that tasks have been performed as follows:
  - .1 Work: completed and inspected for compliance with Contract Documents.
  - .2 Defects: corrected and deficiencies completed.
  - .3 Equipment and systems: tested, adjusted and balanced and fully operational.
  - .4 Certificates required by Fire Commissioner and Utility companies: submitted.
  - .5 Operation of systems: demonstrated to Owner's personnel.
  - .6 Work: complete and ready for final inspection.
- .4 Final Inspection:
  - .1 When completion tasks are done, request final inspection of Work by Departmental Representative, and Contractor.
  - .2 When Work incomplete according to Departmental Representative, complete outstanding items and request re-inspection. The Departmental Representative reserves the right to be compensated by the Contractor for any costs incurred to perform a re-inspection and any other subsequent inspections due to failure of completing and correcting all tasks identified in subsection 1.02.1.3 above.
- .5 Declaration of Substantial Performance: when Departmental Representative considers deficiencies and defects corrected and requirements of Contract substantially performed, make application for Certificate of Substantial Performance.
- .6 Final Payment:
  - .1 When Departmental Representative considers final deficiencies and defects corrected and requirements of Contract met, make application for final payment.

1.03 FINAL CLEANING

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

2 PRODUCTS

2.01 NOT USED

.1 Not Used.

3 EXECUTION

3.01 NOT USED

.1 Not Used.

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

.1 Not used.

1.02 REFERENCE STANDARDS

.1 Not used.

1.03 ADMINISTRATIVE REQUIREMENTS

.1 Pre-warranty Meeting:

.2 Convene meeting one week prior to contract completion with contractor's representative and Departmental Representative, in accordance with Section 01 31 19 - Project Meetings to:

.1 Verify Project requirements.

.2 Review manufacturer's installation instructions and warranty requirements.

.3 Departmental Representative to establish communication procedures for:

.1 Notifying construction warranty defects.

.2 Determine priorities for type of defects.

.3 Determine reasonable response time.

.4 Contact information for bonded and licensed company for warranty work action: provide name, telephone number and address of company authorized for construction warranty work action.

.5 Ensure contact is located within local service area of warranted construction, is continuously available, and is responsive to inquiries for warranty work action.

1.04 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Two weeks prior to Substantial Performance of the Work, submit to the Departmental Representative, three final copies of operating and maintenance manuals in English.

.3 Provide spare parts, maintenance materials and special tools of same quality and manufacture as products provided in Work.

.4 Provide evidence, if requested, for type, source and quality of products supplied.

1.05 FORMAT

.1 Organize data as instructional manual.

.2 PDF copy on two (2) CD’s or two (2) removable USB flash drives.

.4 Label: identify each CD or flash drive with printed title 'O&M Manuals’; list title of project.

.5 Arrange content by under Section numbers and sequence of Table of Contents.

.7 Text: manufacturer's printed data, or typewritten data.

.8 Drawings: provide with associated Section number.

1.06 CONTENTS - PROJECT RECORD DOCUMENTS

.1 Table of Contents for Each Volume: provide title of project;
.1 Date of submission; names.
.2 Addresses, and telephone numbers of Departmental Representative and Contractor with name of responsible parties.
.3 Schedule of products and systems, indexed to content of volume.

.2 For each product or system:
.1 List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.

.3 Product Data: mark each sheet to identify specific products and component parts, and data applicable to installation; delete inapplicable information.

.4 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.

.5 Typewritten Text: as required to supplement product data.
.1 Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 01 45 00 - Quality Control.

1.07 AS -BUILT DOCUMENTS AND SAMPLES

.1 Maintain, at site for Departmental Representative one record copy of:
.1 Contract Drawings.
.2 Specifications.
.3 Addenda.
.4 Change Orders and other modifications to Contract.
.5 Reviewed shop drawings, product data, and samples.
.6 Field test records.
.7 Inspection certificates.
.8 Manufacturer's certificates.

.2 Store record documents and samples in field office apart from documents used for construction.
.1 Provide files, racks, and secure storage.

.3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual.
.1 Label each document "PROJECT RECORD" in neat, large, printed letters.

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

.5 Keep record documents and samples available for inspection by Departmental Representative.

1.08 RECORDING INFORMATION ON PROJECT RECORD DOCUMENTS

.1 Record information on set of black line opaque drawings, and in copy of Project Manual.

.2 Use felt tip marking pens, maintaining separate colours for each major system, for

recording information.

.3 Record information concurrently with construction progress.
.1 Do not conceal Work until required information is recorded.

.4 Contract Drawings and shop drawings: mark each item to record actual construction, including:
.1 Measured depths of elements of foundation in relation to finish first floor datum.
.2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
.3 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.
.4 Field changes of dimension and detail.
.5 Changes made by change orders.
.6 Details not on original Contract Drawings.
.7 Referenced Standards 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.

1.09 MATERIALS AND FINISHES

.1 Building products, applied materials, and finishes: include product data, with catalogue number, size, composition, and colour and texture designations.

.2 Instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

.3 Moisture-protection and weather-exposed products: include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

.4 Additional requirements: as specified in individual specifications sections.

1.10 MAINTENANCE MATERIALS

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

.2 Extra Stock Materials:
.1 Provide maintenance and extra materials, in quantities specified in individual specification sections.
.2 Provide items of same manufacture and quality as items in Work.
.3 Deliver to site; place and store.
.4 Receive and catalogue items.
.1 Submit inventory listing to Departmental Representative.

.2 Include approved listings in Maintenance Manual.

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

.3 Special Tools:

.1 Provide special tools, in quantities specified in individual specification section.

.2 Provide items with tags identifying their associated function and equipment.

.3 Deliver to site; place and store.

.4 Receive and catalogue items.

.1 Submit inventory listing to Departmental Representative.

.2 Include approved listings in Maintenance Manual.

1.11 DELIVERY, STORAGE AND HANDLING

.1 Store spare parts, maintenance materials, and special tools in manner to prevent damage or deterioration.

.2 Store in original and undamaged condition with manufacturer's seal and labels intact.

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

.4 Store paints and freezable materials in a heated and ventilated room.

.5 Remove and replace damaged products at own expense and for review by Departmental Representative.

1.12 WARRANTIES AND BONDS

.1 Submit, warranty information made available during construction phase, to Departmental Representative for approval prior to each monthly pay estimate.

.2 Assemble approved information in binder, submit upon acceptance of work and organize as follows:

.1 Separate each warranty or bond into appropriate folder.

.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.

.3 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.

.4 Respond in timely manner to oral or written notification of required construction warranty repair work.

2 PRODUCTS

2.01 NOT USED

.1 Not Used.

3 EXECUTION

3.01 NOT USED

.1 Not Used.

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

.1 Not used.

1.02 REFERENCE STANDARDS

.1 American National Standards Institute/National Particleboard Association (ANSI/NPA)
- .1 ANSI/NPA A208.1-2009 Particleboard.

.2 ASTM International
- .1 ASTM A 123/A 123M-15, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- .2 ASTM A 307-14 Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60000 PSI Tensile Strength.
- .3 ASTM D 5456-14b, Standard Specification for Evaluation of Structural Composite Lumber Products.
- .4 ASTM F 1667-13 Standard Specification for Driven Fasteners: Nails, Spikes and Staples.

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

.4 Canadian Wood Council
- .1 Wood Design Manual 2010 (R2014) Edition
- .2 Engineering Guide for Wood Frame Construction 2014

.5 CSA International
- .2 CSA B111-1974 (R2003), Wire Nails, Spikes and Staples.
- .3 CSA O86-14 Engineered Design in Wood
- .4 CSA O112.9-10, Evaluation of Adhesives for Structural Wood Products.
- .5 CSA O141-05(R2014), Softwood Lumber.
- .6 CSA O151-09(R2014), Canadian Softwood Plywood.
- .7 CSA O325-07(R2012), Construction Sheathing.

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

1.03 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 products and accessories and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Include manufacturer's pre-engineered floor, ceiling and roof joist span charts, and manufacturer's pre-engineered installation details.
- .3 Submit certified test reports for prefabricated structural members from approved independent laboratory indicating compliance with specifications for specified

performance characteristics and physical properties.

.4 Submit manufacturer's installation instructions.

.3 Shop Drawings:

.1 For structural applications or conditions beyond the scope of the manufacturer's pre-engineered design information, submit drawings stamped and signed by professional engineer registered or licensed in Province of Saskatchewan, Canada.

.2 Include on drawings:

.1 Design data in accordance with CAN/CSA-O86 and CWC Engineering Guide for Wood Frame Construction.

.2 Indicate configuration and spacing of joists, hanger and connector types, fasteners, locations and design values; bearing details.

.3 Submit stress diagrams or print out of computer design indicating design loads for members. Indicate allowable load and stress increase.

.4 Indicate arrangement of webs or other members to accommodate ducts and other specialties.

1.05 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 in dry location and in accordance with manufacturer's recommendations.

.2 Store materials off ground with moisture barrier at both ground level and as a cover forming a well-ventilated enclosure, with drainage to prevent standing water.

.3 Store wood I-beams and I-joists on edge.

.4 Stack, lift, brace, cut and notch engineered lumber products in strict accordance with manufacturer's instructions and recommendations.

.5 Replace defective or damaged materials with new.

2 PRODUCTS

2.02 STRUCTURAL FRAMING

.1 Lumber: 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 Framing and board lumber: in accordance with NBC.

2.03 FURRING AND BLOCKING

.1 Furring, blocking, nailing strips, grounds, rough bucks, cants, curbs, fascia backing and

sleepers:
.1 Board sizes: "Standard" or better grade.
.3 Dimension sizes: "Standard" light framing or better grade.
.4 Post and timbers sizes: "Standard" or better grade.

.2 Where indicated, provide pressure treated materials for furring, blocking, nailing strips, grounds, rough bucks, curbs, fascia backing and sleepers.

2.04 PANEL MATERIALS AND APPLICATION

.1 Electrical equipment mounting boards:
.1 Plywood, square edge 19 mm (3/4”) thick.

2.05 .1 Window infill cladding:
.1 VicWest 7/8” Corrugated, .030" thickness (22 gauge), pre-finished steel.

.2 All accessories minimum .030" pre-finished steel. Provide all closures, sealants, accessories as shown and/or required.

.3 Colour to be selected from extended standard range of colours to match brick.

.4 Provide all required supports, clips, closures, flashings, accessories required to complete the installation.

2.06 ACCESSORIES

.1 General purpose adhesive: to CSA O112.9.

.2 Nails, spikes and staples: to ASTM F 1667.

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

.4 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.

.5 Fastener Finishes:
.1 Galvanizing: to ASTM A 123/A 123M, ASTM A 653, use galvanized fasteners for exterior work

.6 Wire Mesh: 19mm #9/10 rolled flattened steel mesh, installed on attack side of wall. Confirm location with Departmental Representative prior to installation.

.7 Concrete Repair (exterior landing): Terrafuse TF Structural concrete repair mortar, or approved equal.

.8 Fasteners (within Cells): Hardened Torx Head with center pin security screw, installed with Loctite.

3 EXECUTION

3.01 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for product installation in accordance with manufacturer's written instructions.
- .1 Visually inspect substrate in presence of Departmental Representative.
- .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been remedied Departmental Representative.

3.02 SYSTEMS INTEGRATION

.1 Install air barrier and vapour retarder sheeting around framing members to ensure continuity of protection and to lap and seal to main sheets.

3.03 FRAMING INSTALLATION

.1 Install engineered framing and plant fabricated structural wood components, including all hangers, connectors and fasteners, in accordance with accepted shop drawings and manufacturers' instructions.

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

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

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

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

.6 Install specified panel product for each application.

.7 Install wall sheathing in accordance with manufacturer's printed instructions and accepted shop drawings.

.8 Install 38x89 wood blocking @ 600 o.c. vertically at all Type 2 wall locations (walls enclosing rooms 112 & 114). Install wire mesh with ultra-grip steel screws and fender washers @ 150mm o.c. maximum along both vertical and horizontal framing members. Butt or inlay seams of mesh at stud centerlines.

3.04 FURRING AND BLOCKING

.1 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.

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

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

3.06 DOORS, FRAMES, HARDWARE

.1 Install all hollow metal doors and frames, specified in Section 08 11 00.

.2 Install all aluminum doors, specified in Section 08 11 16.

.3 Install all finishing hardware, specified in Section 08 71 00.

3.07 MILLWORK

.1 Install all millwork items, specified in Section 06400.

3.08 FIRESTOP PACKING

.1 Install packing in joints and similar conditions where required to complete fire separations.

.2 Materials shall be Thermafibre or other material as approved by the Saskatchewan Fire Safety Unit for the applicable use.

3.09 SOUND PACKING

.1 Install sound packing where shown and as required to complete sound separations.

.2 Packing for general use – Fiberglas Batts

3.10 Concrete Repair:

.1 Mechanically prepare surface as per manufacturer recommendations.

.2 Install in minimum 3mm thick, 6 mm maximum using steel trowel.

.3 Provide medium broom finish after application.

3.11 EXISTING BUILDING

.1 Patch and repair wherever damaged by execution of this contract.

.2 Refer to mechanical and electrical drawings for routing of gas lines, conduits, and similar, through existing areas.

.3 Refinish to match existing adjacent areas. Refinishing to extend to corners, trim or other existing acceptable cut-off location.

3.12 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.

3.13 WASTE MANAGEMENT

.1 Re-use scrap lumber to the greatest extent possible. Separate scrap lumber for use on site as accessory components, including: shims, bracing, and blocking.

.3 Do not leave any wood, shavings, sawdust, etc. on the ground or buried in fill. Prevent saw dust and wood shavings from entering the storm drainage system.

.4 Do not burn scrap lumber that has been pressure treated.

3.14 PROTECTION

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

.2 Repair damage to adjacent materials caused by rough carpentry installation.

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

.1 Section 07 92 00 - Joint Sealants
.2 Section 09 91 23 - Interior Painting

1.02 REFERENCE STANDARDS

.1 Architectural Woodwork Manufacturers Association of Canada (AWMAC)
  .1 Architectural Woodwork Standards (AWMAC AWS), [2014].

.2 Canadian General Standards Board (CGSB)
  .1 CAN/CGSB-11.3-M87, Hardboard.
  .2 CAN/CGSB-71.20-M88, Adhesive, Contact, Brushable.
  .3 CAN/CGSB-71.19-M88, Adhesive, Contact, Sprayable.

.3 CSA International
  .1 CSA O112-M Series 1977 (R2006) Standards for Wood Adhesives.
  .2 CSA O141-05 (R2014), Softwood Lumber.
  .3 CSA O151-14, Canadian Softwood Plywood.
  .4 CSA O153-M1980 (R2014), Poplar Plywood.

.4 National Electrical Manufacturers Association (NEMA)
  .1 ANSI/NEMA LD-3-05, High-Pressure Decorative Laminates (HPDL).

1.03 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:
  .1 Prepare and submit material list in accordance with AWMAC AWS, cross-referenced to specifications.
  .2 Include manufacturer's instructions, printed product literature, data sheets and catalogue pages for all materials and products to be incorporated into architectural wood casework and include product characteristics, performance criteria, dimensions and profiles, finish and limitations on use.
  .3 Submit two copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements.

.3 Hardware List:
  .1 Submit hardware list cross-referenced to specifications.
  .2 Include manufacturer's specification sheets indicating name, model, material, function, finish, BHMA designations and other pertinent information.

.4 Shop Drawings:
  .1 Prepare and submit shop drawings in accordance with AWMAC AWS and as follows.
  .2 Submit one pdf set of shop drawings for initial review in accordance with requirements of Division 01. Revise as directed.
  .3 Indicate details of construction, profiles, jointing, fastening and other related details.

.1 Scales: profiles full size, details half full size.
.4 Indicate materials, thicknesses, finishes and hardware.
.5 Indicate locations of service outlets in casework, and connections, attachments, anchorage and location of exposed fastenings.
.6 Show location on casework elevations of backing required in supporting structure for attachment of casework.
.7 Indicate AWMAC AWS quality grade where different from predominant grade specified.
.8 Include color schedule of all casework items, including all countertop, exposed, and semi-exposed cabinet finishes, finish material manufacturer, pattern, and color.

.5 Samples:
.1 Prepare and submit samples in accordance with AWMAC AWS and as follows.
.2 Apply sample finishes to specified substrate or core material minimum 300 x 300 mm. For veneers with transparent finish submit three samples to illustrate range and colour of grain expected.
.3 Shop applied coatings:
.1 For transparent finish, submit triplicate samples of each species and cut of wood to be used, finished as specified.
.2 For opaque finish, submit triplicate samples for each colour selection, finished as specified.
.4 Submit duplicate samples of laminated plastic for each specified colour selection.
.5 Furnish four samples of each lumber and composite panel material to Contractor for preparation of field applied finish samples in accordance with Section 09 91 23 Interior Painting.

1.04 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 Deliver wood casework only when area of work is enclosed, plaster and concrete work is dry, and area is broom clean and site environmental conditions are acceptable for installation.

.3 Protect millwork against dampness and damage during and after delivery.

.4 Store millwork in ventilated areas, protected from extreme changes of temperature and humidity, and within range recommended by AWMAC AWS for location of project.

.5 Store materials indoors in dry location in clean, dry, well-ventilated area.

.6 Protect architectural woodwork and hardware from nicks, scratches, and blemishes.

.7 Replace defective or damaged materials with new.

2 PRODUCTS

2.01 QUALITY GRADE

.1 Provide all materials and perform all fabrication in accordance with AWMAC AWS

Custom Grade and as follows, except where specified otherwise:

.1 Economy Grade: mechanical rooms and utility areas, storage areas and janitor's closets.

.2 In case of conflict between Contract Documents and AWMAC AWS grade requirements, Contract Documents govern.

2.02 LUMBER

.1 Softwood and Hardwood Lumber: Sound lumber to specified AWMAC AWS quality grade requirements, kiln-dried to moisture content recommended by AWMAC AWS for location of the Work.

.2 Machine stress-rated lumber is acceptable for all purposes.

.3 Wood slats: 19 x 89 solid maple, stain grade.

2.03 PANEL MATERIALS

.1 Interior mat-formed wood particleboard: to ANSI/NPA A208.1, industrial grade M-2 or M-3, medium density (640-800 kg/m3), thickness 19 mm unless indicated otherwise.

.1 Use moisture resistant grade 2-M-2 or 2-M-3 for countertops and splash-backs to receive plumbing fixtures.

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

2.04 CASEWORK FABRICATION - GENERAL

.1 Fabricate casework of specified core and surface finish materials to specified AWMAC AWS quality grade.

.1 Case Bodies (Ends, divisions, and bottoms): Industrial grade M-3i particle board core, square edge, 19mm thick. Laminated with high pressure laminate on exposed ends and thermofused melamine on concealed interiors.

.2 Backs: Industrial grade M-3i particle board core, square edge, 13mm thick, laminated with thermofused melamine.

.3 Shelving: M-2 particle board core, 19mm thick, laminated with thermofused melamine. Edge banding to be 3mm PVC, colour to match shelving.

.4 Drawers:

a. Sides, Backs, & Bottoms: 15mm thermofused melamine, rabbeted joints
b. Fronts: Industrial grade M-3i particle board core, 19mm thick, laminated with high-pressure plastic laminate.
    i. Exposed Finish: high-pressure plastic laminate
    ii. Semi-Exposed Finish: plastic laminate
    iii. Edges: banded with 3mm PVC edge, colour to match exposed faces

.5 Doors: Industrial grade M-3i particle board core, 19mm thick, laminated with high pressure plastic laminate. Door-cabinet interface to be flush overlay.

i. Exposed Finish: high-pressure plastic laminate
ii. Semi-Exposed Finish: plastic laminate
iii. Edges: banded with 3mm PVC edge, colour to match exposed faces

.3 Colour to be chosen from manufacturer’s full range of standard colours, medium gloss finish.

.2 Set nails and countersink screws apply stained wood filler to indentations, sand smooth

and leave ready to receive finish.

.3 Shop install cabinet hardware for doors, shelves and drawers. Recess shelf standards unless noted otherwise.

.4 Shelving to cabinetwork to be adjustable unless otherwise noted.

.5 Provide cutouts for plumbing fixtures, inserts, appliances, outlet boxes and other fixtures.

.6 Shop assemble work for delivery to site in size easily handled and to ensure passage through building openings.

.7 Obtain governing dimensions before fabricating items which are to accommodate or abut appliances, equipment and other materials.

2.05 CABINET HARDWARE

.1 Cabinet hardware: to AWMAC AWS quality grade specified and to ANSI/BHMA A156.9, designated by letter B and numeral identifiers as listed below.

.2 Finish:
- .1 Exposed hardware: Satin Nickel.
- .2 Semi-exposed hardware: Manufacturer's standard finish.

.3 Casework door hinges: concealed European style Grade II hinges minimum 110° opening, self-closing type.

.4 Pulls: back mounted pull, arched handle, Satin nickel finish. Amerock BP52997G10 or approved equal.

.5 Shelf rests: shelf rest installed in holes drilled, type B54013 stainless steel.

.6 Drawer slides:
- .1 Slide type: bottom edge mounted drawer slides, soft close Richelieu Blum 566H6000B or approved equal.
- .2 Extension and capacity: full extension meeting requirements of AWMAC AWS for type and size of drawer.
- .3 File drawer slides: full extension.

.7 Cabinet Locks: Cam type cylinder lock. Satin nickel finish. Install where shown on details. Key locks that are in the same room alike.

.8 Clear plastic silencers to be installed on all cabinet doors.

2.06 ACCESSORIES

.1 Wood screws: stainless steel, type and size to suit application.

.2 Nails and staples: to CSA B111 and ASTM F 1667.

.3 Splines: wood.

.4 Sealant: in accordance with Section 07 92 00 - Joint Sealants.

2.07 LAMINATED PLASTIC COUNTERTOPS

.1 Laminated plastic for post-forming work: to NEMA LD3.
- .1 Type: post-forming, faced and backed with plastic laminate.
- .2 Grade: HGP.
- .3 Size: 0.9 mm thick.
- .4 Colour: integral colour throughout.
- .5 Pattern: woodgrain or printed pattern, as selected by Departmental Representative.
- .6 Finish: satin.

.2 Core material: particleboard.
- .1 Countertops to receive plumbing fixtures: Water resistant particle board.

.3 Back splashes: cove 100 mm high.

.4 Front edges: no drip bullnose edge.

3 EXECUTION

3.01 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for architectural woodwork installation in accordance with manufacturer's instructions.
- .1 Visually inspect substrate in presence of Departmental Representative.
- .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been remedied.

3.02 INSTALLATION

.1 Install architectural wood casework in accordance with AWMAC AWS grade for respective items.

.2 In case of conflict between Contract Documents and AWMAC AWS grade requirements, Contract Documents govern.

.3 Install prefinished millwork at locations shown on drawings.
- .1 Position accurately, level, plumb straight.

.4 Fasten and anchor millwork securely.
- .1 Supply and install heavy duty fixture attachments for wall mounted cabinets.

.5 Countersink mechanical fasteners at exposed and semi-exposed surfaces, excluding installation attachment screws and screws securing cabinets end to end.

.6 Use draw bolts in countertop joints.

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

.8 At junction of plastic laminate counter back splash and adjacent wall finish, apply small bead of sealant in accordance with Section 07 92 00 - Joint Sealants.

.9 Fit hardware accurately and securely in accordance with manufacturer's written instructions.

.10 Make cutouts for inset equipment and fixtures using templates provided.

3.03 CLEANING

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

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .1 Clean millwork, inside cupboards and drawers and outside surfaces.
- .2 Remove excess glue, pencil and ink marks from surfaces.

3.04 PROTECTION

.1 Protect millwork and cabinet work from damage until final inspection.

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

.3 Repair damage to adjacent materials caused by architectural woodwork installation.

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

.1 Section 06 10 53 – Rough Carpentry

.2 Section 06 40 00 – Architectural Woodwork

1.02 REFERENCE STANDARDS

.1 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-19.13-M87, Sealing Compound, One-component, Elastomeric, Chemical Curing.

1.03 CLOSEOUT SUBMITTALS

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

.2 Operation and Maintenance Data: submit operation and maintenance data for incorporation into manual.

1.04 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 in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

1.05 SITE CONDITIONS

.1 Ambient Conditions:
- .1 Proceed with installation of joint sealants only when:
  - .1 Ambient and substrate temperature conditions are within limits permitted by joint sealant manufacturer or are above 4.4 degrees C.
  - .2 Joint substrates are dry.
  - .3 Conform to manufacturer's recommended temperatures, relative humidity, and substrate moisture content for application and curing of sealants including special conditions governing use.

.2 Joint-Width Conditions:
- .1 Proceed with installation of joint sealants only where joint widths are more than those allowed by joint sealant manufacturer for applications indicated.

.3 Joint-Substrate Conditions:
- .1 Proceed with installation of joint sealants only after contaminants capable of interfering with adhesion are removed from joint substrates.

2 PRODUCTS

2.01 SEALANT MATERIALS

.1 Do not use caulking that emits strong odours, contains toxic chemicals or is not certified as mould resistant in air handling units.

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

.3 Where sealants are qualified with primers use only these primers.

.4 Colours:

.1 Exposed areas: to match adjacent surfaces

.2 Concealed areas: black may be used

2.02 SEALANT MATERIAL DESIGNATIONS

.1 Silicone one part: to CAN/CGSB-19.9Ma.

.2 Preformed compressible and non-compressible back-up materials:
.1 Polyethylene, urethane, neoprene or vinyl foam:
.1 Extruded closed cell foam backer rod.
.2 Size: oversize 30 to 50 %.
.2 Neoprene or butyl rubber:
.1 Round solid rod, Shore A hardness 70.

.3 Epoxy Grout/Caulk:

.1 Joint cleaner: non-corrosive solvent recommended by sealant manufacturer for applicable substrate material.

.2 Epoxy joint filler: high modulus, high strength, structural epoxy, to ASTM C-881, Type 1, Grade 3, Classes B and C.

.3 Acceptable products: Sika Anchor Fix 3001; Pecora Dynapoxy EP-1200; SONNEBORN Epolith G or approved equal.

2.03 SEALANT SELECTION

.1 All locations to be silicone.

2.04 JOINT CLEANER

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

.2 Primer: in accordance with sealant manufacturer's written recommendations.

3 EXECUTION

3.01 SURFACE PREPARATION

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

.2 Clean bonding joint surfaces of harmful matter substances including dust, rust, oil grease, and other matter which may impair Work.

.3 Do not apply sealants to joint surfaces treated with sealer, curing compound, water repellent, or other coatings unless tests have been performed to ensure compatibility of materials. Remove coatings as required.

.4 Ensure joint surfaces are dry and frost free.

.5 Prepare surfaces in accordance with manufacturer's directions.

3.02 PRIMING

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

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

3.03 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.

3.04 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.

3.05 CLEANING

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

.2 Clean adjacent surfaces immediately.
.3 Remove excess and droppings, using recommended cleaners as work progresses.
.4 Remove masking tape after initial set of sealant.

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

3.06 PROTECTION

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

.2 Repair damage to adjacent materials caused by joint sealants installation.

END OF SECTION

1 GENERAL

1.01 REFERENCE STANDARDS

.1 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).

.2 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.

.3 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.

.4 Underwriters' Laboratories of Canada (ULC)
- .1 CAN4-S104-M80, Standard Method for Fire Tests of Door Assemblies.
- .2 CAN4-S105-M85, Standard Specification for Fire Door Frames Meeting the Performance Required by CAN4-S104.

1.02 SYSTEM DESCRIPTION

.1 Design Requirements:
- .1 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.
- .4 Provide fire labelled frames for openings requiring fire protection ratings. Test products in conformance with CAN4-S104 and listed by nationally recognized agency having factory inspection services.

1.03 ACTION AND INFORMATIONAL SUBMITTALS

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

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

.3 Provide shop drawings: in accordance with Section 01 33 00 - Submittal Procedures.
- .1 Submit drawings stamped and signed by professional engineer registered or licensed in Saskatchewan, Canada.
- .2 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.
- .3 Indicate each type frame material, core thickness, reinforcements, glazing stops, location of anchors and exposed fastenings and fire rating finishes.
- .4 Include schedule identifying each unit, with door marks and numbers relating to numbering on drawings and door schedule.
- .5 Submit test and engineering data, and installation instructions.

1.04 DELIVERY, STORAGE AND HANDLING

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

2 PRODUCTS

2.01 MATERIALS

.1 Hot dipped galvanized steel sheet: to ASTM A 653M, ZF75, minimum base steel thickness in accordance with CSDMA Table 1 - Thickness for Component Parts.

.2 Reinforcement channel: to CSA G40.20/G40.21, Type 44W, coating designation to ASTM A 653M, ZF75.

.3 Frames: 16 gauge commercial grade hot rolled sheet steel, wipe-coated zinc finish.

.4 Floor anchors, channel spreaders, and wall anchors: minimum 16 gauge steel with wipe coated zinc finish.

.5 Guard boxes: minimum 22 gauge steel with wipe-coated zinc finish.

.6 Primer: corrosion-resistant steel primer.

2.02 DOOR CORE MATERIALS

.1 Interior: seam locked, honeycomb construction:
  .1 Structural small cell, 24.5 mm maximum kraft paper 'honeycomb', weight: 36.3 kg per ream minimum, density: 16.5 kg/mü minimum sanded to required thickness.

.2 Exterior: face sheets welded, insulated core.
  .1 Polyurethane: to CGSB 51-GP-21M rigid, modified polyisocyanurate, closed cell board. Density 32 kg/m3.

.3 Fabricate doors of 16 gauge commercial grade cold rolled, roller levelled sheet with wipe-coated zinc finish.

.4 Cores for fire doors: manufacturer’s standard for ratings required.

.5 Door shall have flush faces and edge seams. Seams fully welded for exterior doors, mechanically locked for interior doors.

.6 Provide top channel closures for exterior doors.

.7 Touch up prime zinc finish where damaged during fabrication.

2.03 ADHESIVES

.1 Honeycomb cores and steel components: heat resistant, spray grade, resin reinforced neoprene/rubber based, low viscosity, contact cement.
  .1 Adhesive: maximum VOC content 50 g/L.

.2 Lock-seam doors: fire resistant, resin reinforced polychloroprene, high viscosity, sealant/adhesive.

2.04 PRIMER

.1 Touch-up prime CAN/CGSB-1.181.
.1 Maximum VOC limit 50 g/L to GC-03.

2.05 PAINT

.1 Field paint steel doors and frames in accordance with Section 09 91 23 - Interior Painting, 09 91 13. Protect weatherstrips from paint. Provide final finish free of scratches or other blemishes.
.1 Maximum VOC emission level 50 g/L to GS-11.

2.06 ACCESSORIES

.1 Door silencers: single stud rubber/neoprene type.

.2 Exterior and interior top and bottom caps: 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: metal rivited.

2.07 FRAMES FABRICATION GENERAL

.1 Fabricate frames in accordance with CSDMA specifications.

.2 Fabricate frames to profiles and maximum face sizes as indicated.

.3 Exterior frames: 1.6 mm welded type construction.

.4 Interior frames: 1.6 mm welded type construction.

.5 Blank, reinforce, drill and tap frames for mortised, templated hardware,using templates provided by finish hardware supplier. Reinforce frames for surface mounted hardware.

.6 Protect mortised cutouts with steel guard boxes.

.7 Prepare frame for door silencers, 3 for single door, 2 at head for double door.

.8 Manufacturer's nameplates on frames and screens are not permitted.

.9 Conceal fastenings except where exposed fastenings are indicated.

.10 Provide factory-applied touch up primer at areas where zinc coating has been removed during fabrication.

.11 Insulate exterior frame components with polyurethane insulation.

2.07 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.

2.08 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.

2.12 DOOR FABRICATION GENERAL

.1 Doors: swing type, flush, with provision for glass and/or louvre openings as indicated.

.2 Exterior doors: honeycomb construction. Interior doors: honeycomb construction.

.3 Fabricate doors with longitudinal welded. Seams: grind welded joints to a flat plane, fill with metallic paste filler and sand to a uniform smooth finish.

.4 Doors: manufacturers' proprietary construction, tested and/or engineered as part of a fully operable assembly, including door, frame, gasketting and hardware in accordance with ASTM E 330

.5 Blank, reinforce, drill doors and tap for mortised, templated hardware.

.6 Factory prepare holes 12.7 mm diameter and larger except mounting and through-bolt holes, on site, at time of hardware installation.

.7 Reinforce doors where required, for surface mounted hardware. Provide flush steel top caps to exterior doors. Provide inverted, recessed, spot welded channels to top and bottom of interior doors.

.8 Provide factory-applied touch-up primer at areas where zinc coating has been removed during fabrication.

.9 Provide fire labelled doors for those openings requiring fire protection ratings, as scheduled. Test such products in conformance with CAN4-S104 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.

.10 Manufacturer's nameplates on doors are not permitted.

2.09 DOORS: HONEYCOMB CORE CONSTRUCTION

.1 Form face sheets for exterior doors from 1.6 mm sheet steel with honeycomb core laminated under pressure to face sheets.

.2 Form face sheets for interior doors from 1.6 mm sheet steel with honeycomb core laminated under pressure to face sheets.

2.10 HOLLOW STEEL CONSTRUCTION

.1 Form face sheets for exterior doors from 1.6 mm sheet steel.

.2 Form face sheets for interior doors from 1.6 sheet steel.

.3 Reinforce doors with vertical stiffeners, securely welded to face sheets at 150 mm on centre maximum.

.4 Fill voids between stiffeners of exterior doors with honeycomb core.

.5 Fill voids between stiffeners of interior doors with honeycomb core.

3 EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

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

3.02 INSTALLATION GENERAL

.1 Install labelled steel fire rated doors and frames to NFPA 80 except where specified otherwise.

.2 Install doors and frames to CSDMA Installation Guide.

3.03 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.

3.04 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 and thresholds as follows.
- .1 Hinge side: 1.0 mm.
- .2 Latchside and head: 1.5 mm.
- .3 Finished floor, top of carpet and thresholds: 13 mm.

.3 Adjust operable parts for correct function.

3.05 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.

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

.1 Not used.

1.02 REFERENCE STANDARDS

.1 American Architectural Manufacturers Association (AAMA)
- .1 AAMA 609/610-15, Cleaning and Maintenance Guide for Architecturally Finished Aluminum.

.2 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-12.1-M90, Tempered or Laminated Safety Glass.

1.03 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 doors and frames, and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:
- .1 Indicate materials and profiles and provide full-size, scaled details of components for each type of door and frame. Indicate:
  - .1 Interior trim and exterior junctions with adjacent construction.
  - .2 Junctions between combination units.
  - .3 Elevations of units.
  - .4 Core thicknesses of components.
  - .5 Type and location of exposed finishes, method of anchorage, number of anchors, supports, reinforcement, and accessories.
  - .6 Location of caulking.
  - .7 Each type of door system including location.
  - .8 Arrangement of reinforcing for hardware and joints.
  - .9 Arrangement of hardware and required clearances.

1.04 CLOSEOUT SUBMITTALS

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

.2 Operation and Maintenance Data: submit operation and maintenance data for cleaning and maintenance of aluminum finishes for incorporation into manual. Submit copy of shop drawings.

.3 Warranty Documentation: submit warranty documents specified.

1.05 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.
- .1 Apply temporary protective coating to finished surfaces. Remove coating after erection. Use easy to remove, residue free coatings.
- .2 Leave protective covering in place until final cleaning of building.

.3 Storage and Handling Requirements:
- .1 Store materials off ground, indoors, in dry location, and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Store and protect aluminum doors and frames from nicks, scratches, and blemishes.
- .3 Replace defective or damaged materials with new.

1.06 WARRANTY

.1 Manufacturer's warranty: Submit, for Departmental Representative acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty in addition to and not limit other rights Owner may have under Contract Documents.

2 PRODUCTS

2.01 MATERIALS

.1 Aluminum extrusions: to Aluminum Association alloy 6063-T5 anodizing quality, clear anodized finish. Minimum 3mm wall thickness, 114mm x 45mm nominal size mullions, designed as channel or stop glazing for single pane interior glazing.

.2 Storefront: Anotec Series 60 Flush Glazed, or approved equal.
- .1 Speaker Port: Opening to be 120mm (4 ¾”). Metal Fab Services, 820-SD Model, 152mm diameter speaker disc.
- .2 Pass thru: locking device Sobinco Spring Catch #703

.3 Horizontal Sliding Panel: Anotec Series 29, or approved equal. Sliding panel to be hung by two heavy duty roller brackets, each having self-lubricating nylon wheel and ball assembly; running in extruded aluminum track assembly. Provide extruded aluminum door glides and retainer clips along bottom for positive guide no-sway operation of sliding panel. Bottom track to be recessed into countertop.
- .1 Pull: Manufacturer’s standard recessed pull handle, install on office side.
- .2 Cylinder: Adams Rite MS1847 Deadlock, or approved equal. Install thumb turn locking device on office side.
- .3 Include rubber faced door stop to restrict window movement at maximum window opening.

.4 Doors: Anotec Series 23, or approved equal. Clear anodized aluminum finish.
- .1 Rails: Nominal 45mm thickness, 149mm wide top rail, 152 mm wide side stiles, 305mm wide bottom rail, 310mm wide mid rail.
- .2 Hardware:

Door 102:
900 x 2150 x 45, aluminum door, aluminum frame
1 only continuous hinge: Stanley 661 HD x AL, or approved equal.

1 only door closer: Norton 7500 x PA x 689, or approved equal.
1 only wall stop: Hager 230W x US26D
1 only mortise lock: Sargent 8200 x L lever x LS escutcheon x 626, 50 function with 8250-115 cylinder and emergency key, meeting CAN/CGSB-69.29-93, F15, or approved equal.
1 only threshold: Pemko A172A with 282A elevator, or approved equal.
1 only electric strike: SDC 55 DU – 630 or approved equal.

.5 Glass: 2 layers 6mm (1/4") laminated tempered glass with bonded 0.030 PVB interlayer.

.6 Sealants: clear silicone caulking.

.7 Provide all compatible fasteners, accessories, strike plates, etc. to complete installation.

2.02 FABRICATION

.1 Doors and framing by same manufacturer.

.2 Fabricate doors and frames to profiles and maximum face sizes as indicated.

.3 Fabricate units square and true. Reinforce mechanically-joined corners and component areas of aluminum framing with interior steel clips to provide strength, stiffness and rigidity in the completed installation.

.5 All perimeter surfaces of port to be smooth, free of serrations, burrs, and sharp edges.

.6 Mortise, reinforce, drill and tap doors, frames and reinforcements to receive hardware using manufacturer's templates.

.7 Isolate aluminum from direct contact with dissimilar metals, concrete and masonry.

.8 Contractor to verify rough opening dimensions and conditions on site for adequate installation prior to fabrication.

3 EXECUTION

3.01 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts acceptable for aluminum doors and frames installation in accordance with manufacturer's written instructions.
  .1 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  .2 Proceed with installation only after unacceptable conditions have been remedied.

3.02 INSTALLATION

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

.2 Set frames plumb, square, level at correct elevation in alignment with adjacent work.

.3 Anchor securely.

.4 Install doors and hardware in accordance with hardware templates and manufacturer's instructions.

.5 Adjust door components to ensure smooth operation.

.6 Make allowances for deflection of structure to ensure structural loads not transmitted to frames.

.7 Apply sealant in accordance with Section 07 92 00 - Joint Sealants.

3.03 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
- .1 Leave Work area clean at end of each day.
- .2 Perform cleaning of aluminum components in accordance with AAMA 609.1 - Voluntary Guide Specification for Cleaning and Maintenance of Architectural Anodized Aluminum.
- .3 Perform cleaning as soon as possible after installation to remove construction and accumulated environmental dirt.
- .4 Clean aluminum with damp rag and approved non-abrasive cleaner.
- .5 Remove traces of primer, caulking, epoxy and filler materials; clean doors and frames.
- .6 Clean glass and glazing materials with approved non-abrasive cleaner.

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

3.04 PROTECTION

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

.2 Repair damage to adjacent materials caused by aluminum door and frame installation.

END OF SECTION

1 GENERAL

1.02 REFERENCE STANDARDS

.1 American National Standards Institute (ANSI) / Builders Hardware Manufacturers Association (BHMA)
- .1 ANSI/BHMA A156.1-2000, American National Standard for Butts and Hinges.
- .2 ANSI/BHMA A156.2-2003, Bored and Preassembled Locks and Latches.
- .3 ANSI/BHMA A156.3-2001, Exit Devices.
- .4 ANSI/BHMA A156.4-2000, Door Controls - Closers.
- .5 ANSI/BHMA A156.5-2001, Auxiliary Locks and Associated Products.
- .6 ANSI/BHMA A156.6-2005, Architectural Door Trim.
- .7 ANSI/BHMA A156.8-2005, Door Controls - Overhead Stops and Holders.
- .8 ANSI/BHMA A156.10-1999, Power Operated Pedestrian Doors.
- .9 ANSI/BHMA A156.12-2005, Interconnected Locks and Latches.
- .10 ANSI/BHMA A156.13-2002, Mortise Locks and Latches Series 1000.
- .13 ANSI/BHMA A156.16-2002, Auxiliary Hardware.

.3 Canadian Steel Door and Frame Manufacturers' Association (CSDMA)
- .1 CSDMA Recommended Dimensional Standards for Commercial Steel Doors and Frames - 2009.

1.03 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 door hardware] and include product characteristics, performance criteria, physical size, finish and limitations.

.4 Hardware List:
- .1 Submit contract hardware list.
- .2 Indicate specified hardware, including make, model, material, function, size, finish and other pertinent information.

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

.6 Manufacturer's Instructions: submit manufacturer's installation instructions.

1.04 CLOSEOUT SUBMITTALS

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

.2 Operation and Maintenance Data: submit operation and maintenance data for door hardware for incorporation into manual.

1.05 MAINTENANCE MATERIAL SUBMITTALS

- .1 Supply maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Tools:

.1 Supply 2 sets of wrenches for door closers locksets and fire exit hardware.

1.06 QUALITY ASSURANCE

.1 Regulatory Requirements:
- .1 Hardware for doors in fire separations and exit doors certified by a Canadian Certification Organization accredited by Standards Council of Canada.

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

1.07 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 Package items of hardware including fastenings, separately or in like groups of hardware, label each package as to item definition and location.

.4 Storage and Handling Requirements:
- .1 Store materials indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Store and protect door hardware from nicks, scratches, and blemishes.
- .3 Protect prefinished surfaces with wrapping.
- .4 Replace defective or damaged materials with new.

2 PRODUCTS

2.01 HARDWARE ITEMS

.1 Use one manufacturer's products only for similar items.

2.02 DOOR HARDWARE

.1 Locks and latches:
- .1 Interconnected locks and latches: to ANSI/BHMA A156.12, series 5000 interconnected lock, grade 1, designed for function and keyed as directed by Departmental Representative.
- .2 Mortise locks and latches: to ANSI/BHMA A156.13, series 1000 mortise lock, grade 1, designed for function and keyed as directed by Departmental Representative.
- .3 Lever handles: Corbin Russwin – Lustra (cast) or approved equal.
- .4 Roses, Escutcheons: round.
- .5 Normal strikes: box type, lip projection not beyond jamb.
- .6 Cylinders: key into keying system as directed.
- .7 Finish: 26D.

.2 Butts and hinges:
- .1 Butts and hinges: to ANSI/BHMA A156.1.

.1 Interior Hinges: **Hdwe Code A.** Wrought steel, full mortise, ball bearing, heavy-weight butts, non-removable pins, 626 dull chromium finish, meeting requirements of CAN/CGSB- 69.18-M90, A8111. Acceptable products: Monthard BB1068; Hager BB1168.

.2 Exterior Hinges: **Hdwe Code B.** Wrought brass or bronze, full mortise, ball bearing, heavy- weight butts, non-removable pins, 626 dull chromium finish meeting the requirements of CAN/CGSB-69.18-M90, A2111. Acceptable products: Monthard BB1099; Hager BB1199.

.3 Door Closers and Accessories: Provide adjustable backcheck for 90 to 110-degree opening. Finish shall be 628 satin aluminum, powder coated finish. Provide -50 C winter fluid for exterior doors.

.1 Regular Arm: **Hdwe Code C.** Institutional/ Heavy Duty closer mounted on PULL side of door with arm perpendicular to face of door and arm bracket attached to door frame, meeting the requirements of CAN/CGSB-69.20 -M90, C02011. Acceptable products: Sargent 351-0, LCN/Ingersol Rand 4041-REG, Norton 7500.

.2 Parallel Arm: **Hdwe Code D.** Institutional/ Heavy Duty closer mounted on push side of door with arm parallel to face of door and arm bracket attached to door frame, meeting requirements of CAN/CGSB -69.20 C02011. Products shall have universal mounting and adjustments to take into account changing door configurations. Acceptable products: Sargent 351-P9, LCN/Ingersol Rand P4041-REG, Norton P7500

.4 Door Operators:
.1 Existing to be re-used, Door 101

.5 Auxiliary locks and associated products: **Hdwe Code E**, to ANSI/BHMA A156.5, Series 1000, Grade 1 Operational and Grade 3 security. Finishes shall be 626 dull chromium or 630 dull stainless steel to meet manufacturer's standard. Locks shall be equipped with removable construction cylinder. All latch and lock sets shall be complete with standard curved lip strike and wrought strike box for latch and latch/deadbolt combinations, handed.

.1 Passage/Closet Door: **Hdwe Code F.** Latchbolt by lever either side. Both levers always free. ANSI function F01.
Acceptable products: Corbin Russwin CL3310 x LSR or approved equal.

.2 Storeroom Door: **Hdwe Code F1.** Latchbolt by grip either side, latchbolt by key both sides, deadbolt by key either side, inside lever does not retract deadbolt, meeting requirements of CAN/CGSB-69.29-93, F14, lever handled.
Acceptable products: Corbin Russwin ML2022 LSR or approved equal.

.3 Storeroom Door: **Hdwe Code F2.** Latchbolt by grip either side. Deadbolt by key outside or thumbturn inside. Inside lever does not retract deadbolt, meeting the requirements of CAN/CGSB-69.29-93, ANSI function F14, lever handled.
Acceptable products: Corbin Russwin ML-2024 LSR or approved equal.

.4 Storeroom Door: **Hdwe Code F3.** Latchbolt by key in outside lever and by rotating inside lever. Outside lever always rigid. Inside lever always free. ANSI function F07. Acceptable products: Corbin Russwin CL3357 x LSR.

.5 Hotel Door: **Hdwe Code F4.** Latchbolt by grip inside and key outside, outside grip always rigid, deadbolt thumbturn inside & key outside, inside grip retracts latchbolt and deadbolt simultaneously, meeting the requirements of CAN/CGSB-69.29-93, F15, lever handled. Acceptable products: Corbin Russwin ML2029 x LSR or approved equal.

.6 Entrance/Storeroom: **Hdwe Code F5.** Latchbolt by grip either side, deadbolt by key outside and thumbturn inside, outside lever rigid when deadbolt engaged, meeting the requirements of CAN/CGSB-69.29-93, F21, lever handled.
Acceptable products: Corbin Russwin ML2024 x LSR or approved equal.

.7 Entrance or Office: **Hdwe Code F6.** Deadlocking latchbolt by lever either side, except when turn-button locks outside lever. Pushing turn-button in locks outside lever, requiring use of key outside to unlock. Turning inside lever unlocks outside lever. Pushing in & turning button locks outside lever, requiring key at all times. Turning inside lever does not unlock outside lever until button is manually turned to unlocked position. Inside lever always free. ANSI function F109.
Acceptable products: Corbin Russwin CL3351 x LSR or approved equal.

.8 Dormitory or Entrance: **Hdwe Code F7.** Latchbolt by grip either side unless outside grip locked by projection of deadbolt. Deadbolt thrown or retracted by key outside or by thumbturn grip inside. Inside grip simultaneously retracts latchbolt and deadbolt and unlocks outside grip. Inside grip always free. ANSI function F13.
Acceptable products: Corbin Russwin ML2065 x LSR or approved equal.

.6 DEADBOLTS:
Provide interlock for overhead door operator. Provide standard strike with wrought strike box. Finish shall be 626 dull chromium or 630 dull stainless steel to meet manufacturer's standard. Locks shall be equipped with removable construction cylinder. Keys and cylinders shall be turned over to Departmental Representative.

.1 Cylinder X Blank: **Hdwe Code G.** Mortise deadlock by key one side only, opposite side blank. Acceptable products: Corbin Russwin DL4011.

.7 Architectural door trim: to ANSI/BHMA A156.6, **Hdwe Code H** and numeral identifiers listed in Hardware Schedule..
.1 Door protection plates: kick plate type, 1.6 mm thick x 250 mm x 35 m narrower than door width, installed both sides of door with 630 satin stainless steel finish, meeting the requirements of CAN/CGSB-69.22-M90.

.8 Auxiliary hardware: to ANSI/BHMA A156.16, **Hdwe Code J** listed in Hardware Schedule, finished to 26D.
.1 Door silencer: three (3) GJ64 for each frame.
.2 Door viewer: wide-angle prism, 12 mm diameter with male/female threaded brass tube, adjustable for door thickness, meeting requirements of CAN/CGSB-69.23-M90. Acceptable products: ASD Metallic Doorscope, Model DS238 x 26D, or approved equal.
.3 Wall stop: Heavy duty, concave wall stop, satin chromium finish. Hager 234W or approved equal.
.4 Overhead stop: Heavy duty overhead door stop, opening range from 85 – 110 degrees. Acceptable product: Sargent 598S x 26D, or approved equal.

.9 Door bottom seal, **Hdwe Code K**: heavy duty, automatic door bottom of extruded aluminum frame and solid closed cell neoprene weather seal, surface mounted, closed ends, adjustable, clear anodized finish. Acceptable product: KN Crowder CT-52, or approved equal.

.10 Thresholds, **Hdwe Code L**: 150 mm wide x full width of door opening, extruded aluminum mill finish, serrated surface, with lip.

.11 Weatherstripping, **Hdwe Code M**:
- .1 Head and jamb seal:
  - .1 Extruded aluminum frame and solid closed cell neoprene insert, clear anodized finish
- .2 Door bottom seal:
  - .1 Extruded aluminum frame and closed cell neoprene sweep, clear anodized finish.

.12 Barrier Free Pneumatic Door Operator:
- .1 Reinstall existing.

.13 Electric Strike, **Hdwe Code N:**
- .1 Model SDC 55 DU – 630 or approved equal.

2.03 FASTENINGS

.1 Use only fasteners provided by manufacturer. Failure to comply may void warranties and applicable licensed labels.

.2 Supply screws, bolts, expansion shields and other fastening devices required for satisfactory installation and operation of hardware.

.3 Exposed fastening devices to match finish of hardware.

.4 Where pull is scheduled on one side of door and push plate on other side, supply fastening devices, and install so pull can be secured through door from reverse side. Install push plate to cover fasteners.

.5 Use fasteners compatible with material through which they pass.

2.04 KEYING

.1 Doors and cabinet locks to be keyed differently as directed. Prepare detailed keying schedule in conjunction with Departmental Representative.

.2 Supply keys in duplicate for every lock in this Contract.

.3 Supply 3 master keys for each master key or grand master key group.

.4 Stamp keying code numbers on keys and cylinders.

.5 Supply construction cores.

.6 Hand over permanent cores and keys to Departmental Representative.

3 EXECUTION

3.01 INSTALLATION

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

.2 Supply metal door and frame manufacturers with complete instructions and templates for preparation of their work to receive hardware.

.3 Supply manufacturers' instructions for proper installation of each hardware component.

.4 Install hardware to standard hardware location dimensions in accordance with CSDFMA Canadian Metric Guide for Steel Doors and Frames (Modular Construction).

.5 Where door stop contacts door pulls, mount stop to strike bottom of pull.

.6 Install key control cabinet.

.7 Use only manufacturer's supplied fasteners.
- .1 Use of "quick" type fasteners, unless specifically supplied by manufacturer, is unacceptable.

.8 Remove construction cores when directed by Departmental Representative.
- .1 Install permanent cores and ensure locks operate correctly.

3.02 ADJUSTING

.1 Adjust door hardware, operators, closures and controls for optimum, smooth operating condition, safety and for weather tight closure.

.2 Lubricate hardware, operating equipment and other moving parts.

.3 Adjust door hardware to ensure tight fit at contact points with frames.

3.03 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
- .1 Leave Work area clean at end of each day.
- .2 Clean hardware with damp rag and approved non-abrasive cleaner, and polish hardware in accordance with manufacturer's instructions.
- .3 Remove protective material from hardware items where present.
- .4 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

3.04 DEMONSTRATION

.1 Maintenance Staff Briefing:
- .1 Brief maintenance staff regarding:
  - .1 Proper care, cleaning, and general maintenance of projects complete hardware.
  - .2 Description, use, handling, and storage of keys.
  - .3 Use, application and storage of wrenches for door closers locksets and

fire exit hardware.

.3 Demonstrate operation, operating components, adjustment features, and lubrication requirements.

3.05 PROTECTION

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

.2 Repair damage to adjacent materials caused by door hardware installation.

3.06 SCHEDULE

.1 Door 101: 900 x 2150 x 45, HM, PS Frame
Hdwe Codes: B, F7, H, J1, J2, J3, L, M1, M2, Reinstall and attach exist. H/C operator
Provide new annunciator and astragal

.2 Doors 102:
.1 Refer to Aluminum doors and Frames – Section 08 11

.3 Door 103: 914 x 2134 x 45 HM, Existing frame
Hdwe Codes: A, D, F4, H, J1, J2, J3, K, L, M1, M2

.4 Door 103.1: 900 x 2150 x 45, HM, PS Frame
Hdwe Codes: A, D, F3, H, J1, J3, K, L, M1, N

.5 Door 106: Exist. Door, frame and hardware to remain with the following exceptions:
Hdwe Codes: F4, N

.6 Door 106.1: Exist. door, frame and hardware to remain with the following exceptions:
Hdwe Codes: F4, C

.7 Door 109: 900 x 2150 x 45, HM, PS Frame
Hdwe Codes: A, C, F3, H, J1, J3

.8 Door 115: Exist. Door, frame and hardware to remain with the following exceptions:
Hdwe Codes: F4, C, J2, L, M1, M2

.9 Door 115.1: 750 x 2150 x 45 HM, PS Frame
Hdwe Codes: A, C, F4, H, J1, J3, N

.10 Door 116 and 117: 900 x 2150 x 45 HM, PS Frame
Hdwe Codes: A, C, F4, H, J1, J3, N

.11 Door 118: Exist. Door, frame and hardware to remain with the following exceptions
Hdwe Codes: F4, C

.12 Door 127: 900 X 2150 X 45 HM, PS Frame
Hdwe Codes: A, D, F4, H, J1, J3, N

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

.1 Section 06 10 53 – Miscellaneous Rough Carpentry

.2 Section 07 21 16 – Blanket Insulation

.3 Section 07 26 00 – Vapour Retarders

.4 Section 07 84 00 – Fire Stopping

1.02 REFERENCE STANDARDS

.1 American Society for Testing and Materials (ASTM)
- .1 ASTM C 475-02(2015), Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
- .2 ASTM C 840-16, Standard Specification for Application and Finishing of Gypsum Board.
- .3 ASTM C 1002-14, Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
- .4 ASTM C 1047-14a, Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.
- .5 ASTM C 1178/C 1178M-13, Standard Specification for Glass Mat Water-Resistant Gypsum Backing Board.
- .6 ASTM C 1280-13a, Standard Specification for Application of Gypsum Sheathing.
- .7 ASTM C1396/C1396M-14a, Standard Specification for Gypsum board.

.2 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-51.34-M86(R1988), Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
- .2 CAN/CGSB-71.25-M88, Adhesive, for Bonding Drywall to Wood Framing and Metal Studs.

.3 Underwriters' Laboratories of Canada (ULC)
- .1 CAN/ULC-S102-10, Standard Method of Test of Surface Burning Characteristics of Building Materials and Assemblies.

1.03 ACTION AND INFORMATIONAL SUBMITTALS

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

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

1.04 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 and applicable standard designation.

.3 Exercise care in unloading gypsum board materials shipment to prevent damage.

.4 Storage and Handling Requirements in accordance with ASTM C 840-16:
- .1 Store gypsum board assemby materials level flat off ground indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Store and protect gypsum board assemblies from nicks, scratches, and blemishes.
- .3 Protect gypsum board from direct exposure to rain, snow, sunlight, or other excessive weather conditions.
- .4 Protect ready mix joint compounds from freezing, exposure to extreme heat and direct sunlight.
- .5 Protect from weather, elements and damage from construction operations.
- .6 Handle gypsum boards to prevent damage to edges, ends or surfaces.

1.05 AMBIENT CONDITIONS

.1 Maintain temperature 10 °C minimum, 21 °C maximum for 48 hours prior to and during application of gypsum boards and joint treatment, and for 48 hours minimum after completion of joint treatment.

.2 Apply board and joint treatment to dry, clean, 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.

2 PRODUCTS

2.01 MATERIALS

.1 Gypsum sheathing board: to ASTM C1396/C1396M-14 regular and Type X, thickness as indicated on drawings, 1200 mm wide x maximum practical length, ends square cut, edges squared.

.2 Water-resistant board: to ASTM C1396/C1396M-14 regular and Type X, thickness as indicated on drawings, 1200 mm wide x maximum practical length, ends square cut, edges squared. Refer to clause 3.02.3 for locations.

.3 Metal furring runners, hangers, tie wires, inserts, and anchors: to CAN/CSA S136-12.

.4 Drywall furring channels: 0.5 mm core thickness galvanized steel channels for screw attachment of gypsum board.

.5 Resilient drywall furring: 0.5 mm base steel thickness galvanized steel for resilient attachment of gypsum board.

.6 Steel drill screws: to ASTM C 1002-14.

.7 Stud adhesive: to CAN/CGSB-71.25.

.8 Casing beads, corner beads, control joints and edge trim: to ASTM C 1047, metal, 0.5 mm base thickness, perforated flanges, one piece length per location.

.9 Sealants: in accordance with Section 07 92 00 - Joint Sealants.

.10 Joint compound: to ASTM C 475, asbestos-free.

3 EXECUTION

3.01 ERECTION

.1 Do application and finishing of gypsum board to ASTM C 840-16 except where specified otherwise.

.2 Do application of gypsum sheathing to ASTM C 1280-13a.

.3 Erect hangers and runner channels for suspended gypsum board ceilings to ASTM C 840-16 except where specified otherwise.

.4 Support light fixtures by providing additional ceiling suspension hangers within 150 mm of each corner and at maximum 600 mm around perimeter of fixture.

.5 Install work level to tolerance of 1:1200.

.6 Frame with furring channels, perimeter of openings for access panels, light fixtures, diffusers, grilles and all like conditions.

.7 Install 19 x 64 mm furring channels parallel to, and at exact locations of steel stud partition header track.

.8 Furr above suspended ceilings for gypsum board fire and sound stops and to form plenum areas as indicated.

.9 Install wall furring for gypsum board wall finishes to ASTM C 840-16, except where specified otherwise.

.10 Furr duct shafts, beams, columns, pipes and exposed services where indicated.

.11 Erect drywall resilient furring transversely across studs and joists, spaced maximum 400 mm on centre and not more than 150 mm from ceiling/wall juncture. Secure to each support with 25 mm drywall screw.

.12 Install 150 mm continuous strip of 12.7 mm gypsum board along base of partitions where resilient furring installed.

3.02 APPLICATION

.1 Apply gypsum board after bucks, anchors, blocking, sound attenuation, electrical and mechanical work have been approved.

.2 Apply single or double layer gypsum board to wood or metal furring using screw fasteners for first layer, screw fasteners for second layer. Refer to drawings for locations of each application. Maximum spacing of screws 300 mm on centre.

- .1 Single-Layer Application:
  - .1 Apply gypsum board on ceilings prior to application of walls to ASTM C 840-16.
  - .2 Apply gypsum board on walls vertically or horizontally, providing sheet lengths that will minimize number of board edges or end joints.
- .2 Double-Layer Application:
  - .1 Install gypsum board for base layer and exposed gypsum board for face layer.
  - .2 Apply base layer to ceilings prior to base layer application on walls; apply face layers in same sequence. Offset joints between layers at least 250 mm.
  - .3 Apply base layers at right angles to supports unless otherwise indicated.
  - .4 Apply base layer on walls and face layers vertically with joints of base layer over supports and face layer joints offset at least 250 mm with base layer joints.

.3 Apply water-resistant gypsum board to interior of bathroom and ensuite, all walls and ceiling. Apply water-resistant sealant to edges, ends, cut-outs which expose gypsum core and to fastener heads. Do not apply joint treatment on areas to receive tile finish.

.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.

3.03 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 insulating strips continuously at edges of gypsum board and casing beads abutting exterior window and exterior door frames, to provide thermal break.

.5 Finish face panel joints and internal angles with joint system consisting of joint compound, joint tape and taping compound installed according to manufacturer's directions and feathered out onto panel faces.

.6 Gypsum Board Finish: finish gypsum board walls and ceilings to following levels in accordance with AWCI Levels of Gypsum Board Finish:

.5 Level 4: embed tape for joints and interior angles in joint compound and apply three separate coats of joint compound over joints, angles, fastener heads and accessories; surfaces smooth and free of tool marks and ridges.

.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, 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 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 Mix joint compound slightly thinner than for joint taping.

.13 Apply thin coat to entire surface using trowel or drywall broad knife to fill surface texture differences, variations or tool marks.

.14 Allow skim coat to dry completely.

.15 Remove ridges by light sanding or wiping with damp cloth.

3.04 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.

3.05 PROTECTION

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

.2 Repair damage to adjacent materials caused by gypsum board assemblies installation.

END OF SECTION

1 GENERAL

1.1 REFERENCE STANDARDS

.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).

.1 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-75.1-M88, Tile, Ceramic.
- .2 CAN/CGSB-25.20-95, Surface Sealer for Floors.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Provide product data in accordance with Section 01 33 00 - Submittal Procedures.
- .1 Include manufacturer's information on:
  - .1 Ceramic tile, marked to show each type, size, and shape required.
  - .2 Divider strip.
  - .3 Elastomeric membrane and bond coat.
  - .4 Levelling compound.
  - .5 Latex cement mortar and grout.
  - .6 Commercial cement grout.
  - .7 Organic adhesive.
  - .8 Slip resistant tile.

.3 Provide samples in accordance with Section 01 33 00 - Submittal Procedures.
- .1 Base tile: submit duplicate, 300 x 300 mm sample panels of each colour, texture, size, and pattern of tile.
- .2 Floor tile: submit 300 x 300 mm sample panels of each colour, texture, size, and pattern of tile.
- .3 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.
- .4 Adhere tile samples to 11 mm thick plywood and grout joints to represent project installation.

1.04 QUALITY ASSURANCE

- .5 Manufacturer's Instructions: manufacturer's installation instructions.
- .2 Manufacturer's Field Reports: manufacturer's field reports specified.

1.3 DELIVERY, STORAGE AND HANDLING

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

1.4 AMBIENT CONDITIONS

.1 Maintain air temperature and structural base temperature at ceramic tile installation area

above 12 degrees C for 48 hours before, during, and 48 hours after, installation.

.2 Do not install tiles at temperatures less than 12 degrees C or above 38 degrees C.

.3 Do not apply epoxy mortar and grouts at temperatures below 15 degrees C or above 25 degrees C.

1.5 MAINTENANCE

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

2 PRODUCTS

2.1 FLOOR TILE

.1 Ceramic tile: to CAN/CGSB-75.1, Type 7, Class MR 1, 300 mm x 300 mm x 9.5 mm size, square edges, slip resistant surface R9 or greater, marbelized pattern, colour as selected by Departmental Representative. Matching square base, 300 mm x 100 mm high.

2.02 TRIM SHAPES

.1 Conform to applicable requirements of adjoining floor and wall tile.

.2 Use slip resistant trim shapes for horizontal surfaces of reception floor.

.3 Use trim shapes sizes conforming to size of adjoining field wall tile, including existing spaces, unless specified otherwise.

.4 Internal and External Corners: provide trim shapes as follows where indicated.
- .1 Bullnose shapes for external corners including edges.
- .2 Coved shapes for internal corners.
- .3 Special shapes for:
  - .1 Base to floor internal corners to provide integral coved vertical and horizontal joint.
  - .2 Base to floor external corners to provide bullnose vertical edge with integral coved horizontal joint. Use as stop at bottom of openings having bullnose return to wall.
  - .3 Wall top edge internal corners to provide integral coved vertical joint with bullnose top edge.
  - .4 Wall top edge external corners to provide bullnose vertical and horizontal joint edge.

2.2 MORTAR AND ADHESIVE MATERIALS

.1 Cement: to CSA-A5, type [10].

.2 Sand: to ASTM C 144, passing 16 mesh.

.3 Hydrated lime: to ASTM C 207, Type N.

.4 Latex additive: formulated for use in cement mortar and thin set bond coat.

.5 Water: potable and free of minerals and chemicals which are detrimental to mortar and grout mixes.

2.3 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.

2.4 ACCESSORIES

.1 Transition Strips: purpose made metal extrusion; stainless steel type.

.2 Sealant: in accordance with Section [07 92 00 - Joint Sealants].
- .1 Sealants: maximum VOC limit [250] g/L [to SCAQMD Rule 1168].

.2 Floor sealer and protective coating: [to CAN/CGSB-25.20, Type 1 to tile and grout manufacturers recommendations.

2.5 MIXES

.1 Cement:
- .1 Mortar bed for floors: 1 part cement, 4 parts sand, 1 part water. Adjust water volume depending on water content of sand. Latex additive may be included.
- .2 Levelling coat: 1 part cement, 4 parts sand, minimum 1/10 part latex additive, 1 part water including latex additive.
- .1 Bond or setting coat: 1 part cement, 1/3 part hydrated lime, 1 part water.
- .2 Measure mortar ingredients by volume.

.2 Mix bond and levelling coats, and grout to manufacturer's instructions.

.3 Adjust water volumes to suit water content of sand.

2.6 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 50 mm thick, being brought to feather edge, and being trowelled to smooth finish.

.4 Ready for use in 48 hours after application.

2.7 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.

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 Fit tile around corners, fitments, fixtures, drains and other built-in objects. Maintain uniform joint appearance. Cut edges smooth and even. Do not split tiles.

.4 Maximum surface tolerance 1:800.

.5 Make joints between tile uniform and approximately 6 mm wide, plumb, straight, true, even and flush with adjacent tile. Ensure sheet layout not visible after installation. Align patterns.

.6 Lay out tiles so perimeter tiles are minimum 1/2 size.

.7 Sound tiles after setting and replace hollow-sounding units to obtain full bond.

.8 Make internal angles square, external angles bullnosed.

.9 Use bullnose edged tiles at termination of wall tile panels, except where panel abuts projecting surface or differing plane.

.10 Install divider strips at junction of tile flooring and dissimilar materials.

.11 Allow minimum 24 hours after installation of tiles, before grouting.

.11 Clean installed tile surfaces after installation and grouting cured.

3.03 FIELD QUALITY CONTROL

.1 Manufacturer's Field Services:

.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.

3.3 CLEANING

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

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

.1 Not used.

1.02 REFERENCE STANDARDS

.1 ASTM International
- .1 ASTM C 635/C 635M-07, 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-08, Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.

1.03 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 ceiling panels and ceiling suspension system and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Samples:
- .1 Submit for review and acceptance of each unit.
- .2 Samples will be returned for inclusion into work.
- .3 Submit duplicate full size samples of each type acoustical units, and one tile of existing acoustical tile for comparison.

1.04 DELIVERY, STORAGE AND HANDLING

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

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:
- .1 Store materials off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Store materials inside, level, under cover. Protect from weather, damage from construction operations and other causes, in accordance with manufacturer's printed instructions.
- .3 Handle materials to prevent damage to edges or surfaces. Protect metal accessories and trim from being bent or damaged.
- .4 Store and protect acoustic ceiling materials from nicks, scratches, and blemishes.
- .5 Replace defective or damaged materials with new.

2 PRODUCTS

2.01 MANUFACTURER

.1 Equivalent products as manufactured by E.H. Price, Donn, Armstrong, Acousti-Celotex, C.I.P., shall be considered equal to those specified. All alternate manufacturers to submit for approval.

2.02 GRID SYSTEMS

.1 Grid System: Donn DX Fast-Loc, or approved equal.
- .1 Tees: exposed flanges 24mm, white finish.
- .2 Wall Angles: steel, hemmed both legs, white finish, 19mm face.
- .3 Provide all accessories required to complete assemblies.
- .4 Dimensions for tee grid systems to be imperial 24” (610mm).

2.03 ACOUSTIC PANELS

.1 Acoustical Tile: tile to match existing, Armstrong Kitchen Zone, 610mm x 1220mm x 16mm (24”x48”x5/8”) square, lay-in tiles to be used as basis for pricing, or approved equal.

3 EXECUTION

3.01 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for product installation in accordance with manufacturer's written instructions prior to acoustical ceiling installation.
- .1 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been remedied.

3.02 INSTALLATION

.1 Installation: in accordance with ASTM C 636 except where specified otherwise.

.2 Suspension System:
- .1 Erect ceiling suspension system after work above ceiling has been inspected by Departmental Representative.
- .2 Secure hangers to overhead structure using attachment methods as indicated.
- .3 Install hangers spaced at maximum 1200mm centres and within 150mm from ends of main tees.
- .4 Lay out system according to reflected ceiling plan.
- .5 Install wall moulding to provide correct ceiling height.
- .6 Completed suspension system to support super-imposed loads, such as lighting fixtures, diffusers, and grilles.
- .7 Support at light fixtures and diffusers with additional ceiling suspension hangers within 150mm of each corner and at maximum 600mm around perimeter of fixture.
- .8 Interlock cross member to main runner to provide rigid assembly.
- .9 Ensure finished ceiling system is square with adjoining walls and level within

1:1000.

.3 Acoustic Panels:
.1 Install acoustical panels and tiles in ceiling suspension system.
.2 Co-ordinate ceiling work with work of other sections such as interior lighting, fire protection communication, and intrusion and detection systems.

3.03 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.

3.04 PROTECTION

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

.2 Repair damage to adjacent materials caused by acoustical ceiling installation.

END OF SECTION

1 GENERAL

1.02 REFERENCE STANDARDS

.1 ASTM International
- .1 ASTM F 1303-04(2014), Standard Specification for Sheet Vinyl Floor Covering with Backing.

1.03 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 resilient sheet flooring and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Samples:
- .1 Submit duplicate 300 x 300 mm sample pieces of sheet material, 300 mm long base.

1.04 MAINTENANCE MATERIAL SUBMITTALS

.1 Extra Materials:
- .1 Provide extra materials of resilient sheet flooring and adhesives in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Provide 10 square meters of each colour, pattern and type flooring material required for project for maintenance use.
- .3 Extra materials one piece and from same production run as installed materials.
- .4 Identify each roll of sheet flooring and each container of adhesive.
- .5 Deliver to Departmental Representative, upon completion of the work of this section.
- .6 Store where directed by Departmental Representative.

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

1.06 SITE CONDITIONS

.1 Ambient Conditions:
- .1 Maintain air temperature and structural base temperature at flooring installation

area above 20 degrees for 48 hours before, during and 48 hours after installation.

2 PRODUCTS

2.01 MATERIALS

.1 Linoleum sheet flooring: composed of natural ingredients which are mixed and calendered onto a jute backing:
- .1 Pattern: marbleized.
- .2 Thickness: 3.2 mm.
- .3 Colour: selected by Departmental Representative.

.6 Resilient base: continuous, top set, complete with premoulded end stops and external corners:
- .1 Type: rubber.
- .2 Style: cove.
- .3 Thickness: 3.17 mm.
- .4 Height: 101.6 mm.
- .5 Lengths: cut lengths minimum 2400 mm.
- .6 Colour: selected by Departmental Representative.

.12 Primers and adhesives: of types recommended by resilient flooring manufacturer for specific material on applicable substrate, above, on or below grade.
- .1 Rubber floor adhesives:
  - .1 Adhesive: maximum VOC limit 60 g/L.
- .2 Cove base adhesives:
  - .1 Adhesive: maximum VOC limit 50 g/L.

.13 Sub-floor filler and leveller: white premix latex requiring water only to produce cementitious paste as recommended by flooring manufacturer for use with their product.

.14 Metal edge strips:
- .1 Aluminum extruded, smooth, mill finish stainless steel with lip to extend under floor finish, shoulder flush with top of adjacent floor finish.

.15 External corner protectors: stainless steel, type recommended by flooring manufacturer.

.16 Edging to floor penetrations: stainless steel, type recommended by flooring manufacturer.

.17 Sealer and wax: type recommended by resilient flooring material manufacturer for material type and location.

3 EXECUTION

3.01 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for resilient sheet flooring 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 approved by Departmental Representative.

3.02 SITE VERIFICATION OF CONDITIONS

.1 Ensure concrete floors are clean and dry by using test methods recommended by flooring manufacturer.

3.03 PREPARATION

.1 Remove existing resilient flooring.

.2 Remove or treat old adhesives to prevent residual, old flooring adhesives from bleeding through to new flooring and/or interfering with the bonding of new adhesives.

.3 Clean floor and apply filler; trowel and float to leave smooth, flat hard surface. Prohibit traffic until filler cured and dry.

.4 Remove sub-floor ridges and bumps. Fill low spots, cracks, joints, holes and other defects with sub-floor filler.

.5 Prime concrete slab to resilient flooring manufacturer's printed instructions.

3.04 APPLICATION: FLOORING

.1 Provide high ventilation rate, with maximum outside air, during installation, and for 48 to 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 1 month following building occupation.

.2 Apply adhesive uniformly using recommended trowel. Do not spread more adhesive than can be covered by flooring before initial set takes place.

.3 Lay flooring with seams parallel to building lines to produce a minimum number of seams. Border widths minimum 1/3 width of full material. Double cut sheet joints and continuously heat weld according to manufacturer's printed instructions.

.5 Heat weld seams of linoleum sheet flooring in accordance with manufacturer's printed instructions.

.6 As installation progresses, and after installation roll flooring with 45 kg minimum roller to ensure full adhesion.

.7 Cut flooring around fixed objects.

.8 Install feature strips and floor markings where indicated. Fit joints tightly.

.10 Continue flooring over areas which will be under built-in furniture.

.11 Continue flooring through areas to receive movable type partitions without interrupting floor pattern.

.12 Terminate flooring at centreline of door in openings where adjacent floor finish or colour

is dissimilar.

.13 Install metal edge strips at unprotected or exposed edges where flooring terminates.

3.06 APPLICATION: BASE

.1 Lay out base to keep number of joints at minimum.

.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.

.8 Use toeless type base where floor finish will be carpet, coved type elsewhere.

.9 Install toeless type base before installation of carpet on floors.

.10 Heat weld base in accordance with manufacturer's printed instructions.

3.07 CLEANING

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

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .1 Clean flooring and base surfaces to flooring manufacturer's printed instructions.

3.08 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 OF SECTION

1 GENERAL

1.02 REFERENCE STANDARDS

.1 Terrazzo, Tile and Marble Association of Canada (TTMAC)
  .1 2007 Specification Guide - Tile Installation Manual

1.03 ACTION AND INFORMATIONAL SUBMITTALS

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

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

.3 Provide samples in accordance with Section 01 33 00 - Submittal Procedures.
  .1 Submit 300 x 300 x 6 mm thick samples of each colour of plastic matrix terrazzo.

.4 Closeout Submittals:
  .1 Provide maintenance data for plastic matrix terrazzo for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.06 DELIVERY, STORAGE AND HANDLING

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

.2 Deliver materials to job site just prior to installation.

.3 Store materials inside, in dry location, away from heavy traffic areas.

.4 Deliver and store materials in manner to prevent damage.

.5 Ensure materials remain in original wrapping and containers until used.

1.07 ENVIRONMENTAL REQUIREMENTS

.1 Safety: comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of materials.
  .1 Respirators: worn by workers mixing epoxy.

.2 Ventilation:
  .1 Provided continuously during and after installation. Run system 24 hours per day during installation; provide continuous ventilation for 7 days after completion of installation.

.3 Temperature:
  .1 Maintain temperature and structural base temperature at plastic matrix terrazzo installation area above 12 degrees C for 24 hours prior to, during, and for 24 hours following installation.

2 PRODUCTS

2.01 MATERIALS

.1 Acceptable product: Sikafloor Quartz or Stonhard Stonshield HR1, conforming to CGSB 81-GP-4M.

.2 Ceramic-coated quartz grains: uniform, sound and abrasion resistant. Grade chips in accordance with Terrazzo, Tile and Marble Association of Canada (TTMAC) standard.

.3 Epoxy matrix: consisting of two non-volatile clear components, epoxy resin and epoxy hardener.

.5 Accessories: base caps, base divider strips, separator strips, purpose made and to match divider strips.

.6 Primer: As recommended by epoxy matrix manufacturer

.7 Sealing compound: as recommended by epoxy matrix manufacturer.

.9 Non-slip material for inserts: fine aluminum oxide and epoxy mixture in selected colours.

2.02 MIXES

.1 Epoxy Quartz Floor custom color to be selected to match existing. Samples for selection are mandatory. Floor texture to be medium.

3 EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

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

3.02 WORKMANSHIP

.1 Do terrazzo work in accordance with CSC Architectural Specification Study on Terrazzo (Thin Gauge Epoxy Matrix Terrazzo), produced in cooperation with Terrazzo, Tile and Marble Association of Canada (TTMAC), except where specified otherwise.

.2 Moisture content of concrete: maximum 16%.

3.03 PREPARATION

.1 Chemical:
- .1 Scrub floor with heavy-duty detergent or cleaners appropriate to emulsify particular contamination present.
- .2 Rinse with clean water. Repeat procedure as required to remove contamination. Remove rinse water by forcing to appropriate drains or by power vacuum. Perform chemical cleaning in strict accordance with federal, provincial and municipal regulations, which prohibit introduction of certain chemicals and contaminants into sewers, open bodies of water and into ground.

.3 Spread acid solution by sprinkle can and scrub into concrete with stiff broom or power scrubber. Use 25% aqueous solution of HCl (muriatic acid) cut 4 or 5 to 1 with water. (Alternatively, to minimize potential damage to metal equipment adjacent to area being prepared, or to steel reinforcement, use 40% phosphoric acid).

.4 Rinse with clean water. Repeat procedure as required to remove contamination and acid residue. Remove rinse water by forcing to appropriate drains or by power vacuum. Allow to dry.

.2 Mechanical Preparation:

.1 Scarifying:

.1 Level deeply scarred subsurface to obtain uniform finish.

.2 Supplement removal of penetrated materials, where necessary, by other chemical or mechanical processes.

.4 Sanding, or surface abrasion with heavy grit media: corners and edges.

3.04 INSTALLATION

.1 Floors

.1 Mix and install epoxy terrazzo in accordance with manufacturer's instruction, and where possible under direction of manufacturer's representative.

.2 Thickness of topping 6 mm maximum, 3 mm minimum.

.2 Bases:

.1 Standard base: coved 6 mm thick topping direct on wall.

.3 Finishing:

.1 Surface and grout terrazzo when sufficiently hard using No.24 grit carborundum for initial grinding, and No.120 grit carborundum for final grinding.

.4 Sealing:

.1 Clean terrazzo and apply sealing compound in accordance with material manufacturer's instructions.

3.05 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.

3.06 CLEANING

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

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

.1 Section 06 10 53 – Miscellaneous Rough Carpentry

.2 Section 06 20 00 – Finish Carpentry

.3 Section 06 40 00 – Architectural Woodwork

.4 Section 08 11 00 – Metal Doors and Frames

.6 Section 09 21 16 – Gypsum Board Assemblies

1.02 REFERENCE STANDARDS

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

.2 Master Painters Institute (MPI)
- .1 Architectural Painting Specification Manual - current edition.

1.03 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:
- .1 Provide manufacturer's instructions, printed product literature and data sheets for paint and paint products and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Submit 2 copies of WHMIS MSDS in accordance with Section 1 35 29.06 - Health and Safety Requirements.
- .3 Confirm products to be used are in MPI's approved product list.
- .4 Upon completion, provide records of products used. List products in relation to finish system and include the following:
  - .1 Product name, type and use.
  - .2 Manufacturer's product number.
  - .3 Colour number s.
  - .4 MPI Environmentally Friendly classification system rating.
  - .5 Manufacturer's Material Safety Data Sheets (MSDS).
  - .6 MPI #

.3 Samples:
- .1 Provide 200 mm x 300 mm sample panels of each paint with specified paint or coating in colours, gloss/sheen and textures required to MPI Architectural Painting Specification Manual.
- .2 When approved, samples shall become acceptable standard of quality for appropriate on-site surface with one of each sample retained on-site.
- .3 Provide full range of available colours where colour availability is restricted.

1.04 CLOSEOUT SUBMITTALS

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

.2 Operation and Maintenance Data: Provide operation and maintenance data for painting materials for incorporation into manual.

.3 Include:
- .1 Product name, type and use.
- .2 Manufacturer's product number.
- .3 Colour numbers.

1.05 MAINTENANCE MATERIAL SUBMITTALS

- .1 Extra Stock Materials:
- .2 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.
- .3 Submit 1 four litre can of each type and colour of finish coating. Identify colour and paint type in relation to established colour schedule and finish system.

1.06 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.
- .1 Labels: to indicate:
  - .1 Type of paint or coating.
  - .2 Compliance with applicable standard.
  - .3 Colour number in accordance with established colour schedule.

.3 Storage and Handling Requirements:
- .1 Store materials indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Observe manufacturer's recommendations for storage and handling.
- .3 Store materials and supplies away from heat generating devices.
- .4 Store materials and equipment in well ventilated area with temperature range 7 degrees C to 30 degrees C.

1.07 SITE CONDITIONS

.1 Ambient Conditions:
- .1 Heating, Ventilation and Lighting:
  - .1 Where required, provide continuous ventilation for seven days after completion of application of paint.
  - .2 Co-ordinate use of existing ventilation system with Departmental Representative and ensure its operation during and after application of paint as required.
  - .3 Provide temporary ventilating and heating equipment where permanent facilities are not available or supplemental ventilating and heating equipment if ventilation and heating from existing system is inadequate to

meet minimum requirements.

.4 Perform no painting work unless a minimum lighting level of 323 Lux is provided on surfaces to be painted. Adequate lighting facilities to be provided by General Contractor.

.2 Temperature, Humidity and Substrate Moisture Content Levels:

.1 Unless specifically pre-approved by specifying body, Paint Inspection Agency and, applied product manufacturer, perform no painting work when:

.1 Ambient air and substrate temperatures are below 10 degrees C.

.2 Substrate temperature is over 32 degrees C unless paint is specifically formulated for application at high temperatures.

.3 Substrate and ambient air temperatures are expected to fall outside MPI or paint manufacturer's prescribed limits.

.4 Relative humidity is above 85 % or when dew point is less than 3 degrees C variance between air/surface temperature.

.5 Rain or snow are forecast to occur before paint has thoroughly cured or when it is foggy, misty, raining or snowing at site.

2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

.1 Environmental Performance Requirements:

.2 Provide paint products meeting MPI "Environmentally Friendly" ratings based on VOC (EPA Method 24) content levels.

2.02 MATERIALS

.1 Only paint materials listed in latest edition of MPI Approved Products List (APL) are acceptable for use on this project.

.2 Paint materials for paint systems: to be products of single manufacturer.

2.03 COLOURS

.1 Departmental Representative will provide Colour Schedule after Contract award for approval.

.2 Colour schedule will be based upon selection of two base colours and one accent colour. No more than 3 colours will be selected for entire project.

.3 Selection of colours will be from manufacturers' full range of colours.

.4 Where specific products are available in restricted range of colours, selection will be based on limited range.

.5 Second coat in three coat system to be tinted slightly lighter colour than top coat to show visible difference between coats if requested by Departmental Representative.

2.04 GLOSS/SHEEN RATINGS

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

Gloss Level Category/	Units @ 60 Degrees/	Units @ 85 Degrees/
G1 - matte finish	0 to 5	max. 10
G2 - velvet finish	0 to 10	10 to 35
G3 - eggshell finish	10 to 25	10 to 35
G4 - satin finish	20 to 35	min. 35
G5 - semi-gloss finish	35 to 70	
G6 - gloss finish	70 to 85	
G7 - high gloss finish	> 85	

.2 Gloss level ratings of painted surfaces as noted.

2.05 EXTERIOR PAINTING SYSTEMS

.1 Metal: doors, frames, panels, trims, fabrications, etc.

.2 Touch-up shop priming.

.3 For doors only, apply one coat primer tinted to finish colour.

.4 Apply two coats General Paint HP2000, Semi-Gloss. (MPI #141)

.5 Both interior and exterior faces of exterior doors and frames same finish.

.6 Brush apply.

2.06 INTERIOR PAINTING SYSTEMS

.1 Painted Woodwork: includes wood walls, doors, trim, and like surfaces requiring paint finish.
- .1 One coat 02-230 Interior Primer Sealer.
- .2 Two coats Envirogard, semi-gloss (MPI #110-G5)
- .3 Brush apply.

.2 Interior Metal: includes metal doors, frames, miscellaneous iron, radiators, pipes, conduits, and like surfaces.
- .1 Touch up shop priming.
- .2 For doors only, apply one coat enamel undercoat #02-220.
- .3 Apply two coats Envirogard, semi-gloss (MPI #110-G5).
- .4 Brush apply.

.3 Drywall
- .1 One coat 51-087 Superseal Latex Sealer, tinted.
- .2 Two coats Envirogard Eggshell (MPI #110-G3).

.4 Detention Area:
.1 Acceptable products:
.1 Metal primer – Sikagard Duroplast PS or approved equal
.2 Concrete block primer: - Sikaflex Primer 429 or approved equal
.3 Top coat – Sikagard Duroplast 100N or approved equal

3 EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

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

3.02 GENERAL

.1 Perform preparation and operations for interior painting in accordance with MPI Architectural Painting Specifications Manual except where specified otherwise.

.2 Apply paint materials in accordance with paint manufacturer's written application instructions.

3.03 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable to be painted in accordance with manufacturer's written instructions:
.1 Visually inspect substrate in presence of Departmental Representative.

3.04 PREPARATION

.1 Perform preparation and operations for exterior painting in accordance with MPI Maintenance Painting Manual except where specified otherwise.

.2 Apply paint materials in accordance with paint manufacturer's written application instructions.

.3 Sand and dust between coats as required to provide adequate adhesion for next coat and to remove defects visible from a distance up to [1000 mm].

3.05 PROTECTION

.1 Protect items that are permanently attached such as Fire Labels on doors and frames.

.2 Protect factory finished products and equipment.

.3 Remove light fixtures, surface hardware on doors, and other surface mounted equipment, fittings and fastenings prior to undertaking painting operations. Store items and re-install after painting is completed.

3.06 APPLICATION

.1 Method of application to be as approved by Departmental Representative. Apply paint by brush, roller or airless sprayer. Conform to manufacturer's application instructions unless specified otherwise.

.2 Brush and Roller Application:
- .1 Apply paint in a uniform layer using brush and/or roller of types suitable for application.
- .2 Work paint into cracks, crevices and corners.
- .3 Paint surfaces and corners not accessible to brush using spray, daubers and/or sheepskins. Paint surfaces and corners not accessible to roller using brush, daubers or sheepskins.
- .4 Brush and/or roll out runs and sags, and over-lap marks. Rolled surfaces to be free of roller tracking and heavy stipple unless approved by Departmental Representative.
- .5 Remove runs, sags and brush marks from finished work and repaint.

.3 Spray Application:
- .1 Provide and maintain equipment that is suitable for intended purpose, capable of properly atomizing paint to be applied, and equipped with suitable pressure regulators and gauges.
- .2 Keep paint ingredients properly mixed in containers during paint application either by continuous mechanical agitation or by intermittent agitation as frequently as necessary.
- .3 Apply paint in a uniform layer, with overlapping at edges of spray pattern.
- .4 Brush out immediately runs and sags.
- .5 Use brushes to work paint into cracks, crevices and places which are not adequately painted by spray.
- .6 Wood; if sprayed, must be back rolled.

.4 Use dipping, sheepskins or daubers when no other method is practical in places of difficult access and when specifically authorized by Departmental Representative.

.5 Apply coats of paint as continuous film of uniform thickness. Repaint thin spots or bare areas before next coat of paint is applied.

.6 Allow surfaces to dry and properly cure after cleaning and between subsequent coats for minimum time period as recommended by manufacturer.

.7 Sand and dust between coats to remove visible defects.

.8 Finish surfaces both above and below sight lines as specified for surrounding surfaces, including such surfaces as projecting ledges.

.9 Finish top, bottom, edges and cutouts of doors after fitting as specified for door surfaces.

3.07 MECHANICAL/ ELECTRICAL EQUIPMENT

.1 Unless otherwise specified, paint exterior exposed conduits, piping, hangers, duct work and other mechanical and electrical equipment with colour and finish to match adjacent surfaces, except as noted otherwise.

.2 Do not paint over nameplates.

.3 Paint natural gas piping yellow.

3.08 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.

3.09 RESTORATION

.1 Clean and re-install hardware items removed before undertaken painting operations.

.2 Remove protective coverings and warning signs as soon as practical after operations cease.

.3 Remove paint splashings on exposed surfaces that were not painted. Remove smears and spatter immediately as operations progress, using compatible solvent.

.4 Protect freshly completed surfaces from paint droppings and. Avoid scuffing newly applied paint.

.5 Restore areas used for storage, cleaning, mixing and handling of paint to clean.

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

.1 Not used.

1.02 REFERENCE STANDARDS

.1 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-44.40-01, Steel Clothing Locker.

1.03 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:
- .1 Provide manufacturer's printed product literature and data sheets for metal lockers and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:
- .1 Indicate on drawings: type and class of locker, thicknesses of metal, fabricating and assembly methods, tops, hooks, shelves, bases, trim, filler panels, end/back panels, doors, handles, locking method, ventilation method, and finishes.

.4 Samples:
- .1 Submit duplicate 50mm x 50mm samples of colour and finish on actual base metal.

1.04 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:
- .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:
- .1 Store materials indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Store and protect metal lockers from nicks, scratches, and blemishes.
- .3 Replace defective or damaged materials with new.

2 PRODUCTS

2.01 RIFLE LOCKERS ROOM 112 (STG4 and STG10)

.1 Manufacturer: Dasco Storage Solutions, “Weapon Storage Components”, or approved equal.

.2 Lockers: to CAN/CGSB-44.40, freestanding.
- .1 Steel thickness: 1.63mm thick (No. 16 ga.)
- .2 Assembly: welded construction.
- .3 Top: flat
- .4 Doors: bi-fold. One-piece double-wall envelope construction, steel thickness 1.63mm (No. 16 ga) MSG, door swings as indicated on drawings.
- .5 STG4: 1067mm wide x 381mm deep x 1829mm high. Include: 2 plain adjustable shelves per unit, 12 single capacity stock shelves with stiffeners, 24- single capacity stock saddles, 24- single capacity barrel saddles, and Abloy PL362 padlock with 2 keys, each unit.
- .6 STG10: 1067mm wide x 381mm deep x 2134mm high. Include: 2 plain adjustable shelves, 12 single capacity stock shelves with stiffeners, 24- single capacity stock saddles, 24- single capacity barrel saddles, and Abloy PL362 padlock with 2 keys, each unit.
- .7 Hinges: hinges concealed behind door when door is closed.
- .9 Door handle: recessed handle steel with nickel-plated finish.

.3 Accessories
- .1 Adjustable rifle stock saddles with rubber matting on shelf, barrel saddle.
- .2 Extruded rubber edging on all saddles to prevent direct contact between weapon and metal.
- .3 Adjustable shelving: steel construction, 16 ga. Adjustable in minimum 50 mm increments.
- .3 Mounting: provide holes in back of cabinet for mechanical fastening of cabinet to wall.

.4 Locking: cylinder lock keyed to building keying system.

2.02 SURFACE MOUNTED HANDGUN LOCKERS – ROOM 112

.1 Model Number EDHGS08 Surface. Wall mounted handgun lockers by DSM Law Enforcement Products by Spacesaver Corporation, a division of K1, or approved equal. Distributed by HBI Office Plus Inc., Saskatoon, SK.

.2 Lockers to CAN/CGSB-44.40, surface mounted.
- .1 Door and hinge steel thickness: 1.63mm thick (No. 16 ga.)
- .2 Cabinet thickness: minimum 16 ga.
- .3 Assembly: welded construction.
- .4 Finish: Textured powder coated steel
- .5 Colour: selected by consultant from manufacturer’s standard range
- .6 Doors: each 132mm high x 264mm wide, 16 doors/compartments.
- .7 Shelves: 3mm neoprene shelf lining
- .8 Cabinet size: 635mm wide x 664mm high x 165mm deep
- .9 Hinges: piano hinges concealed behind door when door is closed
- .10 Door handle: none
- .11 Number tags: located on each door
- .12 Quantity: two (2)

.3 Accessories
- .1 Mounting: holes in back of cabinet for mechanical fastening of cabinet to wall. Provide wood blocking in wall to suit.

.4 Keying and Locking
.1 Keying and Locking systems: master keyed and all locks keyed differently. Keys removable only in locked position.

3 EXECUTION

3.01 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates and surfaces to receive metal lockers previously installed under other Sections or Contracts are acceptable for product installation in accordance with manufacturer's instructions prior to metal locker installation.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied.

3.02 INSTALLATION

.1 Assemble and install lockers in accordance with manufacturer's written instructions.

.2 Install lockers and level as required.

.3 Securely fasten lockers to floor and blocking in walls.

.4 Install finished end panels to exposed ends of locker banks.

3.03 ADJUSTING

.1 Adjust metal lockers for correct function and operation in accordance with manufacturer's written instructions.

.2 Lubricate moving parts to operate smoothly and fit accurately.

3.04 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.

3.05 PROTECTION

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

.2 Repair damage to adjacent materials caused by metal locker installation.

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

.1 Section 10 51 13 Metal Lockers.

1.02 REFERENCE STANDARDS

.1 ASTM International
- .1 ASTM A 490M-12, Standard Specification for High-Strength Steel Bolts, Classes 10.9 and 10.9.3, for Structural Steel Joints Metric.

.2 Canadian General Standards Board (CGSB)
- .2 CAN/CGSB-1.88-92, Gloss Alkyd Enamel, Air Drying and Baking.

.3 CSA Group
- .1 CSA G40.20/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
- .2 CSA W59-13, Welded Steel Construction (Metal Arc Welding).

1.03 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 metal shelving and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:
- .1 Indicate shelving layouts, number of shelves, system of bracing and anchoring devices.

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

1.05 WARRANTY

.1 Provide under provisions of Section 01 78 80 – Closeout Submittals the following warranties:
- .1 5 years warranty to cover parts and materials against defects.
- .2 2 years warranty to cover workmanship.

2 PRODUCTS

2.01 MATERIALS

.1 Steel sheet:
1. Cold rolled steel sheet complying with ASTM A1008.
2. Hot rolled, pickled steel sheet complying with ASTM A1011.

.2 Steel rail: SAE 1045.

.3 Galvanneal conforming to ASTM #653 zf 120 (A40)

2.02 GENERAL STORAGE CABINETS (STG3)

.1 All steel construction.

.2 Shelf:
- .1 Cold-rolled furniture-grade steel, 1.27mm (18 ga.). Double formed on all four sides. Corners are closed with double thickness steel forming a no-slip notch for the shelf clip.
- .2 Clip: 12-gauge compression type; cadmium plated.
- .3 Reinforcement: 25mm x 12 ga. bent angle of steel, installed in the front and rear flange of the shelf to provide additional shelf capacity.
- .4 2 adjustable shelves per unit. Standards are riveted to locker sides.

.3 Frame:
- .1 Horizontal components: 1.27mm (18 ga.)
- .2 Vertical components: 1.59mm (16 ga.)

.4 Body:
- .1 Side and back panels: 0.63mm (24 ga.)
- .2 Top and bottom: 1.59mm (16 ga.)

.5 Door:
- .1 Outer and inner panels 0.95mm (20 ga.), 30mm thick honeycomb core.
- .2 Hinge 64mm long, 5 knuckle, 14 ga.
- .3 Stainless steel handle box and pull.
- .4 Locking plate welded to one door.

.6 Pull and Locking:
- .1 Stainless steel handle, box and pull.
- .2 locking system: cylinder lock keyed to building keying system.

.7 Finish: Side, back panels, top, bottom and shelves pre-painted galvanized, white in colour.

2.03 METAL SHELVING (STG7)

.1 All steel construction.

.2 Shelf:
- .1 Cold-rolled furniture-grade steel, 1.27mm (18 ga.). Double formed on all four sides. Corners are closed with double thickness steel forming a no-slip notch for the shelf clip.

.2 Clip: 12-gauge compression type; cadmium plated.
.3 Reinforcement: 25mm x 12 ga. bent angle of steel, installed in the front and rear flange of the shelf to provide additional shelf capacity.
.4 3 adjustable shelves per unit. Standards are riveted to locker sides.
.5 Shelf capacity to support minimum load of 315 pounds.

.3 T-Posts:
.1 38mm x 50mm x 3.17mm double-formed steel in a “T” style with a smooth, unperforated face.

.4 Closed End Panel Assembly:
.1 Two “T” posts welded to a cold-rolled steel side panel to form a single unit providing greater strength and easier handling.
.2 Provide closed end panel between adjacent shelving units.

.5 Back Panel:
.1 Cold-rolled steel panel attached to uprights with cadmium-plated back clips.

.6 Base Plates:
.1 Formed top and bottom to provide support for the bottom shelf in addition to closing the space under the shelf.

.7 Finish: Prepare components by being cleaned, iron phosphatized and rinsed. Electrostatically apply high-grade alkyd enamel. Bake to provide a hard, long lasting, furniture-grade finish.

3 EXECUTION

3.01 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for metal shelving installation in accordance with manufacturer's written instructions.
.1 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
.2 Proceed with installation only after unacceptable conditions have been remedied.

3.02 INSTALLATION

.1 Do metal storage shelving work except where specified otherwise.

.2 Install metal storage shelving in accordance with reviewed layout.

.3 Brace, secure and anchor shelving units in place to blocking in wall.

.4 Make good baked enamel surfaces damaged during shipment or installation.

.5 Ensure shelving units are installed square and plumb.

3.03 CLEANING

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

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

END OF SECTION

Part 1 - General

1.1 RELATED WORK

.1 Plumbing Division 22

1.2 INTENT

.1 Provide a complete and fully operational mechanical system with facilities and services to meet requirements described herein and in complete accord with applicable codes and ordinances.

.2 Contract documents for mechanical scope are diagrammatic and approximately to scale unless detailed otherwise. They establish scope, material and installation quality and are not detailed installation instructions.

.3 Should any discrepancies occur on drawings or in specifications which leaves doubt as to the intent and meaning of the drawings and specifications, obtain a ruling from the designer before submitting tender. If this is not done, it will be assumed that the most expensive alternate has been allowed for in the bid.

.4 Follow manufacturer's recommended installation details and procedures for equipment supplemented by details given herein and on plans subject to approval of the Departmental Representative.

.5 Install equipment generally in locations and routes shown, close to building structure with minimum interference with other services or free space. Remove and replace improperly installed equipment to satisfaction of the Departmental Representative at no extra cost.

.6 Provide labour and materials required to install, test and place into operation complete mechanical system. Provide additional material for modifications required to correct minor job conflictions.

.7 Connect to equipment furnished in other Sections and by Departmental Representative, including uncrating equipment, moving in place and installing complete, start-up and test.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Packing, shipping, handling and unloading:
- .1 Deliver, store and handle in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Deliver, store and handle materials in accordance with manufacturer’s written instructions.
- .3 Store and manage hazardous materials in accordance with cepa, tdga AND Regional and Municipal Regulations.

.2 Waste Management and Disposal:
- .1 Due to location, recycling is not required. Remove from site and dispose of packaging materials at appropriate disposal facilities.
- .2 Unused sealant materials must not be disposed of into sewer system, into streams, lakes, onto ground or in other location where it will pose health or environmental hazard.
- .3 Handle and dispose of hazardous materials in accordance with CEPA, TDGA, Regional and Municipal regulations.
- .4 Provide manifests describing and listing waste created. Transport containers by approved means to licenced landfill for burial.

1.4 MATERIALS

.1 Replace materials or workmanship below specified quality and relocate work wrongly placed to satisfaction of the Departmental Representative.

.2 Materials and equipment installed shall be new, full weight and of the best quality specified. Use same brand or manufacturer for each specific application. Statically and dynamically balance rotating equipment for minimum vibration and low operating noise level.

.3 Each major component of equipment shall have manufacturer's name, address, catalog and serial number in a conspicuous place.

.4 Install materials and equipment in a neat and workmanlike manner by competent specialists.

1.5 CUTTING AND PATCHING

.1 Locate and provide holes and sleeves, cutting and fitting required for mechanical work. Relocate improperly located holes and sleeves at no extra cost.

.2 Drill for expansion bolts, hanger rods, brackets, and supports.

.3 Do no cutting or burning of structural members of building frame without obtaining prior written approval from the Departmental Representative.

.4 Provide openings and holes required in precast members for mechanical work. Cast holes larger than 100 mm (4") in diameter. Field-cut smaller than 100 mm (4").

.5 All patching of finished construction of building shall be performed under the sections of specifications covering these materials.

1.6 SEMI-FINAL AND FINAL INSPECTIONS

.1 Perform the following items prior to semi-final inspection.

- .1 Heating and air conditioning systems capable of operation with alarm controls functional and automatic controls in operation generally, but not necessarily finally calibrated.
- .2 Necessary tests on equipment made including those required by authorities and certificates of approval obtained.
- .3 Rough balance of air and water systems completed.
- .4 Valve tagging completed and equipment identified. Equipment and piping painted and escutcheons installed.
- .5 Equipment lubricated as per manufacturer's data.
- .6 Warranty forms have been mailed to manufacturer. Provide copy of original warranty for equipment which has warranty period longer than one year.
- .7 Systems chemically cleaned, flushed and water treatment initiated. Provide report from manufacturer's representative to confirm status of treatment.
- .8 Submit sample of Operating/Maintenance Manuals. Arrange Operating and Maintenance Instructions and submit schedule for approval.
- .9 Review and ensure access doors are suitably located and equipment easily accessible including plumbing cleanouts.
- .10 Have noise and vibration control devices and flexible connections inspected by manufacturer's representative and submit written report.

.11 Equipment alignment carried out by qualified millwright and certified report submitted.
.12 Check operations of plumbing systems and fixtures and ensure fixtures are solidly supported.
.13 Fan plenums cleaned, temporary filters removed and permanent filters installed.

.2 Provide declaration in writing that semi-final deficiencies and the following items have been completed prior to the final inspection:
.1 Equipment cleaned inside, outside and lubricated. Plumbing fixtures and brass cleaned.
.2 Final balancing completed and rough data of balance reports submitted.
.3 Final calibration of controls completed including point-to-point verification and confirmation that sequences are fully operational.

1.7 SHOP DRAWINGS

.1 Submittal procedures in accordance with Division 1.

.2 Submit materials and equipment by manufacturer, trade name and model number. Include copies of applicable brochure or catalog material. Do not assume applicable catalogues are available in the Departmental Representative's office. Maintenance and operating manuals are not suitable submittal material.

.3 Clearly mark each sheet of printed submittal material (using arrows, underlining or circling) to show particular sizes, types, model numbers, ratings, capacities and options actually being proposed. Cross out non-applicable material. Specifically note on the submittal specified features such as special tank linings, pump seals, materials or painting.

.4 Include dimensional data for roughing in and installation, technical data sufficient to check that equipment meets requirements of drawings and specifications, wiring, piping, and service connection data, motor sizes complete with voltage ratings and schedules as applicable.

.5 Shop drawings to show all information identified under individual product specifications and in general shall show the following:
.1 Mounting arrangements.
.2 Operating and maintenance clearances.
.3 Detailed drawings of bases, supports, and anchor bolts.
.4 Acoustical sound power data, where applicable.
.5 Points of operation on performance curves.
.6 Manufacturer to certify current model production.
.7 Certification of compliance to applicable codes.

.6 In addition to transmittal letter referred to in Section 01 33 00 - Submittal Procedures: use MCAC "Shop Drawing Submittal Title Sheet". Identify section and paragraph number.

1.8 OPERATING AND MAINTENANCE MANUALS

.1 Provide services of qualified and experienced personnel to prepare proper documentation and to instruct the Operating Staff in the operation and preventative maintenance of each piece of equipment and system supplied and installed. Complete and turn over documentation prior to final inspection.

.2 Provide 215 mm x 280 mm (8-1/2" x 11") capacity extension type catalogue binders bound with heavy fabric, hot stamped in gold lettering front and spine. Refer to Division 1 for colour and quantity.

.3 Each binder shall be indexed according to the following indexing system:

.4 Tab-1.0 Mechanical Systems: Title page with clear plastic protection cover.

.5 Tab-1.1 List of Mechanical Drawings.

.6 Tab-1.2 Description of Systems: Provide complete description of each system. Include detailed system description and components comprising that system, explanation of how each component interfaces with others to complete the system, location of each thermostat, controller or operating setpoints. Refer to 21 05 01, 1.1.5 for additional required information.

.7 Tab-1.3 Operation Division: Provide complete and detailed operation of each major component. Include how to energize and exact location of switches and controls, how the component interfaces with other components, operation of controls, including the operational sequence, operational characteristic changes for summer or winter operation, and how to accomplish the changeover, complete troubleshooting sequence, setpoints cannot be maintained, and safeguards to check if equipment goes off line. Refer to 21 05 01, 1.1.5 for additional required information.

.8 Tab-1.4 Maintenance and Lubrication Division: Provide detailed preventative maintenance and lubrication schedule for each of the major components to include daily, weekly, monthly, semi-annual and yearly checks and tasks. Explain how to proceed with each task required for each piece of typical equipment such as bearings, drives, motors and filters. Compile this information for each typical piece of equipment separate from the shop drawings section. Refer to 21 0-5 01, 1.1.5 for additional required information.

.9 Tab-1.5 List of Equipment Suppliers and Contractors: Provide complete list of equipment suppliers and contractors, including address and telephone number. Outline procedures for purchasing parts and equipment. Include steps to take in order to purchase new parts.

.10 Tab-Certification (2.0, 2.1, etc.): Include copy of test data degreasing and flushing of heating system analysis of system water taken at time system was put into operation, hydrostatic or air tests performed on piping systems, equipment alignment certificates, copy of balancing data for air and water systems, copy of valve tag identification and pipe colour code, inspection approval certificates for plumbing system, hot air heating and ventilation systems and fire damper schedule.

.11 Tab-Shop Drawings and Maintenance Bulletins (3.0, 3.1, etc.): Provide materials as received in compliance with clause "Shop Drawings".

.12 The divider tabs shall be laminated mylar plastic, and coloured according to section. The colouring is as follows: Mechanical Systems - 1.0 - 1.5 - Orange, Certification - 2.0 - 2.4 - Green, Shop Drawings and Maintenance - 3.0 - 3.17 - Yellow. Plastic tabs with typed insertions will not be accepted.

.13 Submit documents to the Departmental Representative for approval prior to being turned over to the Departmental Representative. At completion of project, hold a Seminar to instruct the Operating Staff in operation and preventative maintenance of each piece of equipment and system supplied and installed.

.14 Provide one digital copy on compact disk of the final operation and maintenance manual in each of the manuals.

1.9 RECORD DRAWINGS

.1 Refer to Division 1.

.2 Keep on site, an extra set of white prints and specifications recording changes and deviations daily. Allow for the work required to transfer site changes to Departmental Representative's original tracings and for providing the Departmental Representative with set of sepias marked "Record Drawings". Co-ordinate through Departmental Representative's office. Addenda corrections and Departmental Representative initiated construction changes to original tracings will be the responsibility of the Departmental Representative.

.3 Contractor shall utilize a different colour water proof ink for each service.

.4 Contractor shall ensure that white prints are available on site for reference purposes and inspection.

.5 Record drawings shall identify location of fire dampers, major control lines, access doors, tagged valves and actual room names or numbers.

.6 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).

.7 Submit to Departmental Representative for approval and make corrections as directed.

1.10 IDENTIFICATION

.1 Refer to General Requirements – Division 01.

1.11 TEMPORARY FACILITIES

.1 Refer to General Requirements - Division 01.

1.12 SUPERVISION

.1 Refer to General Requirements - Division 01.

1.13 EQUIPMENT PROTECTION AND CLEAN-UP

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

.2 Protect equipment with polyethylene covers and crates.

.3 Thoroughly clean piping and equipment of dirt, cuttings and other foreign substances.

1.14 SUBSTANTIAL COMPLETION

.1 The mechanical portion of the project shall be deemed substantially complete when ALL mechanical systems are operational as designed. In addition, the air and/or

water balance must be completed with the report submitted and approved by the Departmental Representative and the temperature control system must be complete, as designed, operational, with all control components calibrated and the maintenance manuals in final form must be submitted. The date will be established by the Departmental Representative and will set the date for the start of the one (1) year warranty on all mechanical systems.

1.15 EXCESSIVE ADMINISTRATION

.1 Following the "Substantial Completion" Inspection a "Final" Inspection will be conducted and a follow up inspection will be conducted to "check off" all outstanding mechanical deficiencies.

.2 If the mechanical portion of the project is not 100 percent complete at the time of the deficiency “checkoff” inspection, the cost of the failed deficiency “check-off” inspection and any and all additional inspections will be back charged directly to the Mechanical Contractor.

.3 The cost of each excessive inspection will be $2,000.00 plus travel, and will be deducted directly from the total Mechanical Contract amount.

.4 If the contractor fails the deficiency “checkoff” inspection, no additional money will be released and a subsequent inspection will be scheduled when the Contractor re-verifies that they are 100% complete.

.5 This process will repeat until the contractor can demonstrate that the project is 100% complete with all deficiencies rectified.

1.16 ALTERNATE MATERIALS & EQUIPMENT

.1 The design is based on the materials and equipment as specified. Any alternate materials or equipment that meet or exceed the performance, quality and design intent of that specified will be accepted unless specifically noted otherwise under this article.

.2 If alternate material or equipment will alter the design intent, make proposals to supply said materials or equipment in writing to the Departmental Representative at least ten working days prior to closing date of tender for Mechanical Trade. Clearly identify in proposal exactly how the proposed material alters the design intent and the benefits and disadvantages of said proposal. Any material or equipment that alters the design intent must be formally approved to be accepted

.3 All proposed equipment is subject to the requirements of the drawings and specifications. Revisions required to adapt equipment other than that specified shall be made without extra charge to the contract. All suppliers, except those specified, shall guarantee in writing that their individual proposed products meet or exceed the performance and quality of specified products. If the departmental representative determines at any time that the equipment or material being supplied does not meet or exceed the performance, quality or design intent of that being specified, the contractor shall replace the article in question with a suitable product at the contractors expense.

Part 2 - Materials

2.1 NOT USED

.1 Not Used

Part 3 - Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

1 General

1.1 RELATED REQUIREMENTS

.1 Materials and installation for domestic water service used in the following:
- .1 Hard domestic hot and cold water services inside building.
- .2 Soft tubing inside building.

.2 Sustainable requirements for construction, verification and operation.

1.2 REFERENCES

.1 American National Standards Institute (ANSI)/American Society of Mechanical Engineers International (ASME)
- .1 ANSI/ASME B16.15-06, Cast Bronze Threaded Fittings, Classes 125 and 250.
- .2 ANSI/ASME B16.18-01, Cast Copper Alloy Solder Joint Pressure Fittings.
- .3 ANSI/ASME B16.22-01, Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
- .4 ANSI/ASME B16.24-01, Cast Copper Alloy Pipe Flanges and Flanged Fittings, Class 150, 300, 400, 600, 900, 1500 and 2500.

.2 ASTM International Inc.
- .1 ASTM A307-07b, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
- .2 ASTM A536-84(2004)e1, Standard Specification for Ductile Iron Castings.
- .3 ASTM B88M-05, Standard Specification for Seamless Copper Water Tube (Metric).

.3 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.

.4 Canadian Standards Association (CSA International)
- .1 CSA B242-05, Groove and Shoulder Type Mechanical Pipe Couplings.

.5 Department of Justice Canada (Jus)
- .1 Canadian Environmental Protection Act, 1999, c. 33 (CEPA).

.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.

.9 Transport Canada (TC)
.1 Transportation of Dangerous Goods Act, 1992, c. 34 (TDGA).

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.

2 Products

2.1 PIPING

.1 Domestic hot, cold and recirculation systems, within building.
.1 Above ground: copper tube, hard drawn, type K: to ASTM B88M.
.2 Buried or embedded: copper tube, soft annealed, type K: to ASTM B88M, in long lengths and with no buried joints.

2.2 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, solder type: to ANSI/ASME B16.18.

.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.

.6 NPS 1 1/2 and smaller: wrought copper to ANSI/ASME B16.22; with 301stainless steel internal components and EPDM seals. Suitable for operating pressure to 1380 kPa.

2.3 JOINTS

.1 Rubber gaskets, latex-free mm thick: to AWWA C111.

.2 Bolts, nuts, hex head and washers: to ASTM A307, heavy series.

.3 Solder: 95/5.

.4 Teflon tape: for threaded joints.

.5 Grooved couplings: designed with angle bolt pads to provide rigid joint, complete with EPDM gasket.

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

2.4 GATE VALVES

.1 NPS 2 and under, soldered:
- .1 Rising stem: to MSS-SP-80, Class 125, 860 kPa, bronze body, screw-in bonnet, solid wedge disc as specified Section 23 05 23.01 - Valves - Bronze.

.2 NPS 2 and under, screwed:
- .1 Rising stem: to MSS-SP-80, Class 125, 860 kPa, bronze body, screw-in bonnet, solid wedge disc as specified Section 23 05 23.01 - Valves - Bronze.

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.

.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 HWS and HWC 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.

3.3 ROUTES AND GRADES

.1 Route piping in orderly manner and maintain proper grades. Install to conserve headroom and interfere as little as possible with use of space. Run exposed piping parallel to walls. Group piping wherever practical at common elevations. Install concealed pipes close to the building structure to keep furrings to a minimum.

.2 Slope water piping 25 mm in 12 m (1" in 40') and arrange to drain at low points.

.3 On closed systems, equip low points with 20 mm (3/4") drain valves and hose nipples. Provide, at high points, collecting chambers and high capacity float operated automatic air vents.

.4 Make reductions in water pipes with eccentric reducing fittings installed to provide drainage and venting.

.5 Grade horizontal drainage and vent piping 22 mm per meter (1/4" per foot) minimum unless otherwise indicated on drawings.

3.4 VALVES

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

.2 Balance recirculation system using lockshield globe valves. Mark settings and record on as-built drawings on completion.

.3 Install valves with stems upright or horizontal, not inverted.

.4 Install gate, ball and butterfly valves for isolating service, to isolate equipment, part of systems or vertical risers.

.5 Install globe, ball or angle valves for throttling service and control device or meter bypass.

.6 Use plug cocks in water systems for throttling service. Use non-lubricated plug cocks only when shut-off or isolation valves are also provided.

.7 Provide drain valves at main shut-off valves, low points of piping and apparatus.

3.5 PRESSURE TESTS

.1 Conform to requirements of Section 21 05 01 - Common Work Results for Mechanical.

.2 Test pressure: greater of 1 times maximum system operating pressure or 860 kPa.

3.6 FLUSHING AND CLEANING

.1 Disinfect and rinse entire system to requirements of authority having jurisdiction and RCMP site standards.

.2 Flush entire system for 8 hours. 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 copper. Let system flush for additional 2 hours, then draw off another sample for testing.

.3 Upon completion, provide laboratory test reports on water quality for Departmental Representative approval. Include one copy of approved test reports in Operation and Maintenance Manual.

3.7 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.

3.8 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 Monitor piping CHW and HHW piping systems for freedom of movement, pipe expansion as designed.
- .4 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 Verify performance of temperature controls.
- .3 Verify compliance with safety and health requirements.
- .4 Confirm water quality consistent with supply standards, and ensure no residuals remain as result of flushing or cleaning.

3.10 OPERATION REQUIREMENTS

.1 Co-ordinate operation and maintenance requirements including, cleaning and maintenance of specified materials and products.

END OF SECTION

1 General

1.1 SUMMARY

.1 Section Includes:
- .1 The installation of drainage waste and vent piping. Sustainable requirements for construction and verification.

1.2 REFERENCES

.1 American Society for Testing and Materials International, (ASTM).
- .1 ASTM B32-03, Specification for Solder Metal.
- .2 ASTM B306-02, Specification for Copper Drainage Tube (DWV).
- .3 ASTM C564-03a, Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.

.2 Canadian Standards Association (CSA International).
- .1 CSA B67-1972 (R1996), Lead Service Pipe, Waste Pipe, Traps, Bends and Accessories.
- .2 CAN/CSA-B70-02, Cast Iron Soil Pipe, Fittings and Means of Joining.
- .3 CAN/CSA-B125-01, Plumbing Fittings.

1.3 QUALITY ASSURANCE

.1 Health and Safety:
- .1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

2 Products

2.1 COPPER TUBE AND FITTINGS

.1 Above ground sanitary and vent Type DWV to: ASTM B306.
- .1 Fittings.
  - .1 Cast brass: to CAN/CSA-B125.
  - .2 Wrought copper: to CAN/CSA-B125.
- .2 Solder: 95:5, type TA, to ASTM B32.

2.2 CAST IRON PIPING AND FITTINGS

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

3 Execution

3.1 INSTALLATION

.1 Install in accordance with Provincial Plumbing Code and local authority having jurisdiction.

3.2 TESTING

.1 Pressure test buried systems before backfilling.

.2 Hydraulically test to verify grades and freedom from obstructions.

3.3 PERFORMANCE VERIFICATION

.1 Cleanouts:
- .1 Ensure accessible and that access doors are correctly located.
- .2 Open, cover with linseed oil and re-seal.
- .3 Verify that cleanout rods can probe as far as the next cleanout, at least.

.2 Test to ensure traps are fully and permanently primed.

.3 Ensure that fixtures are properly anchored, connected to system and effectively vented.

END OF SECTION

1 General

1.1 SUMMARY

.1 Section Includes:
  .1 The installation of drainage waste and venting piping - plastic.
.2 Sustainable requirements for construction and verification.

1.2 REFERENCES

.1 American Society for Testing and Materials International, (ASTM).
  .1 ASTM D2564-02, Specification for Solvent Cements for Poly (Vinyl-Chloride) (PVC) Plastic Piping Systems.

.2 Canadian Standards Association (CSA International).
  .1 CSA-Series B1800-02, Plastic Nonpressure Pipe Compendium.
  .2 CSA-B181.2-02, PVC Drain, Waste and Vent Pipe and Pipe Fittings.
  .3 CSA-B182.1-02, Plastic Drain and Sewer Pipe and Pipe Fittings.

2 Products

2.1 PIPING AND FITTINGS

.1 For buried and or above ground DWV piping to:
  .1 CSA-B181.1.
  .2 CSA-B181.2.
  .3 CSA-B182.1.

2.2 JOINTS

.1 Solvent weld for PVC: to ASTM D2564.

3 Execution

3.1 INSTALLATION

.1 Install in accordance with Provincial Plumbing Code and local authority having jurisdiction.

3.2 TESTING

.1 Pressure test buried systems before backfilling.

.2 Hydraulically test to verify grades and freedom from obstructions.

3.3 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 Ensure fixtures are properly anchored, connected to system and effectively vented.

END OF SECTION

1 General

1.1 SUMMARY

.1 Section Includes:
- .1 Materials and installation for plumbing specialties and accessories.
- .2 Sustainable requirements for construction and verification.

1.2 REFERENCES

.1 American Society for Testing and Materials International (ASTM).
- .1 ASTM A126-95 (2001), Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings.
- .2 ASTM B62-02, Specification for Composition Bronze or Ounce Metal Castings.

.2 Canadian Standards Association (CSA International).
- .1 CSA-B64 Series-01, Backflow Preventers and Vacuum Breakers.
- .2 CSA-B79-94 (R2000), Floor, Area and Shower Drains, and Cleanouts for Residential Construction.
- .3 CSA-B356-00, Water Pressure Reducing Valves for Domestic Water Supply Systems.

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

.4 Plumbing and Drainage Institute (PDI).
- .1 PDI-G101-96, Testing and Rating Procedure for Grease Interceptors with Appendix of Sizing and Installation Data.
- .2 PDI-WH201-92, Water Hammer Arresters Standard.

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 datasheet for fixtures and equipment.
- .2 Indicate dimensions, construction details and materials for specified items.

.3 Shop Drawings:
- .1 Submit shop drawings to indicate materials, finishes, method of anchorage, number of anchors, dimensions, construction and assembly details and accessories.

.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.

1.4 QUALITY ASSURANCE

.1 Health and Safety:
- .1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

.2 Provide materials, equipment and labour to install plumbing as required by Provincial and Local Codes and as specified herein.

.3 Provide water and drainage connections to equipment furnished in other sections of this specification and by the Departmental Representative.

.4 Fittings of same type shall be product of one manufacturer.

2 Products

2.1 TRAP SEAL PRIMERS

.1 Trap Seal Primer: Pressure drop activated brass trap seal primer, with inlet opening of 12 mm male NPT and outlet opening of female 12 mm NPT. Complete with four view holes and removable filter screen. Size to serve number of floor drains connected to primer. Primer shall require no adjustments and no air pre-charge. Specification based on Mifab Model M-500.

.2 Air Gap Fitting: Copper air gap fitting complete with a 12 mm male NPT fitting at the inlet supply incorporating a stream directing nozzle, a 12 mm NPT female outlet, and a ANSI/ASME A112.1.2 air gap in plumbing systems standard. Specification based on Mifab Model MI-GAP.

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 Install in accordance with Provincial Codes, and local authority having jurisdiction.

.2 Install in accordance with manufacturer's instructions and as specified.

3.3 TRAP SEAL PRIMERS

.1 Install for floor drains and elsewhere, as required by Code and/or where indicated on drawings. Trap primers shall be electronic.

.2 Install on cold water supply to nearest frequently used plumbing fixture, in concealed space, to approval of Departmental Representative.

.3 Install plastic PEX tubing to floor drain.

3.4 START-UP

.1 Timing: Start-up only after:
- .1 Pressure tests have been completed.
- .2 Disinfection procedures have been completed.
- .3 Certificate of static completion has been issued.
- .4 Water treatment systems operational.

.2 Provide continuous supervision during start-up.

3.5 TESTING AND ADJUSTING

.1 Timing:
- .1 After start-up deficiencies rectified.
- .2 After certificate of completion has been issued by authority having jurisdiction.

.2 Application tolerances:
- .1 Pressure at fixtures: within tolerance allowable by manufacturer.
- .2 Flow rate at fixtures: +/- 10%.

.3 Adjustments:
- .1 Verify that flow rate and pressure meet design criteria.
- .2 Make adjustments while flow rate or withdrawal is (1) maximum and (2) 25% of maximum and while pressure is (1) maximum and (2) minimum.

.4 Floor drains:
- .1 Verify operation of trap seal primer.
- .2 Prime, using trap primer. Adjust flow rate and timer to suit site conditions.
- .3 Check operations of flushing features.
- .4 Check security, accessibility, removeability of strainer.
- .5 Clean out baskets.

.5 Training:
- .1 In accordance with Specifications, Training of Operation and Maintenance Personnel, to be completed.
- .2 Demonstrate full compliance with Design Criteria.

END OF SECTION

1 General

1.1 SUMMARY

.1 Section Includes:
- .1 The supply and installation of Plumbing Fixtures and Trim.

.2 Products Installed but not Supplied Under this Section:
- .1 Install rough-in for equipment supplied by others, complete with valves on hot and cold water supplies, waste and vent.
- .2 Equipment installed by others.
  - .1 Connect with unions.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International).
- .1 CAN/CSA-B45 Series-02, Plumbing Fixtures.
- .2 CAN/CSA-B125-01, Plumbing Fittings.
- .3 CAN/CSA-B651-95 (R2001), Barrier-Free Design.

1.3 SUBMITTALS

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

.2 Closeout Submittals:
- .1 Submit 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, material, water consumption and details of all items noted under specification..
  - .2 Details of operation, servicing, maintenance.
  - .3 List of recommended spare parts.

1.4 GENERAL REQUIREMENTS

.1 Provide new fixtures, CSA approved, free from flaws and blemishes with finished surfaces clear, smooth and bright.

.2 Provide CSA approved plumbing fittings. Visible parts of fixture brass and accessories shall be heavily chrome plated.

.3 Fixtures shall be product of one manufacturer. Fittings of same type shall be product of one manufacturer.

.4 Protect fixtures against use and damage during construction.

1.5 JOB CONDITIONS

.1 Check millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

2 Products

2.1 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.

.5 Fixtures in any one location to be product of one manufacturer and of same type.

.6 Trim in any one location to be product of one manufacturer and of same type.

2.2 WATER CLOSET WC-1 (Lavatory toilet combination for Secure Facility)

.1 Provide and install 450 mm (18") wide Lav/Toilet Suicide Resistant Comby. Contractor to confirm angled left, central or angled right units based on plans. Provide hemispherical cabinet design to reduce the risk of fixture being used as a suicide device. Fixture shall be fabricated from 14 gauge, type 304 stainless steel. Construction shall be seamless welded exposed surfaces shall have a satin finish. Provide D shaped lavatory bowl.

.2 Fixture shall have air controlled pneumatically operated, push button valves. Valves shall require less than 2.3 kg to activate. Valves to comply with NSF 61, section 9-1997 lead free requirements.

.3 Provide BPH hemispherical penal bubbler and hemispherical penal pushbuttons. Provide toilet bowl housing to prohibit the attachment of objects. Toilet shall be concealed blowout jet type with an elongated bowl, self-draining flushing rim, and an integral contoured seat with a sanitary high polish finish.

.4 Toilet trap shall pass a 66 mm (2-5/8") diameter ball and shall be fully enclosed. Toilet shall conform to ANSI 112.19.2M. Cabinet interior shall be sound deadened with fire resistant material. Fixture shall withstand loading of 1360 kg without permanent damage. Fixture shall be furnished with necessary fasteners for proper installation.

.5 Fixture shall be furnished with necessary fasteners for proper installation. The following options shall be provided with the units: Pinned cleanout plug, rear outlet P-trap, and 75 mm (3") waste outlet. Existing wall sleeve to be reused. Acceptable product: Acorn Penal-Ware 1440-BPH-4-FV (1.6)-PC-PT-SW-W03 or Willoughby Model ECW-1806R/L-MOD.

.6 Provide a hot water tempering valve on the hot water supply line to the lavatory. Acceptable product: Symmons Model 4-10B. Note: unit shall be stamped with the manufacturer’s model number on the face of the unit. Fixture to be installed with epoxy sealant between all flush mounted surfaces and the walls and/or floor.

3. Execution

3.1 INSTALLATION

.1 Install each fixture that is to be operational with its own trap, easily removable for servicing and cleaning. At completion thoroughly clean plumbing fixtures and equipment.

.2 Provide chrome plated rigid or stainless steel flexible supplies to fixtures that are to be operational complete with screwdriver stops, reducers and escutcheons.

.3 Install wall mounted lavatories and water closets with approved wall carriers, model to suit installation.

.4 Mounting heights:
- .1 Standard: to comply with manufacturer's recommendations unless otherwise indicated or specified by architect.
- .2 Physically handicapped: to comply with most stringent of either NBCC or CAN/CSA B651.

3.2 PLUMBING FIXTURE ROUGH-IN SCHEDULE

.1 Rough-in fixture piping connections in accordance with the following table of minimum sizes or as required for particular fixtures:

	Hot Water	Cold Water	Waste	Vent
Lavatories	12 mm (½")	12 mm (½")	38 mm (1-1/2")	32 mm (1-1/4")
Water Closet (flush valve)	-----	32 mm (1-1/4")	75 mm (3")	51 mm (2")

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 or Laminar Flow Control: operation, cleanliness.

.4 Thermostatic controls:
- .1 Verify temperature settings, operation of control, limit and safety controls.

END OF SECTION

1 General

1.1 SUMMARY

.1 Section Includes:
- .1 Hangers and supports for mechanical piping, ducting and equipment.
- .2 Sustainable requirements for construction and verification.

1.2 REFERENCES

.1 American National Standards Institute/American Society of Mechanical Engineers (ANSI/ASME)
- .1 ANSI/ASME B31.1-04, Power Piping.

.2 American Society for Testing and Materials International (ASTM)
- .1 ASTM A125-1996 (R2001), Specification for Steel Springs, Helical, Heat-Treated.
- .2 ASTM A307-04, Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
- .3 ASTM A563-04a, Specification for Carbon and Alloy Steel Nuts.

.3 Factory Mutual (FM)

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

.5 Manufacturer's Standardization Society of the Valves and Fittings Industry (MSS)
- .1 MSS SP58-2002, Pipe Hangers and Supports - Materials, Design and Manufacture.
- .2 ANSI/MSS SP69-2003, Pipe Hangers and Supports - Selection and Application.
- .3 MSS SP89-2003, Pipe Hangers and Supports - Fabrication and Installation Practices.

.6 Underwriter's Laboratories of Canada (ULC)

1.3 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 SP58.
- .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 and prevent vibration.
- .5 Provide for vertical adjustments after erection and during commissioning. Amount of adjustment in accordance with MSS SP58.

.6 Pipe supports shall meet the requirements of ASME B31.1 Power Piping and ASME B31.9 Building Services Piping.
.7 Install supports of strength and rigidity to suit loading without unduly stressing building. Locate adjacent to equipment to prevent undue stresses in piping and equipment.
.8 Select hangers and supports for the service and in accordance with the manufacturer's recommended maximum loading. Hangers shall have a safety factor of 5 to 1.
.9 Fasten hangers and supports to building steel in accordance with the requirements of Structural or inserts in concrete construction. Equipment, piping and ductwork shall be supported from the top chords of trusses/beams, supporting off bottom is not permitted.
.10 Provide and set sleeves required for equipment, including openings required for placing equipment.
.11 Obtain approval prior to drilling for inserts and supports for piping systems.
.12 Obtain approval prior to using percussion type fastenings.
.13 Use of other piping or equipment for hanger supports is not permitted.
.14 Use of perforated band iron, wire or chain as hangers is not permitted.

1.4 QUALITY ASSURANCE

.1 Health and Safety:
.1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

2 Products

2.1 GENERAL

.1 Fabricate hangers, supports and sway braces in accordance with ASME B31.1, ASME B31.9 and MSS SP58.

.2 Use components for intended design purpose only. Do not use for rigging or erection purposes.

.3 Design hangers so they cannot become disengaged by movements of supported pipe.

2.2 PIPE HANGERS

.1 Finishes:
.1 Pipe hangers and supports: galvanized after manufacture.
.2 Use electro-plating galvanizing process or hot 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: to be UL listed.

.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 to MSS-SP58 and MSS-SP69.

.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 to MSS SP69.
- .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.

.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 plate UL listed to MSS SP69.

.5 Shop and field-fabricated assemblies:
- .1 Trapeze hanger assemblies: Steel channels with welded spacers and hanger rods, cast iron roll and stand for hot pipe sizes 150 mm and over.
- .2 Steel brackets: Welded and wrought steel clamp.

.6 Hanger rods: threaded rod material to MSS SP58:
- .1 Ensure that hanger rods are subject to tensile loading only.
- .2 Provide linkages where lateral or axial movement of pipework is anticipated.
- .3 Threaded both ends, one end or continuous.

.7 Pipe attachments: material to MSS SP58:
- .1 Attachments for steel piping: carbon steel black.
- .2 Attachments for copper piping: copper plated black steel.
- .3 Use insulation shields for hot pipework.
- .4 Oversize pipe hangers and supports.

.8 Adjustable clevis: material to MSS SP69 UL listed, 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.

.9 Yoke style pipe roll: carbon steel yoke, rod and nuts with cast iron roll, to MSS SP69.

.10 U-bolts: carbon steel to MSS SP69 with 2 nuts at each end to ASTM A563.
- .1 Finishes for steel pipework: black.
- .2 Finishes for copper, glass, brass or aluminum pipework: black, with formed portion plastic coated.

.11 Pipe rollers: cast iron roll and roll stand with carbon steel rod to MSS SP69.

.12 Wall Support:
- .1 Up to 75 mm: Cast iron hook.

.2 100 mm and over: Welded steel bracket and wrought steel clamp.

.13 Floor Support:
- .1 Pipe sizes up to 100 mm and all cold pipe sizes: Cast iron adjustable pipe saddle, locknut nipple, floor flange and concrete pier to steel support.
- .2 Hot pipe sizes 150 mm and over: Adjustable cast iron roll and stand, steel screws and concrete pier or steel support.

.14 Insulation:
- .1 Supports shall be coordinated with requirements of insulation. Oversized hangars are required for all pipe systems that require insulation with a vapour barrier to maintain integrity of vapour barrier.
- .2 Oversized hangars shall also be required for steam pipe systems.

2.3 WIRE ROPE PIPE AND DUCT HANGERS

.1 Wire Rope Suspension Systems:
- .1 Wire rope suspension systems shall be ULC, CSA and SMACNA approved and tested.
- .2 Wire suspensions systems shall consist of a pre-formed wire rope sling with either a ferruled loop, permanently fixed threaded ¼" (or 3/8") stud, or permanently fixed nipple end with toggle, at one end or hook or eyelet. The end fixings and the wire must be of the same manufacturer. The system is secured and tensioned with a hanger self-locking grip at the other end. System shall incorporate pipe hangars. Pipe hangars shall not penetrate vapour barrier of chilled water pipe insulation.
- .3 Only wire and or supports supplied and or approved, shall be used with the system installed.
- .4 The Contractor shall select the correct specification of wire hanger to use for supporting each particular service from table 1 below. Each size is designated with a maximum Safe Working Load Limit (which incorporates a 5:1 safety factor). The correct specification of wire hanger required is determined using the following formula:

  Weight per metre of object suspended (kg) x Distance between suspension points (m) = Weight loading per hanger suspension point (kg)

  Table 1 Wire Hanger Safe Working Loads

Size	Working Load Limit (kg)	Working Load Limit (lbs)
No. 1	0 - 10 kg	0 - 22 lbs
No. 2	10.5 - 45.5 kg	23 - 100 lbs
No. 3	46 - 91 kg	101 - 200 lbs
No. 4	95.5 - 225 kg	210 - 495 lbs
No. 5	225.5 - 325 kg	496 - 715 lbs

- .5 Where the installed wire rope is not vertical then the working load limit shall be reduced in accordance with the recommendations given in the manufacturer's handbook.
- .6 The Contractor shall select and use the correct length of wire rope required to support the service.
- .7 No in-line joins shall be permitted in the rope.
- .8 Solid trapeze hangars may be used to suspend piping routed together, where wire support can be coordinated with ceiling and still ensure pipes are routed at highest point possible (tight to beams).

2.4 RISER CLAMPS

.1 Steel or cast iron pipe: black carbon steel to MSS SP58, type 42, UL listed.

.2 Copper pipe: carbon steel copper plated to MSS SP58, type 42.

.3 Bolts: to ASTM A307.

.4 Nuts: to ASTM A563.

2.5 INSULATION PROTECTION SHIELDS

.1 Insulated cold piping:
- .1 64 kg/m^3 density insulation plus insulation protection shield to: MSS SP69, galvanized sheet carbon steel. Length designed for maximum 3 m span.

.2 Insulated hot piping:
- .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 SP69.

2.6 CONSTANT SUPPORT SPRING HANGERS

.1 Springs: alloy steel to ASTM A125, 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 A125, 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 meeting requirements of Section 05 50 00 - Metal Fabrications.

2.9 EQUIPMENT ANCHOR BOLTS AND TEMPLATES

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

2.10 SLEEVES

.1 Pipes through floors: Form with 18 gauge galvanized steel.

.2 Pipes through beams, walls, fire proofing, footings, potentially wet floor: Form with steel pipe or 18 gauge galvanized steel.

.3 Size large enough to allow for movement due to expansion and to provide for continuous insulation.

2.11 OTHER EQUIPMENT SUPPORTS

.1 Fabricate equipment supports from structural grade steel meeting requirements of Section 05 50 00 - Metal Fabrications.

.2 Submit structural calculations with shop drawings.

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, at all vibration isolated equipment 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.

.8 Installation of Exposed Pipe and Duct Hangers:
.1 Exposed pipe and duct shall be any pipe/duct visible to the occupants. This does not include piping and ductwork routing above dropped ceilings.
.2 Exposed Pipe and Duct hangers shall be a Wire Rope Suspension System.

3.3 INSERTS

.1 Use inserts for suspending hangers for reinforced concrete slabs and sides of reinforced concrete beams wherever practicable.

.2 Set inserts in position in advance of concrete work. Provide reinforcement rod in concrete for inserts carrying pipe over 100 mm.

.3 Where concrete slabs form finished ceiling, finish inserts flush with slab surface.

.4 Where inserts are omitted, drill through concrete slab from below and provide rod with recessed square steel plate and nut above slab.

3.4 HANGER SPACING

.1 Plumbing piping: to Canadian Plumbing Code, Provincial Code, authority having jurisdiction.

.2 Copper piping: up to NPS 1/2: every 1.5 m.

.3 Flexible joint roll groove pipe: in accordance with table below, but not less than one hanger at joints.

.4 Within 300 mm of each elbow.

Maximum Pipe Size : NPS	Maximum Spacing Steel	Maximum Spacing Copper	Rod Diameter
up to 32 mm	1.8 m	1.8 m	9.5 mm
38 mm	1.8 m	1.8 m	9.5 mm
50 mm and 63 mm	3.0 m	3.0 m	9.5 mm
75 mm - 100 mm	3.6 m	3.0 m	15.8 mm
150 mm - 200 mm	4.3 m	4.3 m	22.2 mm

.5 Install hangers to provide a minimum 12 mm clear space between finished covering and adjacent work.

3.5 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.

.4 Use hangers which are vertically adjustable 38 mm minimum after piping is erected.

.5 Support horizontal soil pipe near each hub, with 1.5 m maximum spacing between hangers.

.6 Support vertical piping at every other floor. Support vertical soil pipe at each floor at hub.

.7 Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

.8 Where practical, support riser piping independently of connected horizontal piping.

.9 Hangers: Pipe sizes 12 mm to 38 mm: Adjustable wrought steel ring.

.10 Hangers: Pipe sizes 50 mm to 100 mm and Cold Pipe Sizes: Adjustable wrought steel clevis.

3.6 SLEEVES

.1 Set sleeves in position in advance of concrete work. Provide suitable reinforcing around sleeves.

.2 Extend sleeves through potentially wet floors 25 mm above finished floor level. Caulk sleeves full depth and provide floor plate.

.3 Where piping passes through floor, ceiling or wall close off space between pipe or duct and construction with non-combustible insulation. Provide tight fitting metal caps on both sides and caulk.

.4 Install chrome plated escutcheons where piping passes through finished surfaces.

.5 All penetrations through fire rated walls, floors or partition assemblies shall be sealed/fire stopped with fire stop materials that will remain in place and prevent the passage of smoke, toxic gases, flame, etc., when subjected to the standard test method Can 4-S115, "Standard Method of Fire Tests for Firestop Systems" for a period of time equal to fire protection rating required for the grade of fire separation of the penetrated wall or floor.

.6 Acceptable Product: According to instructions provided, all penetrations in fire rated walls, floors, or partition assemblies shall be sealed/fire stopped with:
- .1 3M Brand Intumescent, "Fire Barrier" Caulk CP-25, Putty 303, Penetration Sealing Systems 7902 or 7904 Series, Composite Sheet CS-195, or Wrap Strip FS-195.
- .2 Tremco Firestop Systems: Fyresil, Fyreshield for penetrations and perimeters. Dymeric ULC, THC 900 ULC

3.7 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.

3.8 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.

END OF SECTION

1 General

1.1 SECTION INCLUDES

.1 Testing, adjustment and balance of air systems.

1.2 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.

1.3 QUALIFICATIONS OF TAB PERSONNEL

.1 Submit names of personnel to perform TAB to Consultant within 90 days of award of contract.

.2 Personnel performing TAB shall be qualified to standards of AABC and/or NEBB

.3 Provide documentation confirming qualifications, successful experience.

.4 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.

.5 Recommendations and suggested practices contained in the TAB Standard: mandatory.

.6 Use TAB Standard provisions, including checklists, and report forms to satisfy Contract requirements.

.7 Use TAB Standard for TAB, including qualifications for TAB Firm and Specialist and calibration of TAB instruments.

.8 Where instrument manufacturer calibration recommendations are more stringent than those listed in TAB Standard, use manufacturer's recommendations.

.9 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.

1.5 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.

1.6 EXCEPTIONS

.1 TAB of systems and equipment regulated by codes, standards to satisfaction of authority having jurisdiction.

1.7 PRE-TAB REVIEW

.1 Review contract documents before project construction is started confirm in writing to 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 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 Consultant for verification of TAB reports.

1.10 START OF TAB

.1 Notify Consultant 7 days prior to start of TAB.

.2 Start TAB when building is essentially completed, including:

.3 Installation of ceilings, doors, windows, other construction affecting TAB.

.4 Application of weatherstripping, sealing, and caulking.

.5 Pressure, leakage, other tests specified elsewhere Division 23.

.6 Provisions for TAB installed and operational.

.7 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.

1.11 APPLICATION TOLERANCES

.1 Do TAB to following tolerances of design values:
- .1 HVAC systems: plus 5%, minus 5%.

1.12 ACCURACY TOLERANCES

.1 Measured values accurate to within plus or minus 2% of actual values.

1.13 INSTRUMENTS

.1 Use accurate instruments for measurements. 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 3 months of TAB. Provide certificate of calibration to Consultant.

.4 Provide calibration histories for each instrument. Re-calibration or use of other instruments may be requested when accuracy of readings is questionable.

1.14 SUBMITTALS

.1 Submit, prior to commencement of TAB:

.2 Submit proposed methodology and procedures for performing TAB if different from referenced standard.

1.15 PRELIMINARY TAB REPORT

.1 Submit for checking and approval of Consultant, 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 4 copies of TAB Report to Consultant for verification and approval, in English in D-ring binders, complete with index tabs.

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 by Consultant.

.4 Pay costs to repeat TAB as required to satisfaction of Consultant.

1.18 SETTINGS

.1 After TAB is completed to satisfaction of Departmental Representative, 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 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.

.2 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.

.3 Locations of systems measurements to include as appropriate: main ducts, main branch, sub-branch, run-out (or grille, register or diffuser).

1.21 OTHER TAB REQUIREMENTS

.1 Measurement of noise from equipment specified in Division 23.
  .1 As specified elsewhere or as required to prove Noise Performance when operating performance is questioned.

1.22 CLOSEOUT SUBMITTALS

.1 Section 01 33 00: Submission procedures.

.2 Provide copies of complete final TAB report for Operation and Maintenance manual

1.23 BALANCE REPORTS

.1 Balance reports to include the following at minimum (data shall always include design and actual measured data):
  .1 Title Page: Company Name, Address, and Telephone Number; Project Name, Location, Architect, Engineer, and Project Contractor.
  .2 Include types, serial number and dates of calibration of instruments used.
  .3 Air Distribution: Terminal Number, Room Number/Location, Terminal Type and Size, Area Factor, Design Velocity and Air Flow, Test Velocity and Air Flow.

2 Products

2.1 NOT USED

3 Execution

3.1 PREPARATION

.1 Before adjusting and balancing, verify that systems are complete and operable. Ensure temperature control systems are complete and operable, thermal overload protection is in place, final filters installed, hydronic systems, flushed, filled, and vented.

.2 Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Consultant to facilitate spot checks during testing.

.3 Recorded data shall represent actually measured, or observed condition.

3.2 GENERAL PROCEDURES

.1 Balance to maximum measured flow, allowable deviation as specified.

.2 Permanently mark settings on valves, splitters, dampers, and other adjustment devices.

.3 Subsequent to correctional work, take measurements to verify balance has not been disrupted or that any such disruption has been rectified.

.4 At final inspection, re-check random selections of data recorded in report. Re-check points of areas as selected and witnessed by the Owner.

.5 Check and adjust systems approximately six (6) months after final acceptance and submit report.

.6 The Balancing Contractor shall include the cost of sheave changes necessary to achieve specified air flow within limits specified.

3.3 AIR SYSTEM PROCEDURES

.1 Adjust air handling and distribution systems to provide required or design supply, return and exhaust air quantities. Permanently mark settings of damper and other adjustment devices allowing settings to be restored.

.2 Make air quantity measurements in ducts by Pitot tube traverse of entire cross-sectional area of duct.

.3 Measure air quantities at each air inlet and outlet. Use volume control devices to regulate air quantities.

.4 Provide system schematic with required and actual air quantities recorded at each outlet or inlet.

END OF SECTION

1 General

1.1 REFERENCES

.1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
- .1 ANSI/ASHRAE/IESNA 90.1-01, SI; Energy Standard for Buildings Except Low-Rise Residential Buildings.

.2 American Society for Testing and Materials International, (ASTM)
- .1 ASTM B209M, Specification for Aluminum and Aluminum Alloy Sheet and Plate (Metric).
- .2 ASTM C335, Test Method for Steady State Heat Transfer Properties of Horizontal Pipe Insulation.
- .3 ASTM C411, Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.
- .4 ASTM C449/C449M, Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.
- .5 ASTM C547, Specification for Mineral Fiber Pipe Insulation.
- .6 ASTM C553, Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
- .7 ASTM C612, Specification for Mineral Fiber Block and Board Thermal Insulation.
- .8 ASTM C795, Specification for Thermal Insulation for Use with Austenitic Stainless Steel.
- .9 ASTM C921-(1998)e1, Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.

.3 Canadian General Standards Board (CGSB)
- .1 CGSB 51-GP-52Ma, Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.

.4 Thermal Insulation Association of Canada (TIAC): National Insulation Standards (R1999).

.5 Underwriters Laboratories of Canada (ULC)
- .1 CAN/ULC-S102, Surface Burning Characteristics of Building Materials and Assemblies.
- .2 CAN/ULC-S701, Thermal Insulation Polyotrene, Boards and Pipe Covering.

1.2 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" - will mean "not concealed" as defined herein.
- .3 Insulation systems - insulation material, fasteners, jackets, and other accessories.

.2 TIAC Codes:
- .1 CRD: Code Round Ductwork,
- .2 CRF: Code Rectangular Finish.

1.3 SHOP DRAWINGS

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

.2 Submit for approval manufacturer's catalogue literature related to installation, fabrication for duct jointing recommendations.

1.4 MANUFACTURERS' INSTRUCTIONS

.1 Submit manufacturer's installation instructions in accordance with Section 01 33 00 - Submittal Procedures.

.2 Installation instructions to include procedures used, and installation standards achieved.

1.5 QUALITY ASSURANCE

.1 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.

.2 Materials: UL listed; flame spread/smoke developed rating of 25/50 in accordance with ASTM E84.

.3 Do work to TIAC standards.

.4 Deliver material to job site in original non-broken factory packaging, labelled with manufacturer's density and thickness.

.5 Perform work at ambient and equipment temperatures as recommended by the adhesive manufacturer. Make good separation of joints or cracking of insulation due to thermal movement or poor workmanship.

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: as specified includes glass fibre, rock wool, slag wool.

.2 Thermal conductivity ("k" factor) not to exceed specified values at 24 deg.C mean temperature when tested in accordance with ASTM C335. Maximum “K” factor to be 0.035 W/m. deg.K (0.24 BTU in/hr/sq.ft. Deg.K) to ASTM C5553.

.3 TIAC Class C-1: Rigid mineral fibre board to ASTM C612, unfaced or faced with vapour retarder jacket; ksi value of 0.035 at 24 degrees C.

.4 TIAC Code C-2: mineral fibre blanket to ASTM C553 with or without factory applied vapour retarder jacket; ksi value of 0.035 at 24 degrees C

.5 Flexible Duct Liner: Flexible non-combustible mineral fiber blanket to ASTM C 1071 Type 1; ksi value of 0.035 at 24 degrees C, 24 kg/cu m minimum density; coated air side for maximum 20.3 m/s air velocity. Minimum NRC value of 0.65 at 25mm to ASTM 423.

.6 Rigid Duct Liner: semi-rigid non-combustible mineral fiber to ASTM C 1071 Type 2; ksi value of 0.035 at 24 degrees C, 48 kg/cu m minimum density; coated air side for maximum 20.3 m/s air velocity. Minimum NRC value of 0.7 at 25mm to ASTM 423.

2.3 JACKETS

.1 Interior Applications:
- .1 Vapour Barrier Jackets: to CGSB 51-GP-52Ma.
- .2 PVC Jackets: One piece, high-gloss pre-moulded type, 0.8 mm (30mls) thick. Jackets exposed to outdoor use or flourescent lighting shall be ultra-violet ray resistant.
- .3 Canvas Jackets: ULC listed treated cotton fabric, 220 g/sq.m. to ASTM C 921
- .4 Aluminum Jackets: 0.51 mm thick; stucco embossed.

.2 Exterior Applications:
- .1 Aluminum Jackets: 0.51 mm thick; stucco embossed.
- .2 Stainless Steel Jackets: Type 304 stainless steel; 0.25 mm thick, stucco embossed
- .3 Outdoor Jacket: Coated glass fibre sheet, 16 kg/sq m.

2.4 ACCESSORIES

.1 Bands: 20 mm wide; 0.38 mm thick stainless steel.

.2 Insulating Cement: Hydraulic setting on mineral wool.

.3 Fibrous Glass Cloth: Untreated; 305 g/sq m weight.

.4 Adhesives: Compatible with insulation, waterproof, fire-retardant type.

.5 Impale Anchors: Galvanized steel, 2 mm diameter with 35mm diameter head, length as required for insulation.

.6 Joint Tape: self adhesive reinforced aluminum, minimum 50mm wide

.7 Tie Wire: stainless steel, 1.5 mm.

.8 Outdoor vapour retarder mastic:
- .1 Vinyl emulsion type acrylic, compatible with insulation
- .2 Fibrous glass cloth

3 Execution

3.1 PRE-INSTALLATION REQUIREMENTS

.1 Pressure testing of ductwork systems complete, witnessed and certified.

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

3.2 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 Fasteners: install at 300 mm on centre in horizontal and vertical directions, minimum 2 rows each side.

.6 Apply high compressive strength insulation where insulation may be compressed by weight of ductwork.

.7 Locate insulation or cover seams in least visible location.

.8 Provide recovering jackets on exposed insulation throughout, including equipment room. Insulation located in crawl spaces, shafts and suspended ceiling spaces is not considered exposed. Use pre-sized paper under recovering at uneven insulated surfaces.

.9 External Duct Insulation:
.1 Secure insulation with vapour barrier with wires and seal jacket joints with vapour barrier adhesive or tape to match jacket.
.2 Secure insulation without vapour barrier with staples, tape, or wires.
.3 Install without sag on underside of duct work. Use adhesive or mechanical fasteners to prevent sagging. Seal vapour barrier penetrations with vapour barrier adhesive. Stop and point insulation around access doors and damper operators.

.10 Exposed Rectangular: Secure rigid insulation with 50% coverage of adhesive and 12 gauge galvanized impale anchor tabs on 400 mm (16") centres. Seal joints and breaks with 250 mm (10") wide strips of open mesh glass cloth or tape imbedded between 2 coats of vapour barrier sealant. Point up other joints and breaks with hydraulic setting cement.

.11 Round Duct and Concealed Rectangular Duct: Adhere flexible insulation to ductwork with adhesive applied in 150 mm (6") wide strips on 400 mm (16") centres. Provide 16 gauge annealed tie wire tied, spiral wound or half hitched at 200 mm (8") centres for securing duct insulation until adhesive sets. Butt insulation and seal joints and breaks with 50 mm (2") lap of foil adhered over joint.

.12 Acoustic lining: Apply to interior of ducts where shown.
.1 Adhere insulation with adhesive for 100 percent coverage. Secure insulation with mechanical fasteners on 375 mm centres maximum on top and side of duct work with dimension exceeding 500 mm. Seal and smooth joints. Seal vapour barrier penetrations with vapour barrier adhesive. Cut off excess fastener length and cover with brush coat of mastic.
.2 Use 25 mm (1") thick insulation unless otherwise noted.
.3 Provide vapour barrier located on the warm side for outside air intakes.
.4 Ducts with acoustic insulation do not require external thermal insulation
.5 Ductwork dimensions indicated on drawings include insulation thickness.

3.3 INSTALLATION - JACKETS

.1 Install in accordance with TIAC standards and manufacturers written requirements.

.2 Provide recovering jackets on exposed insulation throughout, including equipment room. Insulation located in crawl spaces, shafts and suspended ceiling spaces is not considered exposed. Use pre-sized paper under recovering at uneven insulated surfaces.

3.4 DUCTWORK INSULATION SCHEDULE

.1 Insulation types and thicknesses: conform to following table:

System	TIAC Code	Vapour Retarder	Thickness (mm)
Rectangular cold and dual temperature supply air ducts	C-1	yes	50
Round cold and dual temperature supply air ducts	C-2	yes	50
Supply, return and exhaust ducts exposed in space being served	none, unless indicated otherwise on drawings		
Mixing plenums	C-1	yes	50
Exhaust duct between fan and louvre/discharge	C-1	Yes	50
Acoustically lining	none		25

.2 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 TIAC codes noted in table:

	Rectangular	Round
Indoor, concealed	none	none
Indoor, exposed within mechanical room	CRF/1	CRD/2
Indoor, exposed elsewhere	CRF/2	CRD/3
Outdoor, exposed to precipitation	CRF/3	CRD/4
Outdoor, elsewhere	CRF/4	CRD/5

END OF SECTION

1 General

1.1 SECTION INCLUDES

.1 Metal duct work.
.2 Nonmetal duct work.
.3 Casing and plenums.
.4 Buried duct work.
.5 Duct cleaning.

1.2 REFERENCES

.1 ASTM A36/A36M - Carbon Structural Steel.
.2 ASTM A90/A90M - Weight (Mass) of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings.
.3 ASTM A167 - Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
.4 ASTM A480/A480M - General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip.
.5 ASTM A568/A568M - General Requirements for Steel Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled.
.6 ASTM A653/A653M - Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
.7 ASTM A1008/A1008M - Steel, Sheet, Cold-Rolled Carbon, Structural, High-Strength Low-Alloy and High Strength Low-Alloy with Improved Formability.
.8 ASTM A1011/A1011M - Standard Specification for Steel, Sheet, and Strip Hot-Rolled, Carbon, Structural, High-Strength, Low-Alloy with Improved Formability.
.9 ASTM B209 - Aluminum and Aluminum-Alloy Sheet and Plate.
.10 ASTM C14/C14M - Concrete Sewer, Storm Drain, and Culvert Pipe.
.11 ASTM C443 - Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.
.12 AWS D9.1 - Sheet Metal Welding Code.
.13 NBS PS 15 - Voluntary Product Standard for Custom Contact-Moulded Reinforced-Polyestor Chemical Resistant Process Equipment.
.14 NFPA 90A - Installation of Air Conditioning and Ventilating Systems.
.15 NFPA 90B - Installation of Warm Air Heating and Air-Conditioning Systems.
.16 NFPA 91 - Exhaust Systems for Air Conveying of Vapours, Gases, Mists, and Noncombustible Particulate Solids.
.17 NFPA 96 - Ventilation Control and Fire Protection of Commercial Cooking Operations.
.18 SMACNA - HVAC Air Duct Leakage Test Manual.
.19 SMACNA - HVAC Duct Construction Standards - Metal and Flexible.
.20 SMACNA - Fibrous Glass Duct Construction Standards.
.21 UL 181 - Factory-Made Air Ducts and Connectors.

1.3 DEFINITIONS

.1 Low pressure/low velocity: Static pressure in duct less than 498 Pa (2" w.g.) and velocities less than 10 meters/second (2000 fpm).

.2 Medium pressure/high velocity: Static pressure in duct less than 996 Pa (4" w.g.) and velocities between 10 meters/second (2000 fpm) and 20 meters/second (4000 fpm).

.3 High pressure/high velocity: Static pressure in ducts more than 996 Pa (4" w.g.) And velocities greater than 4000 fpm.

.4 Duct sizes: as shown on drawings are outside dimensions. For acoustically lined or internally insulated ducts, sizes shown are actual duct sizes and the insulation thickness has been accounted for.

1.4 PERFORMANCE REQUIREMENTS

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

1.5 SUBMITTALS

.1 Section 01 33 00: Procedures for submittals.

.2 Shop Drawings: Indicate duct fittings, particulars such as gauges, sizes, welds, and configuration prior to start of work for 1000 kPa pressure class and higher systems.

.3 Product Data: Provide data for duct materials.

.4 Test Reports: Indicate pressure tests performed. Include date, section tested, test pressure, and leakage rate, following SMACNA HVAC Air Duct Leakage Test Manual.

1.6 QUALITY ASSURANCE

.1 Perform Work to SMACNA - HVAC Duct Construction Standards - Metal and Flexible.

.2 Ductwork shall meet the requirements of NFPA 90A, Air Conditioning and Ventilating Systems, and NFPA No. 96, Standard for the Installation of Equipment for the Removal of Smoke and Grease-Laden Vapours from Commercial Cooking Equipment

1.7 QUALIFICATIONS

.1 Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

.2 Installer: Company specializing in performing the work of this section with minimum 3 years documented experience.

1.8 ENVIRONMENTAL REQUIREMENTS

.1 Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.

.2 Maintain temperatures during and after installation of duct sealants.

2 Products

2.1 DUCT MATERIALS

.1 Galvanized Steel Ducts: ASTM A653 galvanized steel sheet, lock-forming quality, having G60 zinc coating to ASTM A90 on both sides.

.2 Steel Ducts: ASTM A1008.

.3 Aluminum Ducts: ASTM B209; aluminum sheet, alloy 3003-H14. Aluminum Connectors and Bar Stock: Alloy 6061- T6 or of equivalent strength.

.4 Stainless Steel Ducts: ASTM A167, Type 304.

.5 Concrete Ducts: ASTM C14; hub and spigot concrete sewer pipe with ASTM C443 joints, rubber gaskets.

.6 Fasteners: use rivets and bolts throughout; sheet metal screws accepted on low pressure ducts.

2.2 SEALANT

.1 Oil resistant, water based or solvent based, anti-microbial, anti-bacterial, ultra violet resistant, polymer type, flame resistant duct sealant.

.2 VOC content to be less than VOC limits of the State of California's South Coast Air Quality District Rule #1168. VOC content less than 30 g/L (less water and less exempt compounds) for sealing metal to metal contact.

.3 Sealant shall be cured for a minimum of 48 hours.

.4 Flame Spread Rating: 0 (zero).

.5 Smoke Spread Raring: 0 (zero).

2.3 TAPE

.1 Polyvinyl treated, open weave fibre glass, 50 mm wide.

2.4 SEAL CLASSIFICATION

.1 Classification as follows:

Maximum Pressure Pa	SMACNA Seal Class
up to 500	B
Over 500	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.

.3 Class C: transverse joints and connections made air tight with gaskets. Longitudinal seams unsealed.

.4 Unsealed seams and joints.

2.5 DUCT WORK FABRICATION

.1 Fabricate and support to SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated. Provide duct material, gauges, reinforcing, and sealing for operating pressures indicated.

.2 Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centreline. Where not possible and where rectangular elbows are used, provide air foil turning vanes.

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

.4 Lap metal ducts in direction of air flow. Hammer down edges and slips to leave smooth duct interior.

.5 Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.

.6 Fabricate continuously welded round and oval duct fittings two gauges heavier than duct gauges indicated in SMACNA Standard. Joints: minimum 100 mm cemented slip joint, brazed or electric welded. Prime coat welded joints.

.7 Provide standard 45 degree lateral wye takeoffs unless duct manufacturer can show 90 degree and tap has less static pressure loss.

.8 Rigidly construct metal ducts with joints mechanically tight, substantially airtight, braced and stiffened so as not to breath, rattle, vibrate or sag. Caulk duct joints and connections with sealant as ducts are being assembled.

.9 Provide easements where low pressure ductwork conflicts with piping and structure where easements exceed 10% duct area, split into two ducts maintaining original duct area.

.10 Exposed ductwork to be fabricated from Aluminum for aesthetics.

2.6 FITTINGS

.1 Fabrication: to SMACNA.

.2 Radiused elbows.
- .1 Rectangular: standard radius with single thickness turning vanes. Centreline radius: 1.5 times width of duct.
- .2 Round: smooth radius. Centreline radius: 1.5 times diameter.
- .3 Oval: 7 gore 90’s, 5 gore 45’s.

.3 Mitred elbows, rectangular:
- .1 To 400 mm: with single thickness Airfoil turning vanes.
- .2 Over 400 mm: with double thickness Airfoil turning vanes.

.4 Branches:
- .1 Rectangular main and branch: with radius on branch 1.5 times width of duct.
- .2 Round main and branch: enter main duct at 45 degrees with conical connection.
- .3 Provide volume control damper in branch duct near connection to main duct.
- .4 Main duct branches: with splitter damper.

.5 Transitions:
- .1 Diverging: 15 degrees maximum included angle when increasing duct sizes.
- .2 Converging: 45 degrees maximum included angle downstream of equipment.
- .3 Diverging: 30 degrees maximum included angle upstream of equipment.

.6 Offsets:
- .1 Full radiused elbows, as indicated.

.7 Obstruction deflectors: maintain full cross-sectional area.
- .1 Maximum included angles: as for transitions.

2.7 MANUFACTURED DUCT WORK AND FITTINGS

.1 Manufacture to SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated. Provide duct material, gauges, reinforcing, and sealing for operating pressures indicated.

.2 Flat Oval Ducts:
- .1 Machine made from round spiral lockseam duct with light reinforcing corrugations; fittings manufactured of at least two gauges heavier metal than duct.

.3 Double Wall Insulated Flat Oval Ducts:
- .1 Machine made from round spiral lockseam duct with light reinforcing corrugations, galvanized steel outer wall, 25 mm thick fibreglass insulation, perforated galvanized steel inner wall; fittings manufactured with solid inner wall.

.4 PVC Coated Steel Ducts:
- .1 UL 181, Class 1, galvanized steel duct coated with polyvinyl chloride plastic, 0.1 mm thick on outside and 0.05 mm thick on inside.

.5 Transverse Duct Connection System:
- .1 SMACNA "E" rated rigidly class connection, interlocking angle and duct edge connection system with sealant, gasket, cleats, and corner clips.

2.8 CASINGS

.1 Fabricate casings to SMACNA HVAC Duct Construction Standards - Metal and Flexible and construct for operating pressures indicated.

.2 Mount floor mounted casings on 100 mm high concrete curbs. At floor, rivet panels on 200 mm centres to angles. Where floors are acoustically insulated, provide liner of 1.20 mm galvanized expanded metal mesh supported at 300 mm centres, turned up 300 mm at sides with sheet metal shields.

.3 Reinforce door frames with steel angles tied to horizontal and vertical plenum supporting angles. Install hinged access doors where indicated or required for access to equipment for cleaning and inspection. Provide clear wire glass observation ports, minimum 150 X 150 mm size.

.4 Fabricate acoustic casings with reinforcing turned inward. Provide 1.50 mm back facing and 0.80 mm perforated front facing with 2.4 mm diameter holes on 4 mm centres. Construct panels 75 mm thick packed with 72 kg/cu m minimum glass fibre media, on inverted channels of 1.50 mm.

2.9 FIRESTOPPING

.1 Retaining angles around duct, on both sides of fire separation

.2 Fire stopping material and installation must not distort duct.

2.10 HANGERS AND SUPPORTS

.1 Hangers and Supports: in accordance with Section 23 05 29 - Hangers and Supports for HVAC Piping Equipment.
- .1 Band hangers: use on round and oval ducts up to 500 mm diameter, of same material as duct but next sheet metal thickness heavier than duct.
- .2 Trapeze hangers: ducts over 500 mm diameter or longest side, to SMACNA.
- .3 Hangers: steel angle with black steel rods to 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 or steel plate washer.
  - .1 Mount to top cord.
  - .3 For steel beams: manufactured beam clamps:

2.11 WIRE ROPE SUSPENSION SYSTEMS

.1 Wire rope suspension systems shall be ULC, CSA and SMACNA approved and tested.

.2 Wire suspensions systems consist of a pre-formed wire rope sling with either a ferruled loop, permanently fixed threaded 1/4ins (or 3/8ins) stud, or permanently fixed nipple end with toggle, at one end or hook or eyelet. The end fixings and the wire must be of the same manufacturer. The system is secured and tensioned with a hanger self-locking grip at the other end.

.3 Only wire and or supports supplied and or approved, shall be used with the system.

.4 The contractor shall select the correct specification of wire hanger to use for supporting each particular service from table 1 below. Each size is designated with a maximum Safe Working Load Limit (which incorporates a 5:1 safety factor). The correct specification of wire hanger required is determined using the following formula:

Weight per metre of object suspended (kg) x Distance between suspension points (m) = Weight loading per hanger suspension point (kg).

Table 1 Wire Hanger Safe Working Loads

Size	**Working Load Limit (kg)** **Working Load Limit (lbs)**
No. 1	0 - 10 kg (0 - 22 lbs)
No. 2	10.5 - 45.5 kg (23 - 100 lbs)
No. 3	46 - 91 kg (101 - 200 lbs)
No. 4	95.5 - 225 kg (210 - 495 lbs)
No. 5	225.5 - 325 kg (496 - 715 lbs)

(i) Where the installed wire rope is not vertical then the working load limit shall be reduced in accordance with the recommendations given in the manufacturer's handbook.

.5 The contractor shall select and use the correct length of wire rope required to support the service.

.6 No in-line joins shall be permitted in the rope.

3 Execution

3.1 GENERAL REQUIREMENTS

.1 Do work in accordance with SMACNA.

.2 Do not break continuity of insulation vapour barrier with hangers or rods.
.1 Ensure diffuser is fully seated.

.3 Support risers in accordance with SMACNA.

.4 Install breakaway joints in ductwork on sides of fire separation.

.5 Install proprietary manufactured flanged duct joints and manufactured equipment in accordance with manufacturer's instructions.

.6 Manufacture duct in lengths and diameter to accommodate installation of acoustic duct lining.

.7 At each point where ducts pass through partitions, the joints around the duct shall be sealed with non-combustible material.

3.2 INSTALLATION

.1 Install and seal ducts to SMACNA HVAC Duct Construction Standards - Metal and Flexible according to seal classification specified.

.2 Provide openings in duct work where required to accommodate thermometers and controllers. Provide pilot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated duct work, install insulation material inside a metal ring.

.3 Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

.4 Use double nuts and lock washers on threaded rod supports.

.5 Provide access doors for inspection.

.6 Tape joints of PVC coated metal duct work with PVC tape.

.7 Connect terminal units to supply ducts directly or with 300 mm maximum length of flexible duct. Do not use flexible duct to change direction.

.8 Connect diffusers to low pressure ducts directly. To decouple diffuser from duct system, use 1.5 m maximum length of flexible duct held in place with caulking compound and strap or clamp. Do not use flexible duct to change direction.

.9 Connect flexible ducts to metal ducts with adhesive and strap or clamp.

.10 Set plenum doors 150 to 300 mm above floor. Arrange door swings so that fan static pressure holds door in closed position.

.11 During construction provide temporary closures of metal or taped polyethylene on open duct work to prevent construction dust from entering duct work system.

.12 Provide floor drains in fresh air coil, and humidifier sections with deep seal traps.

3.3 CLEANING

.1 Clean work to requirements of Division 1 and as detailed herein.

.2 Clean duct system and force air at high velocity through duct to remove accumulated dust. To obtain sufficient air, clean half the system at a time. Protect equipment which may be harmed by excessive dirt with temporary filters, or bypass during cleaning.

.3 Provide adequate access into duct work for cleaning purposes.

.4 Prior to occupancy and during initial occupancy, building shall be flushed at maximum outdoor air volume. Supply a total of 4,300 cu.m of outdoor air per sq.m of floor area or approximately 30,564,400cu.m of outdoor air or approximately 54 days of flushing. Note that a minimum of 3 weeks of flushing will be required prior to occupancy.

3.4 WATER TIGHT DUCTS

.1 Provide watertight duct for:
- .1 Fresh air intake.
- .2 As indicated.

.2 Form bottom of horizontal duct without longitudinal seams.
.1 Solder or weld joints of bottom and side sheets.
.2 Seal other joints with duct sealer.

.3 Slope horizontal branch ductwork down towards 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 discharging to open funnel drain.

3.5 WIRE ROPE SUSPENSION SYSTEMS

.1 The wire hangers shall be fixed to the building structure in accordance with the standard practice and structural limitations.

.2 Loop end can be wrapped around purlins, beams, roof trusses and other accessible building features.

.3 Stud end can be fixed with suitable anchors into concrete ceilings and structures, metal decking and pressed metal brackets (using nuts).

.4 Toggle end can be fixed into profile roof cladding, light fittings and luminaries.

.5 Other wire rope systems can be fixed to an approved structure, as determined by the Departmental Representative.

.6 The wire hangers shall not be fixed to any other services, without the approval of the Departmental Representative.

.7 The free end of the wire rope should be threaded through one channel of the self-locking grip before being either passed around the object being suspended or connected to it, using a suitable fixing. The wire rope is then threaded back through the second channel in the grip until the required level is achieved.

.8 Adjust duct elevations as required to remain level and plumb, the weight of the suspended object must be independently supported while making adjustments.

.9 The wire rope must not be damaged, twisted or deformed in any way prior to, or during, installation. Any such ropes must be discarded and replaced.

.10 When installing wire hangers the angle between the ropes when exiting the grip must never exceed the manufacturer’s recommendations and/or 60 degrees.

.11 Lubricants, paint or any other coating shall not be applied to the wire hanger as it may impair its performance.

.12 Wire hangers must be installed in accordance with the manufacturer’s loading and installation instructions and all the manufacturer’s recommendations.

3.6 LEAKAGE TESTS

.1 Refer to Section 23 05 93.

.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 tests before performance insulation or concealment Work.

3.7 SEALANT APPLICATION

.1 Contractor shall apply sealant on exposed ductwork in a 50mm band centered on joint.

.2 Sealant shall be applied evenly with a clean edge finish perpendicular to duct and plumb.

.3 Tape shall be utilized to provide clean edge finish to sealant application.

3.8 SOUND ATTENUATING TRANSFER DUCTS

.1 Sound attenuating transfer air ducts shall be installed where indicated on drawings complete with internal acoustic insulation in accordance with Section 23 07 13.

.2 Elbows on sound attenuating transfer air ducts shall not utilize turning vanes.

.3 Geometry of all sound attenuating transfer air ducts shall ensure that sound contacts a minimum of two duct surfaces.

.4 Provide single elbow configurations or double elbow configurations as indicated on drawings. It is permissible to utilize double elbow configurations in lieu of single elbow but not vice versa.

END OF SECTION

1 General

1.1 SECTION INCLUDES

.1 Silencers.

1.2 REFERENCES

.1 AABC - National Standards for Total System Balance.
.2 AMCA 300 - Reverberant Room Method for Sound Testing of Fans.
.3 AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data.
.4 AMCA 302 - Application of Sone Ratings for Non-Ducted Air Moving Devices.
.5 AMCA 303 - Application of Sound Power Level Ratings for Fans.
.6 ANSI S1.1 - Acoustical Terminology.
.7 ANSI S1.8 - Preferred Reference Quantities for Acoustical Levels.
.8 ANSI S1.13 - Measurement of Sound Pressure Levels in Air.
.9 ARI 270 - Sound Rating of Outdoor Unitary Equipment.
.10 ARI 575 - Measuring Machinery Sound Within an Equipment Space.
.11 ASA 16 (ANSI S1.36) - Survey Methods for Determination of Sound Power Levels of Noise Sources.
.12 ASA 47 (ANSI S1.4) - Specification for Sound Level Meters.
.13 ASA 49 (ANSI S12.1) - Preparation of Standard Procedures to Determine the Noise Emission from Sources.
.14 ASHRAE 68 - Laboratory Method of Testing to Determine the Sound Power in a Duct.
.15 ASHRAE Handbook - Systems Volume, Chapter "Sound and Vibration Control".
.16 ASTM E90 - Method for Laboratory Measurement of Airborne Sound Transmission loss of Building Partitions and Elements.
.17 ASTM E477 - Method of Measuring Acoustical and Airflow Performance of Duct Liner Materials and Prefabricated Silencers.
.18 ASTM E596 - Method for Laboratory Measurement of Noise Reduction of Sound-Isolating Enclosures.
.19 NEBB - Procedural Standards for Measuring Sound and Vibration.
.20 SMACNA - HVAC Duct Construction Standards - Metal and Flexible.

1.3 SUBMITTALS

.1 Section 01 33 00: Procedures for submittals.

.2 Shop Drawings: Indicate assembly, materials, thicknesses, dimensional data, pressure losses, acoustical performance, layout, and connection details.

.3 Product Data: Provide catalogue information indicating, materials, dimensional data, pressure losses, and acoustical performance.

.4 Design Data: Provide engineering calculations, referenced to specifications and AMCA 301 standards indicating that maximum room sound levels are not exceeded.

.5 Test Reports: Indicate dynamic insertion loss and noise generation values of silencers.

.6 Manufacturer's Installation Instructions: Indicate installation requirements which maintain integrity of sound isolation.

1.4 PROJECT RECORD DOCUMENTS

.1 Section 01 78 00: Submittals for project closeout.

.2 Record actual locations of silencers and sound attenuating devices.

1.5 QUALITY ASSURANCE

.1 Perform Work to AMCA 300 standards and recommendations of ASHRAE 68.

1.6 QUALIFICATIONS

.1 Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

.2 Design application of duct silencers under direct supervision of a Professional Engineer experienced in design of this work and licensed at the place where the Project is located.

2 Products

2.1 CROSS TALK SILENCERS

.1 Description: manufactured dual elbow silencer with sheet metal outer casing, sound absorbing fill material, and inner casing of perforated sheet metal; incorporating interior baffles of similar construction. Fabricate to SMACNA HVAC Duct Construction Standards - Metal and Flexible.

.2 Configuration and performance: as noted on equipment schedule, insertion loss to ASTM E477

.3 Materials:
- .1 Outer Casing: Minimum 0.8 mm (22 gauge) thick galvanized steel stiffened as required, with mastic filled lock formed seams, 75 mm long, 2.9 mm slip joints on both ends.
- .2 Inner Casing and Splitters: Minimum 0.8 mm (22 gauge) thick perforated galvanized steel.
- .3 Fill: Formaldehyde free Glass fibre or mineral wool of minimum 64 kg/cu m density.

.4 Specification Based on VAW Model XTS

3 Execution

3.1 INSTALLATION

.1 Install to manufacturer's written instructions.

.2 Support duct silencers independent of duct work with flexible duct connections, lagged with leaded vinyl sheet on inlet and outlet. Refer to Section 23 33 00.

END OF SECTION

1 General

1.1 SECTION INCLUDES

.1 Fire dampers.
.2 Flexible duct connections.
.3 Volume control dampers.

1.2 REFERENCES

.1 NFPA 90A - Installation of Air Conditioning and Ventilating Systems.
.2 NFPA 92A - Smoke-Control Systems.
.3 SMACNA - HVAC Duct Construction Standards - Metal and Flexible.
.4 UL 33 - Heat Responsive Links for Fire-Protection Service.
.5 UL 555 - Fire Dampers.
.6 UL 555S - Smoke Dampers.

1.3 SUBMITTALS

.1 Section 01 33 00: Procedures for submittals.

.2 Shop Drawings: Provide for shop fabricated assemblies including volume control dampers.

.3 Product Data: Provide for shop fabricated assemblies including volume control dampers. Include electrical characteristics and connection requirements.

.4 Manufacturer's Installation Instructions: Indicate for dampers including fire and fire/ smoke dampers.

1.4 PROJECT RECORD DOCUMENTS

.1 Section 01 78 00: Submittals for project closeout.

.2 Record actual locations of access doors.

1.5 QUALITY ASSURANCE

.1 Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

.2 Accessories shall meet the requirements of NFPA 90A, Air Conditioning and Ventilating Systems.

.3 Fabricate in accordance with ASHRAE handbooks and SMACNA duct manuals.

1.6 REGULATORY REQUIREMENTS

.1 Products Requiring Electrical Connection: Listed and classified by Underwriters' Laboratories Inc., as suitable for the purpose specified and indicated.

1.7 DELIVERY, STORAGE, AND HANDLING

.1 Section 01 61 00: Transport, handle, store, and protect products.

.2 Protect dampers from damage to operating linkages and blades.

1.8 EXTRA MATERIALS

.1 Section 01 78 00: Submittals for project closeout.

.2 Provide two of each size and type of fusible link.

2 Products

2.1 FLEXIBLE DUCT CONNECTIONS

.1 Fabricate to SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.

.2 Connector:
- .1 Fabric: cUL listed fire-retardant self extinguishing neoprene coated woven glass fibre fabric to NFPA 90A, minimum density 1.0 kg/sq m. Approximately 50mm of fabric clenched by means of double locked seams.
- .2 Frame: 75 mm wide, 0.6 mm thick galvanized sheet metal.
- .3 Attach edging strip to ducting and equipment by screws or bolts at 150 mm (6") intervals

.3 Leaded Vinyl Sheet: Minimum 14 mm/0.55 inch thick, 4.2 kg/sq m, 0.87 lbs per sq ft, 10 dB attenuation in 10 to 10,000 Hz range.

3 Execution

3.1 INSTALLATION

.1 Install accessories to manufacturer's written instructions, NFPA 90A, and follow SMACNA HVAC Duct Construction Standards - Metal and Flexible.

.2 Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.

3.2 FLEXIBLE CONNECTORS

.1 Provide flexible connections immediately adjacent to equipment in ducts associated with fans and motorized equipment, and supported by vibration isolators, including but not limited to the following:
- .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.

.6 For fans developing static pressures of 1250 Pa and over, cover connections with leaded vinyl sheet, held in place with metal straps.

END OF SECTION

1 General

1.1 SUMMARY

.1 Section Includes:
- .1 Balancing dampers for mechanical forced air ventilation and air conditioning systems.
- .2 Sustainable requirements for construction and verification.

1.2 REFERENCES

.1 Sheet Metal and Air Conditioning National Association (SMACNA).
- .1 SMACNA HVAC Duct Construction Standards, Metal and Flexible-1985.

.2 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.

1.4 QUALITY ASSURANCE

.1 Health and Safety Requirements:
- .1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

2 Products

2.1 GENERAL

.1 Manufacture to SMACNA standards.

2.2 MANUAL VOLUME CONTROL DAMPERS.

.1 Fabricate to SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.

.2 Splitter Dampers:
- .1 Fabricate from same material as duct but one sheet metal thickness heavier (minimum 16 gauge), with appropriate stiffening to avoid vibration.
- .2 Blade: Fabricate of double thickness sheet metal to streamline shape, secured with continuous piano hinge.
- .3 Operator: Minimum 6 mm diameter rod in self aligning, universal joint action, flanged bushing with set screw and position indicator.
- .4 Rod configuration to prevent end from entering duct.
- .5 Folded leading edge.
- .6 Size on basis of straight air volume proportioning.

.3 Single Blade Dampers:
- .1 Fabricate for duct sizes up to 150 (in depth) x 760 mm.
- .2 Fabricate from same material as duct, but one sheet metal thickness heavier (minimum 16 gauge). V-groove stiffened.
- .3 Size and configuration to recommendations of SMACNA
- .4 Locking quadrant with shaft extension to accommodate insulation thickness.
- .5 Inside and outside nylon end bearings.
- .6 Channel frame of same material as adjacent duct, complete with angle stop.

.4 Multi-Blade Damper:
- .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
- .4 Bearings: self-lubricating oil impregnated nylon.
- .5 Linkage: shaft extension with locking quadrant.
- .6 Channel frame of same material as adjacent duct, complete with angle stop.

.5 End Bearings: Except in round duct work 300 mm and smaller, provide end bearings.

.6 Quadrants:
- .1 Provide locking, indicating quadrant regulators on single and multi-blade dampers.
- .2 On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.
- .3 Where rod lengths exceed 750 mm provide regulator at both ends.

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 specified, where required for balancing and where indicated on drawings.

.2 Install in accordance with recommendations of SMACNA and in accordance with manufacturer's instructions.

.3 Use splitter dampers only where indicated.

.4 Provide commercial balancing dampers on all low velocity duct take-offs to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly unless specifically noted otherwise.

.5 Runouts to registers and diffusers: install single blade damper located as close as possible to main ducts. Where indicated on the drawings, a balancing damper is not required for runouts in non-accessible ceiling spaces provided a damper is specified on the register and diffuser.

.6 Dampers: shall be installed vibration free.

.7 Ensure damper operators are observable and accessible. Provide access doors in ceilings/ walls where required.

END OF SECTION

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.
- .2 Sustainable requirements for construction and verification.

1.2 SYSTEM DESCRIPTION

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

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 Indicate following:
  - .1 Capacity.
  - .2 Throw and terminal velocity.
  - .3 Noise criteria.
  - .4 Pressure drop.
  - .5 Neck velocity.

.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.

1.4 QUALITY ASSURANCE

.1 Air flow tests and sound level measurement shall be made in accordance with ANSI/ ASHRAE Standard 70.

.2 Manufacturer shall have published performance data.

.3 Manufacturer shall certify catalogued performance and ensure correct application of air outlet types.

1.5 JOB CONDITIONS

.1 Review requirements of outlets as to size, finish and type of mounting prior to submitting shop drawings and schedules of outlet.

2. Positions indicated are approximate only. Check location of outlets and make necessary adjustment in position to conform with Architectural features, symmetry, performance, and lighting arrangement.

2 Products

2.1 GENERAL

.1 To meet capacity, pressure drop, terminal velocity, throw, noise level, neck velocity as indicated.

.2 Base air outlet application on space noise level, either by Noise Criteria (NC) curves or Room Criteria (RC) curves, as listed below:

.1	Classroom	NC 30
.2	Offices	NC 30
.3	Scenario Spaces	NC 30

.3 Frames:
- .1 Full perimeter gaskets.
- .2 Plaster frames for diffusers, located in plaster surface.
- .3 Concealed fasteners.

.4 Concealed manual volume control damper operators.

.5 Provide baffles to direct air away from walls, columns or other obstructions within the radius of diffuser operation.

.6 Provide anti-smudge frames or plaques on diffusers located in rough textured surfaces such as acoustical plaster.

.7 Refer to equipment schedule for specification of air outlets.

.8 Colour: as directed by Departmental Representative.

2.2 MANUFACTURED UNITS

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

2.3 LOUVRED SUPPLY GRILLES

.1 Supply grilles shall have streamlined and individually adjustable curved blades to discharge air along face of grille. Units shall have two-way deflection.

.2 Provide 25 mm narrow margin frame with countersunk screw holes.

.3 Fabricate of heavy aluminum extrusions.

.4 Provide grilles with integral, gang-operated opposed blade dampers with removable key operator, operable from face, and equalizing grid, where indicated.

.5 Finish in factory enamel finish, colour as selected by Departmental Representative.

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 instructions.

.2 Install with oval head, stainless steel screws in countersunk holes where fastenings are visible.

.3 Bolt grilles, registers and diffusers, in place, where indicated.

.4 With security grilles, contractor shall use high yield grout to fill any space between back of the face plate and the mounting surface.

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 GENERAL

.1 This Section covers items common to Sections 26, 27 & 28. This section supplements requirements of Section 01.

1.2 CODES AND STANDARDS

.1 Do complete installation in accordance with CSA C22.1 latest edition unless specified otherwise.

.2 Do overhead and underground systems in accordance with CSA C22.3 No.1-M1987 except where specified otherwise.

1.3 DRAWINGS AND SPECIFICATIONS

.1 Before submitting bid and commencing work, check drawings and specifications of other trades for conflicts with the electrical work, if such conflicts exist, obtain a ruling from the Departmental Representative as to what adjustments are to be made before proceeding. Carefully examine the site and ascertain all related conditions, and verify all dimensions.

.2 Should any discrepancy appear between the electrical drawings and the specifications which leaves the trade in doubt as to the true intent and meaning of the drawings and specifications, obtain a ruling from the Departmental Representative before submitting a tender. If this is not done, it will be assumed the more expensive alternative has been allowed.

1.4 SHOP DRAWINGS

.1 Submit shop drawings to the Departmental Representative for electrical equipment and material specified in the following specification sections:

.1 Section 26 05 31 – Splitters, Junction, Pull Boxes and Cabinets
.2 Section 26 05 35 – Surface & Lighting Fixture Raceways
.3 Section 26 24 17 – Panelboards Breaker Type
.4 Section 26 27 26 – Wiring Devices
.5 Section 26 28 16 – Moulded Case Circuit Breakers
.6 Section 26 52 00 – LED Lighting
.7 Section 26 52 01 – Unit Equipment for Emergency Lighting
.8 Section 26 53 00 – Exit Signs
.9 Section 27 05 14 – Communication Cables Inside Buildings
.10 Section 27 11 19 – Terminals & Connectors for Building Communication Conductors
.11 Section 28 31 02 – Multiplex Fire Alarm System

.2 Submit all shop drawings electronically in PDF format. Provide a separate PDF file for each specification section complete with bookmarks for each individual piece of equipment or material. Bookmark names shall correspond to equipment/material names, numbers or labels indicated on the plans or in the specifications.

.3 Ensure all shop drawings contain information pertinent to this project only. Clearly identify all accessories, options, mounting provisions, etc. on each shop drawing.

.4 Include all light fixture shop drawings in a single submission. Arrange light fixture types within the PDF in alphabetical order complete with a bookmark for each fixture. Include lamp, ballast and/or LED driver cut sheets for each light fixture type. Provide IES format photometric reports for each fixture submitted.

.5 All shop drawings shall be reviewed and marked as such the Div 26/27/28 contractor.

.6 Shop drawings which do not comply with the submission requirements listed above will be rejected without review and returned to the contractor for revision and re-submission.

1.5 MAINTENANCE MANUALS AND AS-BUILT DRAWINGS

.1 Compile and submit to the Departmental Representative for review one (1) set of printed and one (1) pdf copy on USB memory stick maintenance manuals. Each manual shall contain shop drawings for all major electrical equipment, a list of suppliers providing components, original factory manuals, name and address of contractors, test results and certificates. Manuals shall be bound in blue 3 ring binders with project name, address and date of completion embossed in white on the binding and the cover.

.2 Submit one (1) digital copy of the maintenance manual in PDF format for review by the Departmental Representative prior to printing hard copies.

.3 Submit to the Departmental Representative as-built drawings detailing electrical systems as installed. Include the following:

.1 All addenda, approved change orders and site instructions. These shall be indicated on the drawings using the consultant’s symbols. Where this is not practical, attach all related documents to the appropriate drawing.

.2 Ensure all panel schedules and circuit numbers reflect on site changes.

.3 Update and dimension all underground services. Dimension from corners of buildings.

1.6 WARRANTY

.1 Unless specified elsewhere, all materials and workmanship shall be warranted for a period of one (1) year from the date of final acceptance. During this time, the contractor shall repair or replace, at their expense, any defective materials or workmanship.

1.7 CARE, OPERATION, START-UP, AND TRAINING

.1 Instruct Departmental Representative operating personnel in the operation, care and maintenance of systems, system equipment and components.

.2 Arrange and pay for the services of manufacturer's factory trained service representative to supervise the start-up of installation and to 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 familiar with all aspects of its care and operation.

.4 Where systems require programming, provide initial programming to allow system to operate in all functional modes. As part of the Departmental Representative operating personnel training demonstrate how to make changes to all programmable functions and modes. Refer to individual specification sections for further training requirements.

.5 Arrange and pay for digital audio/video recording of all Departmental Representative operating personnel training sessions. Upon completion of all training sessions, provide three (3) complete sets of recorded training sessions on DVD. Recording and playback formats shall be compatible with all standard PC's or DVD players. Arrange all files in an easy to read, logical format using a menu system.

.6 Training sessions shall be attended by Departmental Representatives and the consultant. Training sessions shall be arranged a minimum of 10 working days in advance. The contractor shall direct the training session and training shall be provided by the manufacturers representative. Contractor shall provide an attendance sheet which shall be completed by all individuals present at the training session. The attendance sheet shall indicate the system being demonstrated, the name of the contractor, the name and qualifications of the manufacturers representative, the date of the session, the names and positions of the Departmental Representative personnel, the names and positions of the consultants and the project name.

1.8 VOLTAGE RATINGS

.1 Operating voltages: to CAN3-C235-83 (R2010).

.2 Motors, electric heating, control and distribution devices and equipment shall operate satisfactorily at 60 Hz within normal operating limits established by above standard. Equipment shall operate in extreme operating conditions established in above standard without damage to equipment.

1.9 VOLTAGE DROP CALCULATIONS

.1 Perform voltage drop calculations on branch circuit wiring. Adjust conduit and wire sizes as required to conform to a maximum of 5% voltage drop from the supply side of the customers service to the point of utilization and 3% voltage drop in feeder or branch circuits. Refer to CEC section 8.

1.10 PERMITS, FEES AND INSPECTION

.1 Submit to Electrical Inspection Department and Supply Authority necessary number of drawings and specifications for examination and approval prior to commencement of work.

.2 Pay associated fees.

.3 Departmental Representative will provide drawings and specifications required by Electrical Inspection Department and Supply Authority at no cost.

.4 Notify Departmental Representative of changes required by Electrical Inspection Department prior to making changes.

.5 Provide Certificates of Acceptance from authorities having jurisdiction on completion of work to Consultant.

1.11 MATERIALS AND EQUIPMENT

.1 Provide materials and equipment in accordance with Section 01 61 00 - Common Product Requirements.

.2 All equipment and material shall be new and shall be CSA certified. Where there is no alternative to supplying equipment which is not CSA certified, obtain special approval from Electrical Inspection Department.

.3 Factory assemble control panels and component assemblies.

1.12 MECHANICAL CONTROLS AND CONTROL WIRING

.1 Refer to mechanical contract documents for all information related to mechanical controls and control wiring including responsibility for supply and installation.

1.13 FINISHES

.1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.

.1 Paint outdoor electrical equipment "equipment green" finish to EEMAC Y1-1-1955.

.2 Paint indoor switchgear and distribution enclosures light grey to EEMAC 2Y-1-1958.

.2 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.

.3 Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.

1.14 EQUIPMENT IDENTIFICATION

.1 Identify electrical equipment with nameplates and labels as follows:

.2 Nameplates:

.1 Lamacoid 3 mm thick plastic engraving sheet, black face, white core, attached with adhesive back.

NAMEPLATE SIZES

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

.3 Labels: Embossed plastic labels with 6 mm high letters unless specified otherwise.

.4 Wording on nameplates and labels shall be approved by Departmental Representative prior to manufacture.

.5 Allow for average of twenty-five (25) letters per nameplate and label.

.6 Identification to be English and French.

.7 Use one nameplate or label for each language.

.8 Nameplates for terminal cabinets and junction boxes shall indicate system and/or voltage characteristics.

.9 Identify equipment with Size 3 labels engraved "ASSET INVENTORY No.___". Number as and if directed by Consultant.

.10 Disconnects, starters and contactors: indicate equipment being controlled and voltage.

.11 Terminal cabinets and pull boxes: indicate system and voltage.

.13 Each panel shall be supplied with a directory card holder welded to inside of door, complete with a neatly typewritten list showing information as follows:

PANEL BOARD NAME……B
PANEL CIRCUIT……..120/208 VOLTS

CIRCUIT NUMBER	DESCRIPTION	LOAD
1	LIGHTING ROOM 100	1200 WATTS
2	RECEPTACLES ROOM 100	6-15 AMPS
3	ROOM 220 EXHAUST FAN	500 WATTS

.14 Receptacle Identification:

.1 Provide size 1 lamacoid label indicating circuit number(s) (ie. 2A-21) on each receptacle coverplate.

.2 Emergency receptacles hall have red lamacoid labels instead of black.

1.15 WIRING IDENTIFICATION

.1 Identify wiring with permanent indelible identifying markings, either numbered or coloured plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring.

.2 Maintain phase sequence and colour coding throughout.

.3 Colour code: to latest edition of CSA C22.1.

.4 Use colour coded wires in communication cables, matched throughout system.

.5 Branch circuit wiring at all receptacles shall be labelled with circuit number (ie. 2A-21) using slide-on, collar type identifiers with factory printed numbering. Use black lettering on white background.

1.16 CONDUIT AND CABLE IDENTIFICATION

.1 Colour code conduits, boxes and metallic sheathed cables.

.2 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor, and at 15 m intervals.

.3 Colours: 25 mm wide prime colour and 20 mm wide auxiliary colour.

	Prime	Auxiliary
up to 250 V	Yellow	
up to 600 V	Yellow	Green
up to 5 kV	Yellow	Blue
up to 15 kV	Yellow	Red
Voice	Green	
Data	Green	Blue
Fire Alarm	Red	
Nurse Call	Red	Blue
Security Systems	Red	Yellow

.1 Identify conduits, boxes and metallic sheathed cables except for branch circuit conduits less than 25mm.

.2 Identification shall consist of self adhesive printed labels, white label with minimum 20mm black lettering.

.3 Identify all junction boxes on the side and on the cover.

.4 Identify conduits at 10m intervals and/or in every room.

.5 Identify conduits and boxes such that labeling is clearly visible from floor level.

.6 Junction boxes that contain branch circuitry shall identify each circuit on the label including panel designation and voltage.

.7 Conduits 25mm and larger that contain branch circuitry shall identify the panel description, voltage and indicate ‘branch circuits’.

.8 Feeder conduits shall identify the load being fed and the voltage.

.9 Systems conduits and boxes shall identify the system.

.10 Provide a sample of the labeling to the Departmental Representative for approval prior to the installation.

1.17 WIRING TERMINATIONS

.1 Lugs, terminals, screws used for termination of wiring to be suitable for either copper or aluminum conductors.

1.18 MANUFACTURERS AND CSA LABELS

.1 Visible and legible, after equipment is installed.

1.19 WARNING SIGNS

.1 As specified and to meet requirements of Electrical Inspection Department and Departmental Representative.

.2 Decal signs, minimum size 175 x 250 mm.

1.20 LOCATION OF OUTLETS

.1 Do not install outlets back-to-back in wall; allow minimum 150 mm horizontal clearance between boxes.

.2 Change location of outlets at no extra cost or credit, providing distance does not exceed 3000 mm, and information is given before installation.

.3 Locate light switches on latch side of doors.

1.21 VAPOUR BARRIER INTEGRITY

.1 Maintain the integrity of the building vapour barrier where penetrations occur as a result of the work under this division. Refer to appropriate specification sections under other divisions to determine the extent and quality of work.

.2 Use vapour barrier back box covers in all exterior walls and insulated ceilings.

.3 Seal all interior conduits that pass through unheated spaces using duct seal or approved alternate product.

1.22 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.

1.23 LOAD BALANCE

.1 Measure phase current to panelboards under normal operating conditions. Adjust branch circuit connections as required to obtain best balance of current between phases and record changes.

.2 Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment.

1.24 CONDUIT AND CABLE INSTALLATION

.1 Install conduit and sleeves prior to pouring of concrete. Sleeve all conduit penetrations through concrete with: schedule 40 steel pipe, sized for free passage of conduit, and protruding 50 mm. After conduit is installed, fill area between sleeve and conduit with #1/0 stainless steel wool. Seal area at each end using expanding insulating foam, trimmed neatly flush with concrete wall.

.2 Core all conduit and/or cable penetrations through exterior walls and grade beams. Provide and install Roxtec RS seals on interior and exterior of wall or grade beam to provide water tight seal between concrete and conduit/cable. Provide additional Roxtec seals on interior of wall or grade beam to provide water tight seal between conductors in conduit and conduit interior.

.3 If plastic sleeves are used in fire rated walls or floors, remove before conduit installation.

.4 Install cables, conduits and fittings to be embedded or plastered over, neatly and as close to building structure as possible so furring can be kept to minimum.

1.25 OWNERS EQUIPMENT

.1 Prior to ordering any equipment, the Contractor shall confirm the details, specifications and installation requirements for all Departmental Representative r supplied equipment requiring electrical connections. The Departmental Representative shall supply technical information including electrical ratings and installation details. The coordination of electrical provisions for this equipment is the responsibility of the Contractor and no electrical equipment shall be ordered without written confirmation from the Departmental Representative. No allowance shall be made to the Contractor for failure to complete this coordination work, thereby resulting in an incorrect installation.

1.26 EQUIPMENT SUPPLIED BY OTHER DIVISIONS

.1 The Electrical Contractor shall be fully responsible for obtaining electrical ratings, specifications, installation requirements and approved shop drawings of all equipment requiring electrical connections that is supplied by other divisions. No electrical equipment shall be ordered prior to obtaining this information. No electrical equipment shall be ordered prior to a formal review and acceptance of this information by the Departmental Representative. The Electrical Engineer shall issue written acceptance of the information and shall also provide, if required, documented changes to the electrical design resulting from the review of this information. No allowance shall be made to the Electrical Contractor for failure to complete this coordination work, thereby resulting in an incorrect installation.

1.27 FIRE STOPPING FOR ELECTRICAL CABLES

.1 Provide fire stop assemblies, at all required fire separations, for any power and communications cables passing through a fire separation.

.2 Where individual conduits or power cables pass through a fire separation, provide fire rated caulking as specified in Section 07 84 00.

.3 Where multiple conduits, or power cables pass through a single opening in a fire separation, provide a factory assembled steel, rectangular pass through frame with removable intumescent material. Dorn Equipment FIRSTO or equal.

1.28 EXAMINATION OF SITE

.1 Prior to submitting a tender, the electrical contractor shall inspect the site to review conditions, existing equipment, etc., to ensure that there are no conflicts and that all work can be carried out as directed herein. No extra shall be made after tender award for work which would have been evident if a thorough investigation was carried out.

1.29 FIELD QUALITY CONTROL

All electrical work shall be carried out by qualified, licensed electricians or apprentices as per the conditions of the Provincial Act respecting vocational training and qualification. Employees registered in a provincial apprentices program shall be permitted, under the direct supervision of a qualified licensed electrician, to perform specific tasks - the activities permitted shall be determined based on the level of training attained and the demonstration of ability to perform specific duties.

1.30 ELECTRICAL TESTING

.1 Conduct and pay for the following tests:

Section	System	Test Criteria	Report
26 05 21	Wires and Cables 0-100V	As per miscellaneous feeder test schedule	As per miscellaneous feeder test schedule
26 28 16	Moulded Case Circuit Breakers	As per 26 28 16 Item 3.1.2	Submit manufacturers' start-up report
27 05 14	Communications Cabling Inside Buildings	As per 27 05 14 Item 3.3	As per 27 05 14 Item 3.3
28 31 02	Multiplex Fire Alarm System and Voice	As per 28 31 02 Item 3.2	Submit manufacturers' start-up and test reports

.3 Carry out tests in presence of Departmental Representative.

.4 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.

.5 Submit test results for Departmental Representative review.

1.31 INTEGRATED LIFE SAFETY SYSTEMS TEST

.1 Once the contract has been deemed substantially complete, the contractor shall perform an Integrated Life Safety Systems Test in accordance with National Building Code and National Fire Code. The commissioning of these integrated systems must be performed as a whole to ensure the proper operation and inter-relationship between the systems.

.2 The sequence of the test shall be provided by the Departmental Representative. The Contractor shall conduct the test and shall arrange for all necessary trades to assist in the test.

.3 In general, the test will include initiating a fire alarm, simulating a power failure and, if applicable, simulating an activated sprinkler head. The intent is to witness the function of all life safety systems and apparatus to ensure proper integration has been achieved.

.4 Upon completion of a successful test, the Departmental Representative will issue a copy of the completed test with signatures.

1.32 CO-ORDINATION OF PROTECTIVE DEVICES

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

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CSA C22.2No.65-93 (R2008), Wire Connectors.

.2 Electrical and Electronic Manufacturers' Association of Canada (EEMAC)

.1 EEMAC 1Y-2, 1961 Bushing Stud Connectors and Aluminum Adapters (1200 Ampere Maximum Rating).

Part 2 Products

2.1 MATERIALS

.1 Pressure type wire connectors: with current carrying parts of copper sized to fit copper conductors as required.

.2 Fixture type splicing connectors: with current carrying parts of copper sized to fit copper conductors 10 AWG or less.

.3 Bushing stud connectors: to EEMAC 1Y-2 to consist of:

.1 Connector body and stud clamp for round copper conductors.
.2 Clamp for round copper conductors.
.3 Clamp for conductors.
.4 Stud clamp bolts.
.5 Bolts for copper conductors.
.6 Bolts for aluminum conductors.
.7 Sized for conductors as indicated.

.4 Clamps or connectors for armoured cable, aluminum sheathed cable, mineral insulated cable, flexible conduit, non-metallic sheathed cable as required.

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.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 26 05 20 - Wire and Box Connectors - 0 - 1000 V.

1.2 REFERENCES

.1 CSA C22.2 No .03-96 (R2000), Test Methods for Electrical Wires and Cables.

.2 CAN/CSA-C22.2 No. 131-M89 (R1994), Type TECK 90 Cable.

1.3 PRODUCT DATA

.1 Submit product data in accordance with Submittal Procedures.

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Construction/Demolition Waste Management and Disposal, and with the Waste Reduction Workplan.

.2 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.

.3 Fold up metal banding, flatten and place in designated area for recycling.

Part 2 Products

2.1 BUILDING WIRES

.1 Conductors: stranded for 10 AWG and larger. Minimum size: 12 AWG.

.2 Copper conductors: size as indicated, with minimum 600V insulation of chemically cross-linked thermosetting polyethylene material rated RW90 or RWU90.

.3 Conductors with 1000V insulation when servicing loads connected to variable frequency drives.

2.2 ARMOURED CABLES

.1 Type: AC90.

.1 Conductors: insulated, copper, size as indicated.

.2 Armour: interlocking type fabricated from aluminum strip.

2.3 COMMUNICATIONS AND SYSTEMS CABLES

.1 Refer to individual sections elsewhere in this specification for cable specifications.

Part 3 Execution

3.1 INSTALLATION OF BUILDING WIRES

.1 Install wiring as follows:

.1 All building wires shall be installed in conduit in accordance with Section 26 05 34.

.2 In surface and lighting fixture raceways in accordance with Section 26 05 35.

3.2 INSTALLATION OF ARMOURED CABLES

.1 Group cables wherever possible.

.2 Terminate cables in accordance with Section 26 05 20 - Wire and Box Connectors - 0 - 1000 V.

.3 AC90 cables shall be allowed to be used for drops to light fixtures providing the maximum horizontal length does not exceed 1800mm or unless indicated otherwise on the drawings.

.4 AC90 cables shall be allowed to be used for vertical drops to wiring devices in drywall stud partitions providing the maximum horizontal length from the junction box does not exceed 1800mm. Do not run AC90 cables horizontally in partitions.

3.3 INSTALLATION OF COMMUNICATIONS AND SYSTEMS CABLES

.1 Install all cables in conduit unless specifically indicated otherwise on the drawings.

.2 Refer to individual sections for additional requirements.

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 CSAZ32.1-M1986, Safety in Anaesthetizing Locations.

Part 2 Products

2.1 EQUIPMENT

.1 Clamps for grounding of conductor: size as required 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 Rod electrodes: copper clad steel, 19 mm dia by 6 m long.

.4 Grounding conductors: bare stranded copper, soft annealed, size as indicated.

.5 Insulated grounding conductors: green, type RW-90.

.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.

Part 3 Execution

3.1 INSTALLATION GENERAL

.1 Install complete permanent, continuous grounding system including, electrodes, conductors, connectors, accessories. Where EMT is used, run ground wire in conduit.

.2 Install connectors in accordance with manufacturer's instructions.

.3 Protect exposed grounding conductors from mechanical injury.

.4 Make buried connections, and connections to conductive water main and electrodes using copper welding by thermal process.

.5 Use mechanical connectors for grounding connections to equipment provided with lugs.

.6 Soldered joints are not permitted.

.7 Install bonding wire for flexible conduit, connected at end to grounding bushing, solderless lug, clamp or cup washer and screw.

.8 Make grounding connections in radial configuration only, with connections terminating at street side of water pipe. Series and loop connections are not acceptable.

.9 Bond single conductor, metallic armoured cables to cabinet at supply end, and provide non-metallic entry plate at load end.

.10 Ground secondary service pedestals.

3.2 ELECTRODES

.1 Install concrete encased electrodes in building foundation footings, with terminal connected to grounding network.

.2 Install rod electrodes and make grounding connections.

.3 Bond separate, multiple electrodes together.

.4 Use size 3/0 AWG copper conductors for connections to electrodes.

.5 Make special provision for installing electrodes that will give acceptable resistance to ground value where rock or sand terrain prevails. Ground as indicated.

3.3 SYSTEM AND CIRCUIT GROUNDING

.1 Install system and circuit grounding connections to neutral of primary system.

3.4 EQUIPMENT GROUNDING

.1 Install grounding connections to typical equipment included in, but not necessarily limited to following list; Service equipment, switchgear, frames of motors, starters, control panels, building steel work, raceways, distribution panels, outdoor lighting.

3.5 COMMUNICATION SYSTEMS

.1 Install grounding connections for fire alarm systems as follows:

.1 Fire alarm systems as indicated.

3.6 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 01 - 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 RELATED SECTIONS

.1 Construction/Demolition Waste Management And Disposal.

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.

Part 3 Execution

3.1 INSTALLATION

.1 Secure equipment to 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 steel straps to secure surface conduits and cables 53 mm and smaller.
- .2 Two-hole steel straps for conduits and cables larger than 53 mm.
- .3 Beam clamps to secure conduit to exposed steel work.

.7 Suspended support systems.

- .1 Support individual cable or conduit runs with 6 mm dia threaded rods and spring clips.
- .2 Support 2 or more cables or conduits on channels supported by 6 mm dia threaded rod hangers where direct fastening to building construction is impractical.

.8 For surface mounting of two or more conduits use channels at 3 m on centre spacing.

.9 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.

.10 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.

.11 Do not use wire lashing or perforated strap to support or secure raceways or cables.

.12 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Departmental Representative.

.13 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

END OF SECTION

Part 1 General

1.1 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings and product data for cabinets in accordance with Submittal Procedures.

1.2 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Construction/Demolition Waste Management and Disposal, and with the Waste Reduction Workplan.

.2 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.

.3 Fold up metal banding, flatten and place in designated area for recycling.

Part 2 Products

2.1 SPLITTERS

.1 Sheet metal enclosure, welded corners and formed hinged cover suitable for locking in closed position.

.2 Main and branch lugs to match required size and number of incoming and outgoing conductors as indicated.

.3 At least three spare terminals on each set of lugs in splitters less than 400 A.

2.2 JUNCTION AND PULL BOXES

.1 Welded steel construction with screw-on flat covers for surface mounting.

.2 Covers with 25 mm minimum extension all around, for flush-mounted pull and junction boxes.

Part 3 Execution

3.1 JUNCTION, PULL BOXES AND CABINETS INSTALLATION

.1 Install pull boxes in inconspicuous but accessible locations.

.2 Only main junction and pull boxes are indicated. Install pull boxes so as not to exceed 30 m of conduit run between pull boxes.

3.2 IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 01 - Common Work Results - Electrical.

.2 Install size 2 identification labels indicating system name, voltage and phase.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 CSA C22.1-2009, Canadian Electrical Code, Part 1.

1.2 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Construction/Demolition Waste Management and Disposal, and with the Waste Reduction Workplan.

.2 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.

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 for special devices.

.3 Gang boxes where wiring devices are grouped.

.4 Blank cover plates for boxes without wiring devices.

.5 Combination boxes with barriers where outlets for more than one system are grouped.

2.2 SHEET STEEL OUTLET BOXES

.1 Electro-galvanized steel 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.

.2 Electro-galvanized steel utility boxes for outlets connected to surface-mounted EMT conduit, minimum size 102 x 54 x 48 mm.

.3 102 mm square or octagonal outlet boxes for lighting fixture outlets.

.4 102 mm square outlet boxes with extension and plaster rings for flush mounting devices in finished 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-glavanized 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: 28 mm for receptacles; 73 mm for communication equipment.

.2 Multi service type floor boxes complete with hinged PVC cover, sheet steel construction and space for two (2) standard devices. Minimum dimensions shall be 300mm long x 125 mm wide x 70mm deep.

2.6 CONDUIT BOXES

.1 Cast FS or FD feraloy boxes with factory-threaded hubs and mounting feet for surface wiring of switches and receptacle.

2.7 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 32 mm and pull boxes for larger conduits.

.4 Double locknuts and insulated bushings on sheet metal boxes.

Part 3 Execution

3.1 INSTALLATION

.1 Support boxes independently of connecting conduits.

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

.3 For flush installations mount outlets flush with finished wall using plaster rings to permit wall finish to come within 6 mm of opening.

.4 Provide correct size of openings in boxes for conduit, mineral insulated and armoured cable connections. Reducing washers are not allowed.

.5 Outlet boxes installed on opposite sides of fire rated walls shall be complete with wall opening protective materials (fire rated putty pads) where outlet boxes are not separated by a minimum of 610mm.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Canadian Standards Association (CSA)

- .1 CAN/CSA C22.2 No. 18-98 (R2003), Outlet Boxes, Conduit Boxes, and Fittings and Associated Hardware.
- .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 (R2008), Electrical Metallic Tubing.
- .5 CSA C22.2 No. 211.2-06, Rigid PVC (Unplasticized) Conduit.
- .6 CAN/CSA C22.2 No. 227.3-05 (R2010), Flexible Nonmetallic Tubing.

1.2 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance withConstruction/Demolition Waste Management and Disposal, and with the Waste Reduction Workplan.

.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.

.4 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.

Part 2 Products

2.1 CONDUITS

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

.2 Flexible metal conduit: to CSA C22.2 No. 56, steel.

.3 Flexible PVC conduit: to CAN/CSA-C22.2 No. 227.3.

2.2 CONDUIT FASTENINGS

.1 One hole steel straps to secure surface conduits 53 mm and smaller. Two hole steel straps for conduits larger than 53 mm.

.2 Beam clamps to secure conduits to exposed steel work.

.3 Channel type supports for two or more conduits at 3 m oc.

.4 Threaded rods, 6 mm dia., to support suspended channels.

2.3 CONDUIT FITTINGS

.1 Fittings: manufactured for use with conduit specified. Coating: same as conduit.

.2 Factory "ells" where 90˚ bends are required for 27 mm and larger conduits.

2.4 PULL CORD

.1 Polypropylene.

Part 3 Execution

3.1 INSTALLATION

.1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.

.2 Conceal conduits except in unfinished areas.

.3 Use rigid hot dipped galvanized steel threaded conduit except where specified otherwise.

.4 Use electrical metallic tubing (EMT) above 2.4 m not subject to mechanical injury.

.5 Use flexible metal conduit for connection to motors in dry areas, connection to recessed incandescent fixtures without a prewired outlet box, connection to surface or recessed LED fixtures and work in movable metal partitions.

.6 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment in damp, wet or corrosive locations.

.7 Minimum conduit size for lighting and power circuits: 21 mm.

.8 Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter.

.9 Mechanically bend steel conduit over 21 mm dia.

.10 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.

.11 Install pull cord in empty conduits.

.12 Run 2-27 mm spare conduits up to ceiling space and 2-27 mm spare conduits down to ceiling space from each flush panel. Terminate these conduits in 152 x 152 x 102 mm junction boxes in ceiling space or in case of an exposed concrete slab, terminate each conduit in surface type box.

.13 Remove and replace blocked conduit sections. Do not use liquids to clean out conduits.

.14 Dry conduits out before installing wire.

3.2 SURFACE CONDUITS

.1 Run parallel or perpendicular to building lines.

.2 Locate conduits behind infrared or gas fired heaters with 1.5 m clearance.

.3 Run conduits in flanged portion of structural steel.

.4 Group conduits wherever possible on channels.

.5 Do not pass conduits through structural members except as indicated.

.6 Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers.

3.3 CONCEALED CONDUITS

.1 Run parallel or perpendicular to building lines.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Canadian Standards Association (CSA)

.1 CAN/CSA-C22.2 No. 62-93/R1999, Surface Raceway Systems.

1.2 PRODUCT DATA

.1 Submit product data in accordance with Submittal Procedures.

.2 Indicate types of raceways with terminology similar to that used in this Section.

1.3 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Construction/Demolition Waste Management and Disposal, and with the Waste Reduction Workplan.

.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.

.4 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.

Part 2 Products

2.1 METALLIC RACEWAY SYSTEM

.1 The raceway shall be of a two piece design with a metal base and snap-on metal cover. Base shall be a minimum of 0.050" 1.3mm wall thickness and cover shall be a minimum of 0.040" 1mm wall thickness. Assembled base and cover shall be 4.750" 12mm wide by 1.750" 45mm high with a cross section area of 7.50 square inches 484mm². Base shall be dividable by means of a removable barrier section into two equal compartments. Provide cutting tool for the base and cover to ensure clean, square cuts.

.2 A full line of fittings must be available including but not limited to, flat, internal and external elbows, couplings for joining raceway sections, wire clips, blank end fitting and a full compliment of device mounting brackets and plates. The fittings shall be colored to match the raceway.

.3 A complete line of full capacity corner elbows and tee fittings must be available to maintain a controlled 2" 51mm cable bend radius which meets the specifications for Fiber Optic and UTP/STP cabling and exceeds the TIA 569 requirements for communications pathways. A series of inserts shall also be available for retrofit applications that provide a controlled 2" 51mm cable bend radius which meets the specifications for Fiber optic and UTP/STP cabling and exceeds the TIA 569 requirements for communications pathways.

.4 Device brackets shall be available to install single- or two-gang devices both horizontal or vertical within the raceway. Devices both power and data/communication shall have the capacity of mounting flush or in conjunction with faceplates. Device brackets and plates shall be colored to match the raceway.

.5 A plastic device mounting bracket and trim plate shall be available to install devices horizontally. Trim plate shall overlap cover-eliminating seam. Faceplates shall be available to accept a variety of power and data/communication devices. Plastic must be compatible with UL 94 for Plastic Materials.

.6 Refer to wiring device and communications sections. The raceway shall accept all specified devices.

Part 3 Execution

3.1 INSTALLATION

.1 Install raceways before installation of wiring. Install covers for raceways and fittings after installation or wiring.

.2 Install supports, elbows, tees, connectors, fittings, bushings, adaptors as required.

.3 Keep number of elbows, offsets, connections to minimum.

.4 Use wiring with mechanical protection in channel raceways.

.5 Install barriers in raceways where different voltage systems are indicated.

END OF SECTION

Part 1 General

1.1 RELATED WORK

.1 Plywood Backboard: Rough Carpentry.

1.2 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Submittal Procedures.

.2 Drawings to include electrical detail of panel, branch breaker type, quantity, ampacity and enclosure dimension.

Part 2 Products

2.1 PANELBOARDS

.1 Panelboards shall be the 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.

.2 250 and 600 V panelboards: bus and breakers rated for 10 KA (symmetrical) interrupting capacity minimum 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 Tin plated 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.

.10 Custom built panelboard assemblies.

.11 Double stack panels as indicated.

.12 Contactors in mains as indicated.

.13 Feed through lugs as indicated.

.14 Integral surge suppression device as indicated.

.15 Surface mount panels complete with sprinkler hoods in areas with sprinklers.

2.2 BREAKERS

.1 Breakers: to Section 26 28 21 - Moulded Case Circuit Breakers.

.2 Breakers with thermal and magnetic tripping in panelboards except as indicated otherwise.

.3 Main breaker: separately mounted on top or bottom of panel to suit cable entry. When mounted vertically, down position should open breaker.

.4 Provide lock-on devices for 10% of 15 to 30 A breakers installed as indicated. Turn over unused lock-on devices to Owner.

.5 Lock-on devices for fire alarm, door supervisory, intercom, stairway, exit and night light circuits.

2.3 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 01 - 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.

Part 3 Execution

3.1 INSTALLATION

.1 Locate panelboards as indicated and mount securely, plumb, true and square, to adjoining surfaces.

.2 Install surface mounted panelboards on plywood backboards. Where practical, group panelboards on common backboard.

.3 Mount panelboards to height specified in Section 26 05 01 - Common Work Results - Electrical or as indicated.

.4 Connect loads to circuits.

.5 Connect neutral conductors to common neutral bus with respective neutral identified.

.6 Provide (2) two empty 27mm conduits stubbed into the nearest ceiling space from each recess panelboard.

END OF SECTION

Part 1 General

1.1 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings and product data in accordance with Submittal Procedures.

Part 2 Products

2.1 SWITCHES

.1 15, 20A, 120 V, 277 V or 347 V single pole, double pole, three-way, four-way switches.

.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 Rocker operated, fully rated for all specified lamps, and up to 80% of rated capacity of motor loads.
- .6 Ivory toggle style, Leviton #1200 or #1800 Series.

.3 Single-pole / neon pilot AC combination switch with the following features:

- .1 15A, 120V rated.
- .2 Integral red neon pilot light.
- .3 Lamp shall be illuminated when load is on.
- .4 Ivory toggle style, Leviton #5226-W.

2.2 COMMERCIAL GRADE RECEPTACLES

.1 Commercial grade duplex receptacles, CSA type 5-15R, 125V, 15A, U ground, with the following features:

- .1 White thermoplastic nylon molded body and face.
- .2 Suitable for No.10 AWG for back and side wiring.
- .3 Break-off links for use as split receptacles.
- .4 Eight (8) back wired entrances, four (4) side wiring screws.
- .5 Triple wipe contacts and riveted grounding contacts.
- .6 Ivory standard receptacle, Leviton #5262.

.2 Commercial grade ground fault circuit interrupter receptacles, CSA type 5-15R and 5-20R, 125V, 15A with the following features:

- .1 Terminals accommodate No. 14-12 AWG wire.
- .2 Silver alloy contacts.
- .3 Test and reset button shall match face cover.
- .4 Eight (8) back wired entrances, four (4) side wiring screws.
- .5 Heavy duty double wipe contacts.
- .6 Green LED indicator light.

.7 Ivory thermoplastic nylon molded body and face, rectangular decorator style.
.8 AC horsepower rating at rated voltage: 1 ½ HP.
.9 Temp. rise: Max 30°C after 50 cycles OL at 150% rated current.
.10 Current limiting: 10kA.
.11 Meet CSA C22.2 No. 42: File LR-57811.
.12 5-15R - Leviton #7599 Series.
.13 5-20R - Leviton #7899 Series.

2.3 COVER PLATES

.1 Cover plates for wiring devices.

.2 Cover plates from one manufacturer throughout project.

.3 Stamped steel utility box cover for wiring devices installed in surface-mounted utility boxes and FS/FD boxes.

.4 Stainless steel, 1 mm thick cover plates, thickness 2.5 mm for wiring devices mounted in flush-mounted outlet box.

.5 Weatherproof while in use cover plates, complete with gaskets for duplex receptacles as indicated and transparent impact resistant polycarbonate NEMA 3R cover Hubbell Taymac MM410C or approved equal.

2.4 GENERAL

.1 Other receptacles with ampacity and voltage as indicated.

.2 Receptacles of one manufacturer throughout project.

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 specified in Section 26 05 01 - Common Work Results – Electrical or 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 specified in Section 26 05 01 - Common Work Results – Electrical or as indicated.

.3 Where split receptacle has one portion switched, mount vertically and switch upper portion.

.3 Cover plates:

.1 Protect stainless steel 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 RELATED SECTIONS

.1 Section 26 05 01 – Common Work Results - Electrical

1.2 REFERENCES

.1 CSA International

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

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for circuit breakers and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Include time-current characteristic curves for breakers with interrupting capacity of 22,000 A symmetrical (rms) and over at system voltage with ampacity of 200A and over.

.4 Certificates:

.1 Prior to installation of circuit breakers in either new or existing installation, Contractor must submit 3 copies of a production certificate of origin from the manufacturer. Production certificate of origin must be duly signed by factory and local manufacturer's representative certifying that circuit breakers come from this manufacturer and are new and meet standards and regulations.

.1 Production certificate of origin must be submitted to Departmental Representative for approval.

.2 Delay in submitting production of certificate of origin will not justify any extension of contract and additional compensation.

.3 Any work of manufacturing, assembly or installation to begin only after acceptance of production certificate of origin by Consultant. Unless complying with this requirement, Consultant reserves the right to mandate manufacturer listed on circuit breakers to authenticate new circuit breakers under the contract, and to Contractor's expense.

.4 Production certificate of origin must contain:

.1 Manufacturer's name and address and person responsible for authentication. Person responsible must sign and date certificate.

.2 Licensed dealer's name and address and person of distributor responsible for Contractor's account.

.3 Contractor's name and address and person responsible for project.

.4 Local manufacturer's representative name and address. Local manufacturer's representative must sign and date certificate.

.5 Name and address of building where circuit breakers will be installed:

.1 Project title: [_____].

.2 End user's reference number: [_____].

.3 List of circuit breakers: [_____].

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store circuit breakers indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect circuit breakers from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

Part 2 Products

2.1 BREAKERS GENERAL

.1 Moulded-case circuit breakers to CSA C22.2 No. 5.

.2 Bolt-on moulded case circuit breaker: quick- make, quick-break type, for manual and automatic operation 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 10,000A symmetrical rms interrupting capacity rating.

2.2 THERMAL MAGNETIC BREAKERS

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

2.3 OPTIONAL FEATURES

.1 Include:

.1 Shunt trip.

.2 Auxiliary switch.

.3 Under-voltage release.

.4 On-off locking device.

.5 Handle mechanism.

2.4 ENCLOSURE

.1 As indicated on the drawings.

Part 3 Execution

3.1 INSTALLATION

.1 Install circuit breakers as indicated.

3.2 CLEANING

.1 Progress Cleaning: clean in accordance with Section 26 05 00 Common Work Results – Electrical.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 CSA 22.1-09, Canadian Electrical Code, Part 1

.2 IEEE C62.41, Guide on the Surge Environment in Low-Voltage (1000 V and Less) AC Power Circuits.

.3 FCC 47 CFR Part 15, Federal Code of Regulation (CFR) testing standard for electronic equipment.

.4 IESNA LM-79-08, Electrical and Photometric Measurements of Solid-State Lighting Products.

.5 IESNA LM-80-08, Approved Method for Measuring Lumen Maintenance of LED Light Sources.

.6 IESNA TM-15, Luminaire Classification System for Outdoor Luminaires.

.7 UL1598, Standard for Safety of Luminaires.

.8 NEMA SSL 3-2010, High-Power White LED Binning for General Illumination.

.9 NEMA IEC60529, Degrees of Ingress Protection by Enclosures.

1.2 RELATED SECTIONS

.1 Submittal Procedures.

.2 Construction/Demolition Waste Management and Disposal.

.3 Quality Control.

1.3 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings in accordance with Submittal Procedures.

.2 Submit complete photometric data prepared by independent testing laboratory for luminaires where specified, for review by Departmental Representative.

.3 Photometric data to include: VCP Table spacing criterion.

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with 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.

1.5 QUALITY ASSURANCE

.1 Manufacturers of LED luminaires shall demonstrate a suitable quality assurance program incorporating high heat, high humidity and thermal shock test regimens to ensure system reliability and to substantiate lifetime claims.

.2 Luminaires shall be provided with a minimum 5 year warranty covering, LEDs, drivers, paint and mechanical components.

Part 2 Products

2.1 LED LUMINAIRES

.1 General: Except as otherwise indicated, provide LED luminaires, of types and sizes indicated on fixture schedules.

.2 Material and specifications for each luminaire are as follows:

.1 Each luminaire shall consist of an assembly that utilizes LEDs as the light source. In addition, a complete luminaire shall consist of a housing, LED array and electronic driver (power supply).

.2 The rated operating temperature range shall be 0°C to +40°C for interior fixtures. Exterior fixture operating range shall be -40°C to +40°C.

.3 Photometry must be compliant with IESNA LM-79-08 and shall be conducted at 25°C ambient temperature.

.4 Each luminaire shall meet all parameters of this specification throughout the minimum operational life.

.5 The individual LEDs shall be constructed such that a loss or the failure of one or more LEDs will not result in the loss of the entire luminaire.

.6 Luminaire shall be constructed such that LED modules may be replaced or repaired without replacement of whole luminaire.

.7 Each luminaire shall be listed with CSA or cUL under UL1598 for luminaires.

2.2 TECHNICAL REQUIREMENTS

.1 Electrical

.1 Power Consumption: Maximum power consumption allowed for the luminaire shall be determined by application. The luminaire shall not consume power in the off state.

.2 Operation Voltage: The luminaire shall operate from a 60Hz +/-3 Hz AC line over a voltage ranging from 108 VAC. The fluctuations of line voltage shall have no visible effect on the luminous output.

.3 Power Factor: The luminaire shall have a power factor of 0.90 or greater.

.4 THD: Total harmonic distortion (current and voltage) induced into an AC power line by a luminaire shall not exceed 10% over entire load range 0-100%.

.5 The power supply driver for exterior fixtures enclosure should be sealed. This area should be sealed to minimum Ingress Protection level 65 (IP65).

.6 RF Interference: LED Drivers must meet Class A emission limits referred in Federal Communications Commission (FCC) Title 47, Subpart B, Section 15 regulations concerning the emission of electronic noise.

2.3 PHOTOMETRIC REQUIREMENTS

.1 The Luminaire shall have minimum efficacy as noted in the Light Fixture Schedule.

.2 All photometric data will be measured by the IESNA LM-79-08 standard and formatted per IESNA LM-63-02 as an electronic .ies file.

.3 Measurements shall be calibrated to standard photopic calibrations. The LED device manufacturer shall have tested the lumen maintenance characteristics of the LED package in accordance with the guidelines of IESNA LM-80-08 "Approved Method for Lumen Maintenance Testing of LED Light Sources". A copy of the manufacturer's LM – 80 reports shall be submitted for review.

.4 The color rendition index (CRI) shall be as noted in the Light Fixture Schedule. Binning of LEDs shall conform to ANSI/G. NEMA SSL 3-2010 and shall be within a 3-step McAdam ellipse.

2.4 THERMAL MANAGEMENT

.1 The thermal management of the heat generated by the LEDs shall be of sufficient capacity to assure proper operation of the luminaire over the expected useful life.

.2 The LED manufacturer's maximum thermal pad temperature for the expected life shall not be exceeded.

.3 Thermal management shall be passive by design. The use of fans or other mechanical devices shall not be allowed.

.4 The luminaire shall have a minimum heat sink surface such that LED manufacturer's maximum junction temperature is not exceeded at maximum rated ambient temperature of 40 degrees Celsius (supply heat test).

.5 The heat sink material shall be aluminum.

2.5 FINISHES

.1 Baked enamel finish:

.1 Conditioning of metal before painting:

.1 For corrosion resistance conversion coating to ASTM F1137.

.2 For paint base, conversion coating to ASTM F1137.

.2 Metal surfaces of luminaire housing and reflectors finished with high gloss baked enamel to give smooth, uniform appearance, free from pinholes or defects.

.3 Reflector and other inside surfaces finished as follows:

.1 White, minimum reflection factor 85%.

.2 Colour fastness: yellowness factor not above 0.02 and after 250 hours exposure in Atlas fade-ometer not to exceed 0.05.

.3 Film thickness, not less than 0.03 mm average and in no areas less than 0.025 mm.

.4 Gloss not less than 80 units as measured with Gardner 60° gloss meter.

.5 Flexibility: withstand bending over 12 mm mandrel without showing signs of cracking or flaking under 10 times magnification.

.6 Adhesion: 24 mm square lattice made of 3 mm squares cut through film to metal with sharp razor blade. Adhesive cellulose tape applied over lattice and pulled. Adhesion satisfactory if no coating removed.

2.6 LUMINAIRES

.1 Refer to light fixture schedule.

Part 3 Execution

3.1 INSTALLATION

.1 Locate and install luminaires as indicated.

.2 Support luminaries directly from building structure.

.3 Replace fixtures, which in the opinion of the electrical consultant, are found to exhibit excessive noise.

3.2 WIRING

.1 Connect luminaires to lighting circuits.

3.3 LUMINAIRE SUPPORTS

.1 For luminaires mounted on soffits, support luminaires from building structure in accordance with local inspection requirements

3.4 LUMINAIRE ALIGNMENT

.1 Align luminaires mounted individually parallel or perpendicular to building grid lines.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Materials and installation for emergency lighting systems.

1.2 RELATED SECTIONS

.1 Section 26 05 21 - Wires and Cables (0-1000 V).

.2 Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

1.3 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CSA C22.2 No.141-M1985 (R1999), Unit Equipment for Emergency Lighting.

1.4 SUBMITTALS

.1 Submit product data in accordance with Submittal Procedures.

.2 Data to indicate system components, mounting method, source of power and special attachments.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Construction/Demolition Waste Management and Disposal.

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

.3 Dispose of unused batteries at official hazardous material collections site approved by Consultant.

.4 Fold up metal banding, flatten and place in designated area for recycling.

1.6 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: as indicated on fixture schedule.

.3 Output voltage: as indicated on fixture schedule.

.4 Operating time: 60 min.

.5 Battery: sealed, lead acid, 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, for 'AC Power ON' and 'Unit charging, and diagnostic status.

.10 Self diagnostic system which will provide indication of the following:

.1 Disconnected battery
.2 Lamp Failure
.3 Charger Failure

.11 Self test system which will cycle the battery and connected lamps for:

.1 1 minute every month
.2 10 minutes every 6 months
.3 30 minutes every 12 months

.12 Auxiliary equipment:

.1 Test switch.
.2 Battery disconnect device.
.3 AC input and DC output terminal blocks inside cabinet.

2.2 WIRING OF REMOTE HEADS

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

.2 Conductors: type in accordance with Section 26 05 21 - Wires and Cables 0-1000 V sized in accordance with manufacturer's recommendations.

Part 3 Execution

3.1 INSTALLATION

.1 Install unit equipment and remote mounted fixtures.

.2 Direct heads.

.3 Connect exit lights to unit equipment.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Atomic Energy Control Board Regulations

.2 Canadian Code for Preferred Packaging

.3 Canadian Standards Association (CSA)

.1 CSA C22.2 No.141-02, Unit Equipment for Emergency Lighting.

.2 CSA C860- 07, Performance of Internally-Lighted Exit Signs.

.4 National Fire Protection Association (NFPA) requirements

1.2 SUBMITTALS

.1 Submit product data in accordance with Submittals.

.2 Submit WHMIS MSDS - Material Safety Data Sheets in accordance with Hazardous Materials. WHMIS acceptable to Labour Canada, and Health and Welfare Canada.

.3 Submit product data sheets for exit lights. Include product characteristics, performance criteria, physical size, limitations and finish.

.4 Manufacturer's Instructions: Provide to indicate special handling criteria, installation sequence, and cleaning procedures.

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, and with Waste Reduction Workplan.

.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.

.4 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.

.5 Fold up metal banding, flatten and place in designated area for recycling.

Part 2 Products

2.1 STANDARD UNITS

.1 Exit lights: to CSA C22.2 No.141 and CSA C860, packaged in accordance with the Canadian Code for Preferred Packaging guidelines.

.2 Housing: cast anodized extruded aluminum housing, as per schedule.

.3 Face and back plates: extruded aluminum.

.4 Lamps: as per schedule.

.5 Green pictorial running man style with die cast aluminum construction.

.6 Downlight: translucent acrylic in bottom of unit.

.7 Face plate to remain captive for relamping.

.8 Exit light shall be suitable for wall, end or ceiling mounting as determined on site.

.9 Blank faceplate for the back of single face exit signs, shall not have any knockouts.

.10 The exit light shall be illuminated with a minimum of 21 LED's along the top, and 19 LED's along the bottom of the exit light interior. The LED's shall be contained in an acrylic lens panel, which shall evenly distribute light on the lettering. The module containing the LED's shall be capable of illuminating both single and double face exit signs.

.11 LED's shall be connected in parallel (not series) so that failure of an LED shall not cause more than 5 LED's to be extinguished.

.12 Exit light input shall be maximum 2 watts.

.13 LED's shall operate on 120 volt, as well as DC voltage provided by remote emergency battery units (refer to drawings for voltage), without the use of any external transformer.

.14 Design life for the exit light shall be minimum 25 years.

Part 3 Execution

3.1 INSTALLATION

.1 Install exit lights in plain view as indicated, and in accordance with the latest edition of the National Building Code.

.2 Exit lighting shall be connected to a separate AC circuit dedicated to exit lighting only, and shall also be connected to an emergency power supply source.

.3 Coordinate installation of exit lights with ceiling or wall construction. If necessary, provide hanger to suspend exit light below visual obstructions.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 271119 – Terminals and Connectors for Communication Conductors.

1.2 REFERENCES

.1 The following references and standards shall be followed with respect to the cabling system supply, installation and testing, but shall not alter the design of the cabling system as detailed on the drawings and specifications.

.2 CAN/CSA-T530-M90 Building Facilities, Design Guidelines for Telecommunications.

.3 CAN/CSA-T529-M Design Guidelines for Telecommunications Wiring System in Commercial Buildings.

.4 CAN/CSA-C22.2 No. 214-08 Communications Cables.

.5 CAN/CSA-C22.2 No. 182.4-M90 (R2006) Plugs, Receptacles and Connectors for Communication Systems.

.6 EIA/TIA Bulleting TSB-36 Technical Systems Bulleting Additional Cable Specifications for Unshielded Twisted Pair Cables, Electronic Industries Association (USA), November 1991.

.7 Uniform International Conference of Building Officials Building Code (ICBO).

.8 EIA/TIA-569- A Commercial Building Standard for Telecommunication Pathways and Spaces, latest draft.

EIA/TIA-568-B2 (2001) Commercial Building Wiring Standard, latest draft.
EIA/TIA-607 (CSA T527) Grounding and Bonding
EIA/TIA-606 (CSA T528) Administration Standards
EIA/TIA TSB-67 UTP End-to-End System Testing

.9 CAN/ULC C102.4M (1987) Test for Fire and Smoke Characteristics of Electrical Wiring and Cable.

.10 Treasury Board Information Technology Standard (TBITS) No. 6.9 Profile for the Telecommunications Wiring System in Government Owned and Leased Buildings.

.11 CAN/CSA C22.2 No. 232-M Optical Fibre Cables.

1.3 SYSTEM DESCRIPTION

.1 Structured system of telecommunications cables (copper) installed within buildings for distributing voice and data (including video) signals.

1.4 WARRANTY

.1 All material, equipment and workmanship detailed in this specification section shall be warrantied by the contractor and the manufacturer for a period of twenty-five (25) years from date of Substantial Performance. Warranty shall be offered through the

manufacturers Certified System Vendor (CSV) program and shall be fully comprehensive covering all costs associated with the repair and/or replacement of equipment and material becoming defective during the 25 year period.

Part 2 Products

2.1 HORIZONTAL CABLING, DATA

.1 Cable supplied to all data outlets shall be Category 6, UTP- 4 Pair, 24 AWG, CMP rated cable, FT6 rated.

.2 Category 6 Electrical Specifications

.1 DC Resistance @ 20C, Maximum: 9.8 Ohm/100meters

.2 DC Resistance Unbalance, Maximum: 5%

.3 Mutual Capacitance, Maximum: 5.6 nF/100meters

.4 Capacitance Unbalance Pair to Ground, Maximum: 330pF/100meters

.5 Input Impedance: 100+/- 15 Ohms from 1 Hz to 100MHz 100+/- 22 Ohms from 100MHz to 200MHz

.6 Nominal Velocity of Propagation: NVP Plenum 72% @ 10MHz

.7 Propagation Delay (Skew) , Maximum: 20 ns/100meter

.8 Blue in color.

Maximum Attenuation Values, Worst Pair and Cross Talk (NEXT Min).

Frequency (MHz)	Attenuation (dB/100m)	Next (dB Min.)
1	2.0	74.3
4	3.8	65.3
8	5.4	60.8
10	6.0	59.3
16	7.6	56.3
20	8.5	54.8
25	9.6	53.3
31.25	10.7	51.9
62.5	15.5	47.4
100	19.9	44.3
200	29.2	39.8
250	33	38.3
300	36.6	37.2
350	40.0	36.2
400	43.2	35.3

2.2 HORIZONTAL CABLING, VOICE

.1 Cable supplied to all voice outlets shall be Category 6, UTP – 4 Pair, 24 AWG, CMP rated cable, FT6 rated.

.2 Category 6 Electrical Specifications

.1 DC Resistance @ 20C, Maximum: 9.4 Ohm / 100 meters.

.2 DC Resistance Unbalance, Maximum 5%.

.3 Mutual Capacitance, Maximum: 5.6 nF/100 meters.

.4 Capacitance Unbalance Pair to Ground, maximum: 330 pF / 100 meters.

.5 Input Impedance: 100 +/- Ohms from 1 Hz to 100 MHz, 100 +/- 22 Ohms from 100 MHz to 200 MHz.

.6 Nominal Velocity of Propagation: NVP Plenum 72% @ 10 MHz.

.7 Propagation Delay (skew), Maximum: 20 ns / 100 meter.

.8 White in color.

Maximum Attenuation Values, Worst Pair and Cross Talk (next min).

Frequency (MHz)	Attenuation (dB/100m)	Next (dB Min.)
1	2.0	74.3
4	3.8	65.3
8	5.4	60.8
10	6.0	59.3
16	7.6	56.3
20	8.5	54.8
25	9.6	53.3
31.25	10.7	51.9
62.5	15.5	47.4
100	19.9	44.3
200	29.2	39.8
250	33	38.3
300	36.6	37.2
350	40.0	36.2
400	43.2	35.3

2.3 COAXIAL CABLE (CXC)

.1 Single coaxial member, 75ohm impedance each having metallic centre conductor surrounded by dielectric material and 2 metal outer conductors separated by dielectric material and surrounded by PVC jacket: to CAN/CSA C22.2 No.214 FT-4 fire rated jacket.

.2 Distribution cable (RG-11), 75ohm impedance. Centre conductor No. 14 AWG, copper-covered steel, insulation of cellular polyethylene, shield of aluminum foil plus braid, shield coverage 97%. Loss at 500 MHz not to exceed 3.5 dB per 30m.

.3 Drop cable (RG-6), 75ohm impedance. Centre conductor No. 18 AWG, copper-covered steel, insulation of cellular polyethylene, shield of aluminum foil plus braid, shield coverage 97%. Loss at 500 MHz not to exceed 5 dB per 30m.

Part 3 Execution

3.1 INSTALLATION OF HORIZONTAL DISTRIBUTION CABLES

.1 Install horizontal cables, as indicated on drawings from termination in telecommunications closet to outlets.

.2 Plastic tie – wraps, 'C' clamps, 'D' rings are not permitted for use with communications cabling. Only hook and loop straps are permitted, and are to be utilized every 610mm.

3.2 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 01 - Common Work Results - Electrical.

.1 The Departmental Representative shall be notified one week prior to any testing so that the testing may be witnessed.

.2 Before requesting a final inspection, the Contractor shall perform a series of end to end installation performance tests. The Contractor shall submit for approval a proposal describing the test procedures, test result forms, and timetable for copper plant wiring.

.3 When errors are found, the source of each error shall be determined, corrected, and the cable re-tested. All defective components shall be replaced and re-tested. Defective components not corrected shall be reported to the Departmental Representative with explanations of the corrective actions attempted.

.4 Test results for each UTP cable must be submitted with identification to match labels on all patch panel ports and 8 position modular jacks, and identification to match as-built associated with that cable.

.5 Owner will observe and verify the accuracy of test results submitted.

.2 UTP cable installations tests:

.1 Contractor to show evidence of channel bandwidth performance by submitting to the Engineer "Testing Certificate" of manufacturer's product evaluated by independent testing authority or agency to TIA/EIA-568-A-5.

.2 The installed channel must pass all Category 6 tests using a high performance level tester equipped with a compatible link interface adapter. Testing capability shall be up to 350 MHz including verification for Cable length, Wire Mapping , Cross-Talk (NEXT), Equal Level Far-End Cross-Talk (ELFEXT) , Power Sum Cross-Talk (PSNEXT) , Power Sum Equal Level Far-

End Cross-Talk (PSELFEXT), Attenuation, Attenuation to Cross- Talk Ratio (ACR), Propagation Delay , Return Loss, and Delay Skew.

.3 For each network drop installed the following documentation must be provided on a CD:

1. Room # of installation
2. Cable ID
3. Length of cable in metres
4. Wall plate ID
5. An indication of what test type was used and whether the test was a PASS or FAIL.
6. Output from cable tester showing attenuation on each pair, and NEXT for all pair combinations. Complete output of the test result is desirable.

The test results from the cable tester should also be included in electronic form on a compact disk in PDF format.

3.3 LABELING

.1 Label each cable within 50mm of terminations.

.2 Use permanent, wrap around, self-adhesive labels employing individual characters. Characters shall be minimum 14 point, bold, Arial font, black on white background.

.3 Prior to labelling, coordinate with the Departmental Representative personnel to determine the exact labelling standard. Allow for 10 characters per label.

3.4 "AS BUILT' RECORDS

.1 Provide as built drawings detailing the terminations and connections for all communication conductors. As built drawings shall include label names for all terminations and connections as installed on site. Provide in hard copy format.

END OF SECTION

Part 1 General

1.1 SYSTEM DESCRIPTION

.1 Termination, patch cords, and cross-connection equipment installed inside building for voice and data for telecommunications systems employing unshielded-twisted-pair (UTP), shielded-twisted-pair (STP), coaxial (CXC), and optical fibre (OFC) cables.

1.2 RELATED SECTIONS

.1 Rough Carpentry

.2 Communications Cables Inside Building

.3 Common Work Results – Electrical

.4 Construction / Demolition Waste Management and Disposal

1.3 REFERENCES

.1 CAN/CSAT530-M90, Building Facilities, Design Guidelines for Telecommunications.

.2 CAN/CSAC22.2No.182.4-M90 (R2006), Plugs, Receptacles and Connectors for Communication Systems.

.3 CAN/CSAT529-91, Design Guidelines for Telecommunications Wiring Systems in Commercial Buildings.

.4 Canadian Open Systems Application Criteria (COSAC) Profile for the Telecommunications Wiring System in Government Owned and Leased Buildings, Treasury Board Information Technology Standards TBITS-6.9

.5 EIA/TIA Bulletin TSB-36, Technical Systems Bulletin Additional Cable Specifications for Unshielded Twisted Pair Cables, Electronic Industries Association (USA), November 1991.

.6 TIA/EIA Telecommunications Systems Bulletin TSB40, Additional Transmission Specifications for Unshielded Twisted-Pair Connecting Hardware, Telecommunications Industry Association, August 1992.

Part 2 Products

2.1 PATCH PANELS

.1 One piece, unloaded, black, painted steel suitable for mounting in a standard 475mm wall or floor rack assembly.

.2 Minimum 24 port. Provide quantity of multi-port patch panels to accommodate all terminations plus 25% for future.

.3 Labelled in sequential numbering from top left to bottom right.

2.2 COVERPLATES

.1 4 port coverplate.

.2 Construction and color as per Section 26 27 26 – Wiring Devices.

2.3 DATA OUTLETS

.1 Flush type, snap-in inserts with encapsulated lead frame design and inline IDC terminating interface.

.2 Category 6, RJ-45.

.3 Suitable for 568A termination.

.4 Blue in color.

2.4 VOICE OUTLETS

.1 Flush type, snap-in inserts with encapsulated lead frame design and inline IDC terminating interface.

.2 Category 6, RJ-45.

.3 Suitable for 568A termination.

.4 White in color.

2.5 COMMUNICATIONS CABLE ROUTING HOOKS:

.1 100mm in diameter

.2 Galvanized steel construction

.3 Complete with wire retainers

.4 Suitable for fastening directly to building structure only.

Part 3 Execution

3.1 INSTALLATION

.1 Install building communications terminating and cross-connecting systems in rack and on wall in equipment room in accordance with manufacturer's instructions.

3.2 INSTALLATION OF COMMUNICATION WIRES

.1 Colour match conductors on terminal strip in accordance with CAN/CSA C22.2 No.182.4 and CSA T529. For IDC-type connections, use tool with seating and cutting heads for connecting conductors to terminals.

.2 Harness slack wire in cabinets, terminals and cross-connecting terminating systems.

3.3 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 01 - Common Work Results - Electrical.

3.4 GROUNDING AND BONDING

.1 Racks shall be grounded using #6 AWG insulated copper conductor. Provide all required bonding material and hardware and bond to building grounding electrode subsystem at building electrical service entrance. ANSI/TIA/EIA 607 Grounding and Bonding requirements must be met.

3.5 LABELING

.1 Provide a separate label for each terminated outlet or connector location.

.2 For outlets at patch panels or workstations, provide self-adhesive labels using black characters on white background.

.3 Prior to labelling, coordinate with the Departmental Representative staff to determine the exact labelling requirements. Allow 10 characters per label.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 26 05 01 - Common Work Results - Electrical.

1.2 REFERENCES

.1 Government of Canada

.1 NBC-2015, National Building Code of Canada.

.2 Underwriters Laboratories of Canada (ULC)

.1 CAN/ULC-S524-14, Installation of Fire Alarm Systems.
.2 CAN/ULC-S525-07, Audible Signal Appliances for Fire Alarm.
.3 CAN/ULC-S526-07, Visual Signal Appliances, Fire Alarm.
.4 CAN/ULC-S527-11, Control Units.
.5 CAN/ULC-S528-14, Manual Pull Stations.
.6 CAN/ULC-S529-09, Smoke Detectors.
.7 CAN/ULC-S530-1991 (R1999), Heat Actuated Fire Detectors.
.8 CAN/ULC-S531-14, Smoke Alarms.
.9 CAN/ULC-S536-13, Inspection and Testing of Fire Alarm Systems.
.10 CAN/ULC-S537-13, Verification of Fire Alarm Systems.
.11 CAN/ULC-S561-13, Installation and Services for Fire Signal Receiving Centres and Systems.

1.3 SYSTEM DESCRIPTION

.1 Extend/modify the existing addressable Notifier AFP-200 fire alarm system as indicated on the drawings.

.2 System to carry out fire alarm and protection functions; including receiving alarm signals; initiating two-stage alarm; supervising components and wiring; actuating annunciators and auxiliary functions; initiating trouble signals and signalling to existing ULC listed monitoring agency via fire alarm monitoring panel.

.3 Zoned, non-coded, two stage.

.4 New system components to include:

.1 Manual and automatic initiating devices.
.2 Audible and visual signalling devices.
.3 End-of-line resistors.

1.4 REQUIREMENTS OF REGULATORY AGENCIES

.1 System components: listed by ULC and comply with applicable provisions of National Building Code Local/Provincial Building Code, and meet requirements of local authority having jurisdiction.

1.5 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Submittal Procedures.

.2 Include:

.1 Details for devices.

.2 Details and performance specifications for control, annunciation and peripherals with item by item cross reference to specification for compliance.

1.6 CLOSEOUT SUBMITTALS

.1 Provide operation and maintenance data for fire alarm system for incorporation into manual specified in Closeout Submittals.

.2 Include:

.1 Technical data - illustrated parts lists with parts catalogue numbers.

.2 Copy of approved shop drawings with corrections completed and marks removed except review stamps.

.3 List of recommended spare parts for system.

.4 Copies of certificates indicating that the fire alarm system has been installed and tested to:

.1 CAN/ULC S524-14

.2 CAN/ULC S536-04

.3 CAN/ULC S537-13

.4 CAN/ULC S561-13

1.7 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Construction/Demolition Waste Management and Disposal, and with the Waste Reduction Workplan.

.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 MATERIALS

.1 Equipment and devices: ULC listed and labelled and supplied by single manufacturer.

.2 New equipment shall be compatible with the existing system.

.3 Thermal detectors: to CAN/ULC-S530.

.4 Smoke detectors: to CAN/ULC-S529.

2.2 SYSTEM OPERATION: TWO STAGE - SIGNALS ONLY

.1 Actuation of any alarm initiating device on first stage to:

.1 Cause electronic latch to lock-in alarm state at central control unit.

.2 Indicate zone of alarm at central control unit and at remote annunciators.

.3 Cause audible devices throughout building to sound at 20 strokes per minute.

.4 Cause audible devices in zone of alarm to sound continuously while other audible devices throughout building sound at 20 strokes per minute.

.5 Transmit signal to ULC monitoring agency via existing fire alarm monitoring panel.

.6 Cause air conditioning and ventilation fans to shut down or to function to provide required control of smoke movement.

.7 Cause fire doors and smoke control doors, if normally held open, to close automatically.

.2 Actuation of any alarm initiating device on second stage to:

.1 Cause audible signalling devices to sound in alarm tone throughout building.

.3 If first stage alarm is not acknowledged within 0 seconds, system to automatically go into second stage.

.4 Acknowledging alarm: indicated at central control unit.

.5 Possible to silence signals by "alarm silence" switch at central control unit, after 60 s period of operation.

.6 Subsequent alarm, received after previous alarm has been silenced, to re-activate signals.

.7 Actuation of any supervisory device to:

.1 Cause electronic latch to lock-in supervisory state at central control unit.

.2 Indicate respective supervisory zone at central control unit and remote annunciator.

.3 Cause audible signal at central control unit to sound.

.4 Activate common supervisory sequence.

.5 Transmit signal to ULC monitoring facility via fire alarm monitoring panel.

.8 Resetting alarm or supervisory device not to return system indications/functions back to normal until control unit is reset.

.9 Trouble on system to:

.1 Indicate circuit in trouble at central control unit.

.2 Activate "system trouble" indication, buzzer and common trouble sequence. Acknowledging trouble condition to silence audible indication; visual indication to remain until trouble is cleared and system is back to normal.

.3 Transmit signal to ULC monitoring facility via fire alarm monitoring panel.

.10 Troubles on system: suppressed during course of alarm.

.11 Trouble condition on any circuit in system not to initiate alarm conditions.

2.3 INITIATING/ INPUT CIRCUITS

.1 Receiving circuits for alarm initiating devices such as manual pull stations, smoke detectors, heat detectors and water flow switches, wired in DCLB configuration to fault isolator modules.

.2 Alarm receiving circuits (active and spare): compatible with smoke detectors and open contact devices.

.3 Actuation of alarm initiating device: cause system to operate as specified in "System Operation".

.4 Receiving circuits for supervisory, N/O devices. Devices: wired in DCLB configuration to fault isolator modules.

.5 Actuation of supervisory initiating device: cause system to operate as specified in "System Operation".

2.4 ALARM OUTPUT CIRCUITS

.1 Alarm output circuit: connected to signals, wired in class B configuration to central control unit.

.1 Signal circuits' operation to follow system programming; capable of sounding horns continuously. Each signal circuit: rated at 2 A, 24 VDC; fuse-protected from overloading/overcurrent.

.2 Manual alarm silence, automatic alarm silence and alarm silence inhibit to be provided by system's common control.

2.5 AUXILIARY CIRCUITS

.1 Auxiliary contacts for control functions.

.2 Actual status indication (positive feedback) from controlled device.

.3 Alarm and / or supervisory trouble on system to cause operation of programmed auxiliary output circuits.

.4 Upon resetting system, auxiliary contacts to return to normal or to operate as pre-programmed.

.5 Auxiliary circuits: rated at 2A, 24Vdc or 120 Vac, fuse-protected.

2.6 WIRING

.1 Twisted copper conductors: rated 300V.

.2 To initiating circuits: 18 AWG minimum, and in accordance with manufacturer's requirements.

.3 To signal circuits: 16 AWG minimum, and in accordance with manufacturer's requirements.

.4 To control circuits: 14 AWG minimum, and in accordance with manufacturer's requirements.

2.7 AUTOMATIC ALARM INITIATING DEVICES

.1 Addressable thermal fire detectors, combination fixed temperature and rate of rise, non-restorable fixed temperature element, self-restoring rate of rise, fixed temperature 88˚C, rate of rise 8.3˚C per minute.

.1 Electronics to communicate detector's status to addressable module/transponder.

.2 Detector address to be set on detector head in field.

.2 Addressable smoke detector.

.1 Photo-electric type.

.2 Electronics to communicate detector's status to addressable module/transponder.

.3 Detector address to be set on detector head in field.

2.8 END-OF-LINE DEVICES

.1 End-of-line devices to control supervisory current in alarm circuits and signalling circuits, sized to ensure correct supervisory current for each circuit. Open, short or ground fault in any circuit will alter supervisory current in that circuit, producing audible and visible alarm at main control panel and remotely as indicated.

Part 3 Execution

3.1 INSTALLATION

.1 Install fire alarm systems in accordance with CAN/ULC-S524 and TB OSH Chapter 3-04.

.2 Connect to existing fire alarm monitoring panel in accordance with CAN/ULC S561-13.

.3 Locate and install smoke detectors and connect to alarm circuit wiring. Do not mount detectors within 1 m of air outlets. Maintain at least 600 mm radius clear space on ceiling, below and around detectors. Locate duct type detectors in straight portions of ducts.

.4 Connect alarm circuits to main control panel.

.5 Install end-of-line devices at end of supervisory and control circuits.

.6 Splices are not permitted.

.7 “T-Tapping” or t-style connections are not permitted for initiating, control or monitoring devices.

.8 Provide necessary raceways, cable and wiring to make interconnections to terminal boxes, annunciator equipment and CCU, as required by equipment manufacturer.

.9 Ensure that wiring is free of opens, shorts or grounds, before system testing and handing over.

.10 Identify circuits and other related wiring at central control unit, annunciators and terminal boxes.

3.2 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 01 - Common Work Results - Electrical and CAN/ULC-S537.

.2 Fire alarm system:

.1 Test each new device and alarm circuit to ensure thermal and smoke detectors transmit alarm to control panel and actuate first stage alarm, general alarm and ancillary devices.

.2 Check annunciator panels to ensure zones are shown correctly.

.3 Simulate grounds and breaks on alarm and signalling circuits to ensure proper operation of systems.

3.4 VERIFICATION AND CERTIFICATION OF THE FIRE ALARM EQUIPMENT

.1 The contractor shall retain the services of the fire alarm system manufacturer's authorized factory representative to verify and certify fire alarm system operation. The manufacturer's authorized factory representative shall:

.1 Inspect all new fire alarm equipment to ensure installation conforms to the manufacturer's recommendations.

.2 Test all new alarm initiating devices to ensure each device is operable and will initiate alarm and trouble signals as specified.

.3 Test all new alarm indicating devices to ensure each device operates upon alarm and is correctly wired to provide supervision.

.2 The contractor shall provide the manufacturer's authorized representative with sufficient personnel during system identification.

.3 The manufacturer's authorized representative shall provide the contractor with technical assistance to correct deficiencies identified during the verification.

.4 Inspection Certification:

.1 On completion of the verification and when all of the conditions have been complied with, the contractor shall issue to the Departmental Representative the following:

.1 A Certificate of Verification and copies of the verification worksheet that the fire alarm system devices have been installed and tested as per CAN/ULC S537-04, and that the system is fully operational.

.5 All costs involved in this inspection, both for the manufacturer's and the electrical contractor's work shall be included with the electrical contractor's total tender price.

3.5 INTEGRATED LIFE SAFETY SYSTEMS TEST

.1 At the completion of construction but prior to deeming the contract substantially complete, the contractor shall carry out an integrated life safety systems test. This test shall include the following:

.1 Demonstrate that all ancillary functions that are initiated by the fire alarm system operate as specified.

.2 Demonstrate the continued operation of all of the functions noted in .1 while the building power supply has been turned off.

.3 Demonstrate the continued operation of all of the functions noted in .1 during the restoration of the building power supply.

.2 The Project Authority shall prepare a detailed sequence of events prior to the test. The contractor shall arrange for personnel to assist in the test including other sub trades.

END OF SECTION