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PROJECT

Roof Remediation Project

Regina, Saskatchewan

PROJECT No.

21/2014

SET No.

DATE

2015-03-06

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Part 1 General

1.1 WORK COVERED BY CONTRACT DOCUMENTS

- .1 Work of this Contract comprises the remediation of four metal clad roofs and all associated Work. The building is located in Regina, Saskatchewan.

1.2 WORK SEQUENCE

- .1 The General Contractor will be responsible for the coordination of all work.

1.3 CONTRACTOR USE OF PREMISES

- .1 Coordinate use of premises under direction of Departmental Representative.
- .2 Obtain and pay for use of additional storage or work areas needed for operations under this Contract.
- .3 Cooperate with other contractors employed by the Departmental Representative for other work within the building.

1.4 EXISTING SERVICES

- .1 Notify, Departmental Representative and utility companies of intended interruption of services and obtain required permission.
- .2 Where Work involves breaking into or connecting to existing services carry out work at times as directed by governing authorities with minimum disturbance to pedestrian and vehicular traffic.
- .3 Establish location and extent of service lines in area of work before starting Work. Locations of utilities shown on drawings are approximate. Notify Departmental Representative of findings.
- .4 Provide adequate bridging over trenches which cross sidewalks or roads to permit normal traffic.
- .5 Where unknown services are encountered, immediately advise Departmental Representative and confirm findings in writing.
- .6 Protect, relocate or maintain existing active services. When inactive services are encountered, cap off in manner approved by authorities having jurisdiction.
- .7 Record locations of maintained, re-routed, and abandoned service lines.
- .8 Construct barriers in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.

END OF SECTION

Part 1 General

1.1 SPECIAL REQUIREMENTS

- .1 Ensure that Contractor personnel employed on site become familiar with and obey regulations including safety, fire, traffic and security regulations.
- .2 Keep within limits of work and avenues of ingress and egress.

1.2 RCMP SECURITY CLEARANCE REQUIREMENTS (LAW ENFORCEMENT CHECKS)

- .1 After interim completion of the project, all personnel engaged in the execution of the work on the interior of an RCMP occupied and/or unoccupied building shall have at a minimum, the requisite RCMP Reliability (RRS) clearance.
- .2 A minimum of four months prior to interim completion of the project, the Contractor shall prepare and submit the following attached requisite forms and documents for an RRS clearance, for each Contractor employee and sub-contractor employee to be engaged in the work on the interior of an occupied and/or unoccupied building after interim completion of the project:
 - .1 RCMP Contractor/Consultant Information Sheet
 - .2 TBS 330-23e – Personnel Screening, Consent and Authorization Form
 - .3 TBS 330-60e – Security Clearance Form
 - .4 Security/Reliability Interview Pre-Interview Questionnaire
- .3 Also, contractor's employees and sub-contractor employees must include with their completed requisite forms, the following documents:
 - .1 Valid government issued photo identification: photocopy of front and back of document (photo must be clear), certified to be a true copy by their supervisor or colleague. Examples of government issued photo identification include Driver's License, Passport or Treaty card.
 - .2 Birth certificate: photocopy of front and back of document, certified to be a true copy by their supervisor or colleague.
 - .3 Two sets of roll and ink fingerprints on Form C-216 (Contractor cost): Fingerprints must be taken/obtained from a Corp of Commissionaires office.
 - .4 Two current Passport Style Photographs (Contractor cost).
- .4 In addition to the requirements noted in .3 above, Contractor employees and sub-contractor employees must undertake the following additional clearance requirements to obtain the RCMP Reliability Status clearance:
 - .1 Undertaking of a Reliability interview as scheduled by the RCMP.
- .5 To eliminate delays in the clearance process, all clearance forms/documents completed by the Contractor's employees and sub-contractor employees **MUST be reviewed by the Contractor** to ensure that all requested information has been provided, **prior to submitting documents to the RCMP**. The RCMP will not accept/cannot process documents with ANY requested information missing as per instruction sheets provided – NO EXCEPTIONS (ie. no abbreviations on documents anywhere ie. "AB", "CA"). *All*

incomplete forms will be returned to the Contractor (ensure instructions for completion of documents noted in .2 above are read and followed by each applicant, prior to submitting to the RCMP).

- .6 The Contractor should batch the fully completed submissions, based on priority work on site and allow for a minimum eighty (80) working days processing time in the project schedule for the review to occur (from the date the “fully completed” documents are received by the RCMP). The inability to submit the fully completed requisite forms and documents will not be reason for an extension to the project schedule or additional compensation.
- .7 After interim completion of the project, the Contractor’s employees and sub-contractor employees shall only mobilize in the interior of an occupied and/or unoccupied building, once the requisite RCMP RRS clearance has been granted.

1.3 BUILDING SMOKING ENVIRONMENT

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

END OF SECTION

Part 1 General

1.1 ADMINISTRATIVE

- .1 Project meetings will be scheduled throughout the progress of the work and at the call of Departmental Representative.
- .2 Provide physical space and make arrangements for meetings.
- .3 The Consultant shall chair meetings.
- .4 Representative of Contractor, Subcontractor and suppliers attending meetings will be qualified and authorized to act on behalf of party each represents.

1.2 PRECONSTRUCTION MEETING

- .1 Within 10 days after award of Contract, request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.
- .2 Agenda to include:
 - .1 Appointment of official representative of participants in the Work.
 - .2 Schedule of Work: in accordance with Section 01 32 16 - Construction Progress Schedules - Bar (GANTT) Chart.
 - .3 Schedule of submission of shop drawings, samples, colour chips. Submit submittals in accordance with Section 01 33 00 - Submittal Procedures.
 - .4 Requirements for temporary facilities, offices, storage sheds, utilities, fences in accordance with Section 01 52 00 - Construction Facilities.
 - .5 Delivery schedule of specified equipment.
 - .6 Site security in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.
 - .7 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements.
 - .8 Owner provided products and work.
 - .9 Record drawings in accordance with Section 01 33 00 - Submittal Procedures.
 - .10 Maintenance manuals in accordance with Section 01 78 00 - Closeout Submittals.
 - .11 Take-over procedures, acceptance, warranties in accordance with Section 01 78 00 - Closeout Submittals.
 - .12 Monthly progress claims, administrative procedures, photographs, hold backs.
 - .13 Appointment of inspection and testing agencies or firms.
 - .14 Insurances, transcript of policies.

1.3 PROGRESS MEETINGS

- .1 During course of Work, progress meetings will be held on a regular basis. Schedule to be determined.
- .2 Contractor, major Subcontractors involved in Work, Departmental Representative, Consultant and Owner's representatives are to be in attendance.
- .3 Minutes of meetings will be recorded by the Consultant. Minutes will be distributed within 72 hours.
- .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 Review of off-site fabrication delivery schedules.
 - .6 Corrective measures and procedures to regain projected schedule.
 - .7 Revision to construction schedule.
 - .8 Progress schedule, during succeeding work period.
 - .9 Review submittal schedules: expedite as required.
 - .10 Maintenance of quality standards.
 - .11 Review proposed changes for affect on construction schedule and on completion date.
 - .12 Other business.

END OF SECTION

Part 1 General

1.1 DEFINITIONS

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

1.2 REQUIREMENTS

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

1.3 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit to Departmental Representative within 7 working days of Award of Contract Bar (GANTT) Chart as Master Plan for planning, monitoring and reporting of project progress.

1.4 PROJECT MILESTONES

- .1 Project milestones form interim targets for Project Schedule.
 - .1 Project milestone will be identified through discussion with the Contractor and Departmental Representative at the outset of the project.

1.5 PROJECT SCHEDULE REPORTING

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

1.6 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.

END OF SECTION

1.1 ADMINISTRATIVE

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

1.2 SHOP DRAWINGS AND PRODUCT DATA

- .1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.
- .2 Submit where required in the specifications, shop drawings bearing stamp and signature of qualified professional engineer registered or licensed in 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 co-ordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.
- .4 Allow 7 days for Departmental Representative's review of each submission.

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- .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 6 copies of shop drawings for each requirement requested in specification Sections and as Departmental Representative may reasonably request.
 - .11 Submit 6 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.

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- .12 Submit 6 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 6 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 6 copies of manufacturer's instructions for requirements requested in specification Sections and as requested by Departmental Representative.
 - .1 Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.
 - .15 Submit 6 copies of manufacturer's Field Reports for requirements requested in specification Sections and as requested by Departmental Representative.
 - .1 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.
 - .16 Submit 6 copies of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Departmental Representative.
 - .17 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, copies will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.
 - .20 The review of shop drawings by Departmental Representative is for sole purpose of ascertaining conformance with general concept.
 - .1 This review shall not mean that Departmental Representative approves detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting requirements of construction and Contract Documents.
 - .2 Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that

pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of sub-trades.

- .21 Electronic submission of Shop Drawings
 - .1 Electronic Shop Drawings (PDF format) shall not exceed 11x17 actual size. Electronic transfer of shop drawings relies on Architect and Engineering Consultants to print a record copy for their files - this can be done providing shop drawings do not exceed 11x17. Larger shop drawings would require hard copies for review.
 - .2 General Contractor to review shop drawing and place their electronic stamp signifying review.
 - .3 General Contractor to email all shop drawings to Architect with copy to Engineering Consultant as applicable.
 - .4 Engineering Consultant to review and place their electronic stamp / marks up, then email to Architect only (Engineering Consultant will not copy anyone else).
 - .5 Architect to check for coordination and transmit reviewed shop drawings by email to General Contractor.

1.3 SAMPLES

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

1.4 MOCK-UPS

- .1 Erect mock-ups in accordance with 01 45 00 - Quality Control and as specified in each applicable Section.

END OF SECTION

Part 1 General

1.1 SITE PROTECTION

- .1 Prevent damage to all existing items which are to remain (e.g. fencing, signs, trees, shrubs, turf, natural features, buildings, asphalt, surface or underground utility lines). Make good any damage.
- .2 Preserve and protect existing benchmarks and survey monuments. Inform Departmental Representative immediately if benchmarks or survey monuments are encountered during construction. Make good any damage.

1.2 FINES AND PENALTIES

- .1 Abuse to any plant material or unauthorized pruning or removal, in whole or in part, of plant material is not permitted.
- .2 Be responsible to monitor all sub-trades for plant material abuse. Restitution for all damages found will be solely upon the Contractor.
- .3 A fine for not less than plant material repair or replacement costs plus for loss of aesthetic or intrinsic value per individual plant, will be levied. The decision of the Departmental Representative in determination of damage will be final.

1.3 FIRES

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

1.4 DISPOSAL OF WASTES

- .1 Burying of rubbish and waste materials on site is not permitted.
- .2 Disposal of waste, or volatile materials such as mineral, spirits, oil or paint thinner, into waterways, storm or sanitary sewers prohibited.
- .3 Remove rubbish, waste products and debris in accordance with regulations of authorities having jurisdiction.

1.5 CARE OF EXISTING PLANT MATERIAL

- .1 Use all means necessary to protect plant materials before start up and during construction.
- .2 Do not disturb the existing grade or store heavy equipment within the drip line of existing trees. If access is required within the drip line of existing trees, then protect the access route with a moveable timber bridge to cushion/spread weight of vehicles over a greater surface area. Departmental Representative to approve access route and timber bridge construction before work begins.
- .3 Protection of branches that are interfering with construction: All branches that pose temporary interference to the process of construction, are to be tied up or back under the supervision of the Departmental Representative. Bindings thus provided will be removed as soon as feasible by the completion of construction (or phase of construction) to reduce possible water sprouting or structural damage.

- .4 Pruning trees that are interfering with construction: Remove interfering branches, without injury to trunks only when directed by the Departmental Representative. The Departmental Representative will determine all trees which require pruning, the extent of pruning allowed, and will identify the amount of compensatory pruning required for loss of roots or tops. The Contractor will adhere to limitations of on-site construction movement around identified trees.
- .5 Monitor condition of trees, in particular, possible wind damage or snow load damage to branches that are tied up.
- .6 Wash foliage should excessive construction dust build up on plant material.

1.6 TRAFFIC PROVISIONS AND STORAGE

- .1 Determine interference of trees and their root zones before moving equipment or supplies on site to avoid any damage to trees.
- .2 Traffic provisions:
 - .1 Use only approved access routes for vehicular and heavy pedestrian movement.
- .3 Parking areas shall be pre-designated at each construction site.
- .4 Contractor responsible to provide soil aeration of compacted tree root areas through holes bored into the soil at the direction of the Departmental Representative.
- .5 Storage:
 - .1 Store construction materials, fuels, chemicals, etc., in approved areas only.
 - .2 Store equipment, soil, building materials and debris beyond the drip-line of trees.

1.7 HERBICIDES / PESTICIDES

- .1 Do not use any herbicides or pesticides on site.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .3 Province of Saskatchewan
 - .1 Occupational Health and Safety Act, 1993, S.S. 2005.

1.2 SUBMITTALS

- .1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit site-specific Health and Safety Plan: Within 7 days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include:
 - .1 Results of site specific safety hazard assessment.
 - .2 Results of safety and health risk or hazard analysis for site tasks and operation found in work plan.
- .3 Submit 1 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 Submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 33 00 - Submittal Requirements.
- .7 Departmental Representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within 7 days after receipt of plan. Revise plan as appropriate and resubmit plan to Departmental Representative within 5 days after receipt of comments from Departmental Representative.
- .8 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.
- .9 Medical Surveillance: where prescribed by legislation, regulation or safety program, submit certification of medical surveillance for site personnel prior to commencement of Work, and submit additional certifications for any new site personnel to Departmental Representative.
- .10 On-site Contingency and Emergency Response Plan: address standard operating procedures to be implemented during emergency situations.

1.3 FILING OF NOTICE

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

1.4 SAFETY ASSESSMENT

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

1.5 MEETINGS

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

1.6 REGULATORY REQUIREMENTS

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

1.7 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.

1.8 RESPONSIBILITY

- .1 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.
- .2 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

1.9 COMPLIANCE REQUIREMENTS

- .1 Comply with Occupational Health and Safety Regulations, 1996.
- .2 Comply with Canada Labour Code, Canada Occupational Safety and Health Regulations.

1.10 UNFORSEEN HAZARDS

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

1.11 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 overhead work.
- .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 .

1.12 POSTING OF DOCUMENTS

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

1.13 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.

1.14 BLASTING

- .1 Blasting or other use of explosives is not permitted.

1.15 WORK STOPPAGE

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

END OF SECTION

Part 1 General

1.1 REFERENCES AND CODES

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

1.2 BUILDING SMOKING ENVIRONMENT

- .1 Comply with smoking restrictions and municipal by-laws.
- .2 Smoking on site is restricted to within personal vehicles or designated smoking locations.

END OF SECTION

Part 1 General

1.1 INSPECTION

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

1.2 ACCESS TO WORK

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

1.3 PROCEDURES

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

1.4 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.

1.5 REPORTS

- .1 Submit two (2) copies of inspection and test reports to Departmental Representative.
- .2 Provide copies to subcontractor of work being inspected or tested.

1.6 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.

1.7 MOCK-UPS

- .1 Prepare mock-ups for Work specifically requested in specifications. Include for Work of Sections required to provide mock-ups.
- .2 Construct in locations acceptable to Departmental Representative and as specified in specific Section.
- .3 Prepare mock-ups for Departmental Representative and Consultant's review with reasonable promptness and in orderly sequence, to not cause delays in Work.
- .4 Failure to prepare mock-ups 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.
- .5 If requested, Departmental Representative will assist in preparing schedule fixing dates for preparation.
- .6 Mock-ups may remain as part of Work.

END OF SECTION

Part 1 General

1.1 SUBMITTALS

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

1.2 INSTALLATION AND REMOVAL

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

1.3 TEMPORARY HEATING AND VENTILATION

- .1 Maintain temperatures of minimum 10 degrees C in areas where construction is in progress.
- .2 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 Continue operation of ventilation and exhaust system for time after cessation of work process to assure removal of harmful contaminants.
- .3 Permanent heating system of building may be used when available. Obtain written approval from Departmental Representative prior to using equipment. Be responsible for damage to heating system if use is permitted.
- .4 Refer to Mechanical and Electrical sections for specific requirements regarding temporary use of utilities.
- .5 On completion of Work for which permanent heating system is used, provide service maintenance to system at discretion of the Departmental Representative.
- .6 Pay costs for maintaining temporary heat, when not using permanent heating system.
- .7 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.
- .8 Be responsible for damage to Work due to failure in providing adequate heat and protection during construction.

1.4 TEMPORARY POWER AND LIGHT

- .1 Provide and maintain temporary lighting throughout project. Existing lighting and power systems may be utilized.

1.5 TEMPORARY COMMUNICATION FACILITIES

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

1.6 FIRE PROTECTION

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

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-S269.2-M1987(R2003), Access Scaffolding for Construction Purposes.

1.2 SUBMITTALS

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

1.3 INSTALLATION AND REMOVAL

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

1.4 SCAFFOLDING

- .1 Scaffolding in accordance with CAN/CSA-S269.2.
- .2 Provide and maintain scaffolding, ramps, ladders, swing staging, platforms, and temporary stairs.

1.5 HOISTING

- .1 Provide, operate and maintain hoists and cranes required for moving of workers, materials and equipment. Make financial arrangements with Subcontractors for their use of hoists.
- .2 Hoists and cranes to be operated by qualified operator.
- .3 Provide protective coverings for finish surfaces of cars and entrances.

1.6 SITE STORAGE/LOADING

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

1.7 CONSTRUCTION PARKING

- .1 Parking will be permitted on site.
- .2 Provide and maintain adequate access to project site.

1.8 OFFICES

- .1 Provide and maintain, during the entire progress of the Work, a suitable office on the site, for own use, with suitable tables or benches for the examination of drawings, specifications, etc., and where all notices and instructions from the Consultant may be received and acknowledged. Provide suitable meeting space for site meetings. Provide adequate heating, ventilating and lighting. Location of these offices to be coordinated with the Departmental Representative.
- .2 Provide marked and fully stocked first-aid case in a readily available location.

1.9 EQUIPMENT, TOOL AND MATERIALS STORAGE

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

1.10 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.
- .3 Contractor shall be responsible for cleaning and maintenance of designated facilities.

1.11 CONSTRUCTION SIGNAGE

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

1.12 PROTECTION AND MAINTENANCE OF TRAFFIC AND PEDESTRIANS

- .1 Maintain and protect traffic on affected roads during construction period except as otherwise specifically directed by Departmental Representative.
- .2 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
- .3 Protect travelling public from damage to person and property.
- .4 Do not block roads without obtaining approval to do so from the Departmental Representative.

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- .5 Contractor's traffic on roads selected for hauling material shall not interfere with on-going training on site.
 - .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 Provide necessary lighting, signs, barricades, and distinctive markings for safe movement of traffic.
 - .8 Dust control: adequate to ensure safe operation at all times.
 - .9 Provide snow removal during period of Work.

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 on an on-going basis.
- .3 Store materials resulting from demolition activities that are salvageable.
- .4 Stack stored new or salvaged material not in construction facilities.

END OF SECTION

Part 1 General

1.1 INSTALLATION AND REMOVAL

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

1.2 GUARD RAILS, BARRICADES, AND SIGNAGE

- .1 Provide secure, rigid guard rails and barricades around deep excavations, open shafts, open stair wells, open edges of floors and roofs.
- .2 Provide Construction Zone warning and access control signage.

1.3 HOARDING

- .1 Erect temporary site enclosure using 1.8 m high chain link fence with steel posts spaced at maximum 2.4 m on centre. Maintain fence in good repair.
- .2 Provide lockable truck entrance gates and at least one pedestrian door as directed and conforming to applicable traffic restrictions on adjacent streets. Equip gates with locks and keys.
- .3 Provide barriers around trees and plants designated to remain. Protect from damage by equipment and construction procedures.

1.4 MAINTAIN ENTRANCES AND EXITS

- .1 Protect and maintain entrances and emergency exits from building when doing work overhead.
- .2 Provide directional signage, markings, etc. to clearly identify exit path when through Work area.

1.5 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.

1.6 DUST TIGHT SCREENS

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

- .3 Maintain negative pressure in area of dust generating work. Exhaust directly to the exterior.

1.7 ACCESS TO SITE

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

1.8 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.

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

1.12 WASTE MANAGEMENT AND DISPOSAL

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

END OF SECTION

Part 1 General

1.1 REFERENCES

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

1.2 QUALITY

- .1 Products, materials, equipment and articles incorporated in Work shall be new, not damaged or defective, and of best quality for purpose intended. If requested, furnish evidence as to type, source and quality of products provided.
- .2 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.
- .3 Should disputes arise as to quality or fitness of products, decision rests strictly with Departmental Representative based upon requirements of Contract Documents.
- .4 Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout building.
- .5 Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations, except where required for operating instructions, or when located in mechanical or electrical rooms.

1.3 AVAILABILITY

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

1.4 STORAGE, HANDLING AND PROTECTION

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

1.5 TRANSPORTATION

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

1.6 MANUFACTURER'S INSTRUCTIONS

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

1.7 QUALITY OF WORK

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

- .2 Do not employ anyone unskilled in their required duties. Departmental Representative reserves right to require dismissal from site, workers deemed incompetent or careless.
- .3 Decisions as to standard or fitness of Quality of Work in cases of dispute rest solely with Departmental Representative, whose decision is final.

1.8 CO-ORDINATION

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

1.9 CONCEALMENT

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

1.10 REMEDIAL WORK

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

1.11 LOCATION OF FIXTURES

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

1.12 FASTENINGS

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

- .6 Fastenings which cause spalling or cracking of material to which anchorage is made are not acceptable.

1.13 FASTENINGS - EQUIPMENT

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

1.14 PROTECTION OF WORK IN PROGRESS

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

1.15 EXISTING UTILITIES

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

END OF SECTION

Part 1 General

1.1 QUALIFICATIONS OF SURVEYOR

- .1 Qualified registered land surveyor, licensed to practice in Place of Work, acceptable to Departmental Representative.

1.2 SURVEY REFERENCE POINTS

- .1 Locate, confirm and protect control points prior to starting site work. Preserve permanent reference points during construction.
- .2 Make no changes or relocations without prior written notice to Departmental Representative.
- .3 Report to Departmental Representative when reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.
- .4 Require surveyor to replace control points in accordance with original survey control.

1.3 SURVEY REQUIREMENTS

- .1 Existing base horizontal and vertical control points are designated on drawings.
- .2 Establish two permanent bench marks on site, referenced to established bench marks by survey control points. Record locations, with horizontal and vertical data in Project Record Documents.
- .3 Establish lines and levels, locate and lay out, by instrumentation.
- .4 Establish lines and levels for mechanical and electrical work.

1.4 EXISTING SERVICES

- .1 Before commencing work, establish location and extent of service lines in area of Work and notify Departmental Representative of findings.

1.5 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.

1.6 RECORDS

- .1 Maintain a complete, accurate log of control and survey work as it progresses.

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

END OF SECTION

Part 1 General

1.1 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 Departmental Representative 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 Departmental Representative or separate contractor.
 - .7 Written permission of affected separate contractor.
 - .8 Date and time work will be executed.

1.2 FORMS

- .1 Special forms may be required during the course of this Work. Forms will be supplied by the Departmental Representative.

1.3 MATERIALS

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

1.4 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.

1.5 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 airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- .11 At penetration of fire rated wall, ceiling, or floor construction, completely seal voids with firestopping or firestopping sealant material using UL or ULC rated assembly in accordance with manufacturer's instructions.
- .12 Refinish surfaces to match adjacent finishes: Refinish continuous surfaces to nearest intersection. Refinish assemblies by refinishing entire unit.
- .13 Conceal pipes, ducts and wiring in floor, wall and ceiling construction of finished areas except where indicated otherwise. Coordinate Work with mechanical and electrical divisions.

1.6 WASTE MANAGEMENT AND DISPOSAL

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

END OF SECTION

Part 1 General

1.1 PROJECT CLEANLINESS

- .1 Maintain Work in tidy condition, free from accumulation of waste products and debris, other than that caused by Departmental Representative or other Contractors.
- .2 Remove waste materials from site at daily regularly scheduled times. Do not burn waste materials on site.
- .3 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .4 Provide on-site containers for collection of waste materials and debris.
- .5 Dispose of waste materials and debris off site.
- .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 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.
- .9 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.
- .10 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

1.2 FINAL CLEANING

- .1 When Work is Substantially Performed remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.
- .2 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy. Remove debris and surplus materials from accessible concealed spaces.
- .3 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.
- .4 Dust all horizontal surfaces, clean all glass and wipe down walls in renovated areas.

END OF SECTION

Part 1 General

1.1 WASTE MATERIAL STORAGE

- .1 Provide on-site facilities for collection, handling, and storage of anticipated quantities of waste materials.
- .2 Locate containers in locations, to facilitate deposit of materials without hindering daily operations.

1.2 DISPOSAL OF WASTES

- .1 Do not bury rubbish or waste materials.
- .2 Do not dispose of waste, volatile materials, mineral spirits, oil, and paint thinner into waterways, storm, or sanitary sewers.

1.3 USE OF SITE AND FACILITIES

- .1 Execute work with least possible interference or disturbance to normal use of premises.
- .2 Maintain security measures established by existing facility and where required provide temporary security measures approved by Departmental Representative.
- .3 Burning of waste on site is not permitted.

1.4 SCHEDULING

- .1 Co-ordinate Work with other activities at site to ensure timely and orderly progress of Work.

1.5 APPLICATION

- .1 Handle waste materials in accordance with appropriate regulations and codes.

1.6 CLEANING

- .1 Remove tools and waste materials on completion of Work, and leave work area in clean and orderly condition.
- .2 Clean-up work area as work progresses.

END OF SECTION

Part 1 General

1.1 INSPECTION AND DECLARATION

- .1 Contractor's Inspection: Contractor and Subcontractors: conduct inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents.
 - .1 Notify Departmental Representative in writing of satisfactory completion of Contractor's Inspection and that corrections have been made.
 - .2 Request Departmental Representative Inspection.
- .2 Departmental Representative Inspection: Departmental Representative and Contractor will perform inspection of Work to identify obvious defects or deficiencies. Contractor to correct Work accordingly.
- .3 Completion: submit written certificate that following have been performed:
 - .1 Work has been completed and inspected for compliance with Contract Documents.
 - .2 Defects have been corrected and deficiencies have been completed.
 - .3 Equipment and systems have been tested, adjusted and balanced and are fully operational.
 - .4 Certificates required by Fire Commissioner and Utility companies have been submitted.
 - .5 Operation of systems have been demonstrated to Owner's personnel.
 - .6 Commissioning of systems is complete and commissioning forms have been completed.
 - .7 Work is complete and ready for final inspection.
- .4 Final Inspection: when items noted above are completed, request final inspection of Work by Departmental Representative, Consultants and Contractor. If Work is deemed incomplete by Departmental Representative, complete outstanding items and request re-inspection.
- .5 Where re-inspection is required due to uncompleted deficiencies, the time required by the Departmental Representative and Consultants will be recorded and reimbursement of this time may be charges back to the Contractor by deducting from amounts retained.

1.2 CLEANING

- .1 In accordance with Section 01 74 11 - Cleaning.
- .2 Remove waste and surplus materials, rubbish and construction facilities from the site in accordance with Section 01 74 21 - Waste Management and Disposal.

END OF SECTION

Part 1 General

1.1 SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Refer to Mechanical Division for information specific to the mechanical close-out submittals.
- .3 Prepare instructions and data using personnel experienced in maintenance and operation of described products.
- .4 Copy will be returned after final inspection, with Departmental Representative's comments.
- .5 Revise content of documents as required prior to final submittal.
- .6 Two weeks prior to Substantial Performance of the Work, submit to the Departmental Representative, four final copies of operating and maintenance manuals in English.
- .7 Ensure spare parts, maintenance materials and special tools provided are new, undamaged or defective, and of same quality and manufacture as products provided in Work.
- .8 Furnish evidence, if requested, for type, source and quality of products provided.
- .9 Defective products will be rejected, regardless of previous inspections. Replace products at Contractor's own expense.
- .10 Pay costs of transportation.

1.2 FORMAT

- .1 Organize data as instructional manual.
- .2 Provide three (3) bound copies including 1 PDF copy on DVD or CD in each of the manuals.
- .3 Binders: cloth, hard covered, expandable, loose leaf paper size 219 x 279 mm. Colour "black."
- .4 When multiple binders are used correlate data into related consistent groupings. Identify contents of each binder on spine.
- .5 Cover: identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents. Lettering to be "gold" colour.
- .6 Provide printed title on DVD/CD version to coincide with title on bound version.
- .7 Arrange content by systems, under Section numbers and sequence of Table of Contents.
- .8 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.

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

1.3 CONTENTS - EACH VOLUME

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

1.4 AS-BUILTS AND SAMPLES

- .1 Maintain, in addition to requirements in General Conditions, 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. Provide files, racks, and secure storage.
- .3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual. Label each document "PROJECT RECORD" in neat, large, printed letters.

- .4 Maintain record documents in clean, dry and legible condition. Do not use record documents for construction purposes.
- .5 Keep record documents and samples available for inspection by Departmental Representative.

1.5 RECORDING ACTUAL SITE CONDITIONS

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

1.6 EQUIPMENT AND SYSTEMS

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

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

1.7 MATERIALS AND FINISHES

- .1 Building Products, Applied Materials, and Finishes: include product data, with catalogue number, size, composition, and colour and texture designations. Provide information for re-ordering custom manufactured products.
- .2 Instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- .3 Moisture-Protection and Weather-Exposed Products: include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- .4 Additional Requirements: as specified in individual specifications sections.

1.8 SPARE PARTS

- .1 Provide spare parts, in quantities specified in individual specification sections.
- .2 Provide items of same manufacture and quality as items in Work.

- .3 Deliver to location as directed; place and store.
- .4 Receive and catalogue items. Submit inventory listing to Departmental Representative. Include approved listings in Maintenance Manual.
- .5 Obtain receipt for delivered products and submit prior to final payment.
- .6 Additional Requirements: as specified in individual specifications sections.

1.9 MAINTENANCE MATERIALS

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

1.10 SPECIAL TOOLS

- .1 Provide special tools, in quantities specified in individual specification section.
- .2 Provide items with tags identifying their associated function and equipment.
- .3 Deliver to location as directed; place and store.
- .4 Receive and catalogue items. Submit inventory listing to Departmental Representative. Include approved listings in Maintenance Manual.

1.11 STORAGE, HANDLING AND PROTECTION

- .1 Store spare parts, maintenance materials, and special tools in manner to prevent damage or deterioration.
- .2 Store in original and undamaged condition with manufacturer's seal and labels intact.
- .3 Store components subject to damage from weather in weatherproof enclosures.
- .4 Store paints and freezable materials in a heated and ventilated room.
- .5 Remove and replace damaged products at own expense and to satisfaction of 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 and submit upon acceptance of work. Organize binder as follows:
 - .1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.
 - .2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.
 - .3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten days after completion of applicable item of work.
 - .4 Verify that documents are in proper form, contain full information, and are notarized.
 - .5 Co-execute submittals when required.
 - .6 Retain warranties and bonds until time specified for submittal.
- .3 Except for items put into use with the Departmental Representative's permission, leave date of beginning of time of warranty until Date of Substantial Performance is determined.
- .4 Respond in a timely manner to oral or written notification of required construction warranty repair work.
- .5 Written verification will follow oral instructions. Failure to respond will be cause for the Departmental Representative to proceed with action against Contractor.

1.13 PRE-WARRANTY CONFERENCE

- .1 Meet with Departmental Representative, to develop understanding of requirements of this section. Schedule meeting prior to contract completion, and at time designated by Departmental Representative.
- .2 Departmental Representative will establish communication procedures for:
 - .1 Notification of construction warranty defects.
 - .2 Determine priorities for type of defect.
 - .3 Determine reasonable time for response.
- .3 Provide name, telephone number and address of licensed and bonded company that is authorized to initiate and pursue construction warranty work action.
- .4 Ensure contact is located within local service area of warranted construction, is continuously available, and is responsive to inquiries for warranty work action.

END OF SECTION

- .4 Review of shop drawings will not relieve Contractor of responsibility for general and detail dimensions and fit, or any errors or omissions.
- .5 Prepare shop drawings under the direction of a professional engineer registered in the Province of Saskatchewan, Canada.
- .6 Submit shop drawings stamped and signed by qualified professional engineer registered in Province of Saskatchewan, Canada.

Part 2 Products

2.1 MATERIALS/COMPONENTS

- .1 *Sheet Steel:* Grade A or Grade B structural quality, conforming to ASTM A446.

2.2 DECKING/RELATED ACCESSORIES

- .1 *Roof Decking:* RD938 Roof Deck - 38 mm deep by 914 mm wide sheets by 0.76 mm core thickness, as manufactured by VicWest or approved equivalent. Galvanized to Z275 (G90) standard or ZF075 (A25) wiped coat.
- .2 Any substitution of specified material to be approved in writing by the Consultant.
- .3 *Closure Strips, Flashings, Cover Plates and Related Accessories:* minimum 1.6 mm (16 gauge) sheet steel.

2.3 FABRICATION

- .1 Fabricate metal decking in accordance with Drawings and as recommended by the Canadian Sheet Steel Building Institute (CSSBI) Standards. Fabricate to accommodate maximum deflections of 1/360 span.
- .2 Supply steel fillers between decking and supporting members where required.
- .3 Deck units to be 3 span continuous where possible; under no circumstances should deck be less than 2 span continuous except where detailed.

Part 3 Execution

3.1 INSTALLATION

- .1 Erect metal decking in accordance with drawings and as recommended by the CSSBI. Properly align and level on structural supports.
- .2 Allow minimum 40 mm bearing when supported by structural steel and minimum 100 mm bearing when supported by masonry or concrete.
- .3 Mechanical fasten male/female side laps at maximum 300 mm.

- .4 Reinforce openings 150 mm to 450 mm in size with L51 x 51 x 4.8 steel angles or as indicated on the Drawings. Place angles perpendicular to flutes, extended minimum two flutes each side of openings and weld to deck.
- .5 Reinforce openings over 450 mm in accordance with details indicated on Drawings.
- .6 Install minimum 150 mm cover plates where deck changes direction. Spot weld in place at maximum 300 mm on centre.
- .7 Install strip closures at slab edges to match thickness of slab, as required to contain poured concrete. Ensure closures are of sufficient strength to remain in place without distortion.
- .8 Immediately after installation, touch up welds, burned areas and damaged spots with prime paint. Use type of primer recommended for galvanized surfaces.

END OF SECTION

Part 1 General

1.1 GENERAL CONDITIONS

- .1 All component selection and connection design shall be performed by a professional engineer, registered in the Province of Work, whose area of practice includes this type of Work.
- .2 Metal studs and framing to conform to CAN/CSA-S136-01.
- .3 All studs shall be of type, size, spacing and gauge indicated in details on drawings. All 1.22 mm or lighter studs shall be formed from Grade A steel to ASTM A446. Minimum yield strength of 228 MPa. Minimum flange width to be 41 mm for 1.22 mm and 0.91 mm studs and 32 mm for 0.76 mm studs.
- .4 All stud components shall be L.S.C. galvanized.
- .5 Supply and install steel studs in continuous lengths between supports, splicing will not be permitted.
- .6 Top and bottom tracks shall be of the same gauge as the studs. Tracks and studs shall be anchored to the adjacent structure to properly transfer all imposed design loads.
- .7 Provide confirmation by way of section properties and load tables that studs being supplied can resist wind pressure of 1.0 kPa for applicable spans with maximum deflection of L/480.
- .8 Workmanship to conform to Association of Wall & Ceiling Contractors (AWCC) as a minimum.
- .9 Store materials flat, blocked off the ground in a manner to prevent kinking or permanent set. Bent, kinked or twisted studs and track will be rejected.
- .10 Submit shop drawings clearly indicating all construction details including connections and anchor requirements. All Submittals shall bear the seal of a professional engineer registered in the Province of Work. Submit engineer's design notes and calculations upon request of the Consultant.
- .11 Exterior walls shall be designed in accordance with Building Code for the following minimum criteria:
 - .1 Maximum allowable deflection under q10 sustained wind loading shall be L/480.
 - .2 Studs, clip anchor, screws and other attachments shall meet the requirements of the loading structural design criteria set out on the structural drawings, in the Building Code and system dead loads.
 - .3 Stud sizes, gauges and spacings, sill and top track, and fastening details specified herein are to be considered as minimums only. Revise upwards as required by engineering design as specified herein.

2 Products

2.1 MATERIALS

- .1 *Exterior walls:* Studs to CAN/CSA-S136, hot dipped galvanized steel. Sections are to be roll formed with knurled flanges, services and bracing cutouts; spacing at 16" O.C. or as indicated. Metal core thickness 1.22 mm (18 gauge) or 0.089 mm (20 gauge) as indicated.
- .2 *Channel stiffener:* 19 mm (¾") cold-rolled channel of 2.657 mm metal core thickness (0.104") (12 ga.) hot dipped galvanized steel.
- .3 Fasteners:
 - .1 *Stud to stud:* To ASTM C1002, steel, self-drilling, self-threading, case hardened shallow Phillips type heads with integral washer, 25 mm (1") minimum length.
 - .2 *Track to concrete:* Secure track to concrete with either Hilti "Kwikbolts 3" expansion type anchors or metal hit type 6.25 mm (¼") at 400 mm (16") centres. Do **not** use Powder Actuated Fasteners.
 - .3 *Track to steel:* Secure track to structural steel over 8 mm thickness with Hilti E N27 S12 fasteners at 300 mm on centre.

Part 3 Execution

3.1 ERECTION

- .1 For exterior walls ensure all flashings and waterproof membranes provided by others are properly installed to divert moisture to exterior.
- .2 Ensure all door and window frames placed and securely braced in proper location.
- .3 Align exterior wall partition tracks at floor and underside of deck and secure.
- .4 At exterior wall, bottom of studs to be cut square and set with full contact in bottom track. Screw fasten both flanges to sill track.
- .5 Place studs vertically at not over 400mm O.C. unless otherwise shown.
- .6 Cross-brace steel studs as required to provide rigid installation to design engineer's instructions. Provide horizontal bridging in all walls at maximum 1200mm on centre. Secure bridging to each stud using metal clips and screws.
- .7 Erect metal studding to tolerance of L/500.
- .8 Attach studs to lower ceiling track using specified fasteners.
- .9 Co-ordinate simultaneous erection of studs with installation of service lines. When erecting studs ensure web openings are aligned.

- .10 Co-ordinate erection of studs with installation of door/window frames and special supports or anchors for Work specified in other Sections.
- .11 Provide minimum two studs extending from floor to ceiling at each side of openings wider than stud centres specified. Secure studs together, 16" apart using column clips or other approved means of fastening placed alongside frame anchor clips.
- .12 Erect track at head of door openings and sills of sidelight/window openings to accommodate intermediate studs. Secure track to studs at each end, in accordance with engineer's instructions. Install intermediate studs above and below openings in same manner and spacing as wall studs.
- .13 Install steel studs or furring channel between studs for attaching electrical and other boxes.
- .14 Install all attachments within steel-stud partitions for fixtures being hung from or anchored to such partitions.
- .15 Install access doors to electrical or mechanical fixtures supplied under respective Sections.
- .16 Rigidly secure frames to furring or framing systems.
- .17 Install pressed-steel frames supplied under other Sections in steel-stud partitions.
- .18 The installation of the exterior steel stud walls shall be inspected periodically by the professional engineer responsible for the component selection and connection designs for conformance to the shop drawings and design intent.
- .19 Copies of inspection reports shall be forwarded to Consultant, the trade responsible for the Work and the general contractor.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM C36/C36M-03e1, Standard Specification for Gypsum Wallboard.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-51.32-M77, Sheathing, Membrane, Breather Type.
 - .2 CAN/CGSB-51.34-M86, Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
 - .3 CAN/CGSB-71.26-M88, Adhesive for Field-Gluing Plywood to Lumber Framing for Floor Systems.
- .3 Canadian Standards Association (CSA International)
 - .1 CSA B111-1974(R2003), Wire Nails, Spikes and Staples.
 - .2 CAN/CSA-G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .3 CSA O112 Series-M1977(R2006), CSA Standards for Wood Adhesives.
 - .4 CSA O141-05(R2009), Softwood Lumber.
 - .5 CSA O151-09, Canadian Softwood Plywood.
 - .6 CAN/CSA-O325.0-92(R2003), Construction Sheathing.
- .4 National Lumber Grades Authority (NLGA)
 - .1 Standard Grading Rules for Canadian Lumber 2010.

1.2 SUBMITTALS

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

1.3 QUALITY ASSURANCE

- .1 Lumber by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board.
- .2 Plywood, particleboard, OSB and wood based composite panels in accordance with CSA and ANSI standards.

1.4 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 FRAMING AND STRUCTURAL MATERIALS

- .1 Lumber: unless specified otherwise, softwood, S4S, moisture content 19% (S-dry) or less in accordance with following standards:
 - .1 CSA O141.
 - .2 NLGA Standard Grading Rules for Canadian Lumber.
- .2 Structural Composite Lumber (SCL) in accordance with ASTM D5456.
- .3 Framing and board lumber: in accordance with NBC.
- .4 Furring, blocking, nailing strips, grounds, rough bucks:
 - .1 Board sizes: "Standard" or better grade.
 - .2 Dimension sizes: "Standard" light framing or better grade.
 - .3 Post and timbers sizes: "Standard" or better grade.
- .5 Use pressure (preservative) treated lumber material for wood nailers at roof.

2.2 PANEL MATERIALS

- .1 Plywood, OSB and wood based composite panels: to CAN/CSA-O325.0.
- .2 Canadian softwood plywood (CSP): to CSA O151, standard construction.

2.3 ACCESSORIES

- .1 Sealants: in accordance with Section 07 92 10 - Joint Sealing.
 - .1 Maximum allowable VOC limit 250 g/L.
- .2 Subflooring adhesive: to CGSB-71.26, cartridge loaded.
 - .1 Maximum allowable VOC limit 30 g/L.
- .3 General purpose adhesive: to CSA O112 Series.
 - .1 Maximum allowable VOC limit 140 g/L.
- .4 Nails, spikes and staples: to CSA B111.
- .5 Bolts: 12.5 mm diameter unless indicated otherwise, complete with nuts and washers.
- .6 Proprietary fasteners: toggle bolts, expansion shields and lag bolts, screws and lead or inorganic fibre plugs, recommended for purpose by manufacturer.

2.4 FASTENER FINISHES

- .1 Galvanizing: to CAN/CSA-G164, use galvanized fasteners for exterior work, interior highly humid areas, pressure-preservative, fire-retardant, and treated lumber.

Part 3 Execution

3.1 PREPARATION

- .1 Store wood products in a dry location, off the ground.

3.2 INSTALLATION

- .1 Comply with requirements of NBC 2005 Part 9 supplemented by following paragraphs.
- .2 Install members true to line, levels and elevations, square and plumb.
- .3 Construct continuous members from pieces of longest practical length.
- .4 Install spanning members with "crown-edge" up.
- .5 Select exposed framing for appearance. Install lumber and panel materials so that grade-marks and other defacing marks are concealed or are removed by sanding where materials are left exposed.
- .6 Install wall sheathing in accordance with manufacturer's printed instructions.
- .7 Install furring and blocking as required to space-out and support casework, cabinets, wall and ceiling finishes, facings, electrical equipment mounting boards, and other work as required.
- .8 Install solid wood blocking 38mm x 152 mm in joist cavities at locations where wall mounted door stop is attached to steel stud wall assemblies.
- .9 Install rough bucks, nailers and linings to rough openings as required to provide backing for frames and other work.
- .10 Use dust collectors and high quality respirator masks when cutting or sanding wood panels.

3.3 ERECTION

- .1 Frame, anchor, fasten, tie and brace members to provide necessary strength and rigidity.
- .2 Countersink bolts where necessary to provide clearance for other work.
- .3 Use nailing disks for soft sheathing as recommended by sheathing manufacturer.

3.4 SCHEDULES

- .1 Refer to drawings for various items requiring furring, blocking, nailing strips, grounds and rough bucks.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Underwriters Laboratories of Canada (ULC)
 - .1 ASTM C612-[04], Standard Specification for Mineral Fibre Block and Board Thermal Insulation.
 - .2 CAN/ULC-S701-05, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Coverings.
 - .3 CAN/ULC-S702- 97, Thermal Insulation, Mineral Fibre, for Buildings.
 - .4 CAN/ULC-S704-03, Standard for Thermal Insulation Polyurethane and Polyisocyanurate, Boards, Faced.

1.2 SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and data sheet in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Submit two copies of WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01300 Submittals. Indicate VOC's insulation products and adhesives.
- .2 Manufacturer's Instructions:
 - .1 Submit manufacturer's installation instructions.

1.3 ENVIRONMENTAL PERFORMANCE REQUIREMENTS

- .1 Mineral fibre insulation must be formaldehyde free.

Part 2 Products

2.1 INSULATION

- .1 Rigid Cellular Polyisocyanurate:
 - .1 Refer to Section 07 52 00 – Modified Bituminous Roofing
 - .2 Faced: to CAN/ULC C-S704-11.
 - .1 Closed cell polyisocyanurate foam core bonded to inorganic glass fibre reinforced faces, 2 sides per ASTM C1289 Type II, Class 1, Grade 2.
 - .2 Shape: flat.
 - .3 RSI (R-Value): as indicated on drawings.
- .2 Mineral Fibre Board Insulation: to CAN/ULC-S702- 97.
 - .1 Purpose made, dual density fibre board for use in cavity and rainscreen applications.
 - .2 R-Value: RSI 0.76/ 25.4mm (R4.3/inch)
 - .3 Exterior cavity wall as noted on drawings.
 - .1 Type 1.

- .2 Density: Outer layer 100 kg/m³, Inner layer approximately 55 kg/m³.
- .3 Thickness as indicated.
- .4 Approved product:
 - .1 Roxul – “Cavityrock DD”
 - .2 Approved equivalent

2.2 ADHESIVE

- .1 Adhesive (for polystyrene): to CGSB 71-GP-24.
- .2 Compatible with roofing membrane and polystyrene insulation

2.3 ACCESSORIES

- .1 Insulation clips: impale type, perforated 50 x 50 mm cold rolled carbon steel 0.8 mm thick, adhesive back, spindle of 2.5 mm diameter annealed steel, length to suit insulation, 25 mm diameter washers of self locking type.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 WORKMANSHIP

- .1 Install insulation after building substrate materials are dry.
- .2 Install insulation to maintain continuity of thermal protection to building elements and spaces.
- .3 Fit insulation tight around electrical boxes, plumbing and heating pipes and ducts, around exterior doors and windows and other protrusions.
- .4 Keep insulation minimum 75 mm from heat emitting devices such as recessed light fixtures, and minimum 50 mm from sidewalls of CAN4-S604 type A chimneys and CAN/CGA-B149.1 and CAN/CGA-B149.2 type B and L vents.
- .5 Cut and trim insulation neatly to fit spaces. Butt joints tightly, offset vertical joints. Use only insulation boards free from chipped or broken edges. Use largest possible dimensions to reduce number of joints.
- .6 Offset both vertical and horizontal joints in multiple layer applications.
- .7 Do not enclose insulation until it has been inspected and approved by Consultant.

3.3 EXAMINATION

- .1 Examine substrates and immediately inform Consultant in writing of defects.

-
- .2 Prior to commencement of work ensure:
- .1 Substrates are firm, straight, smooth, dry, free of snow, ice or frost, and clean of dust and debris.

3.4 CAVITY WALL INSTALLATION

- .1 Install mineral fibre insulation in wall cavity as recommended by manufacturer.

3.5 ROOF INSULATION INSTALLATION

- .1 Rigid Cellular Polyisocyanurate
- .1 Refer to Section 07 52 00 – Modified Bituminous Roofing.

3.6 CLEANING

- .1 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM C553-02, Specification for Mineral Fibre Blanket Thermal Insulation for Commercial and Industrial Applications.
- .2 Underwriters Laboratories of Canada (ULC)
 - .1 CAN/ULC-S702-1997, Standard for Mineral Fibre Insulation.
 - .2 CAN/ULC S102 – Surface Burning Characteristics

Part 2 Products

2.1 INSULATION

- .1 Batt Insulation
 - .1 Fibreglass batt: to ASTM C665. Roof parapets and as otherwise indicated in drawings.
 - .1 Type: 1 (Unfaced)
 - .2 Thickness: as indicated.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSULATION INSTALLATION

- .1 Install insulation to maintain continuity of thermal protection to building elements and spaces and to ASTM C1320.
- .2 Fit insulation closely around electrical boxes, pipes, ducts, frames and other objects in or passing through insulation.
- .3 Do not compress insulation to fit into spaces.
- .4 Keep insulation minimum 75 mm from heat emitting devices such as recessed light fixtures, and minimum 50 mm from sidewalls of CAN/ULC-S604 Type A chimneys and CAN/CGA-B149.1 and CAN/CGA-B149.2 Type B vents.

3.3 CLEANING

- .1 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Canadian Urethane Foam Contractors' Association Inc. (CUFCA)
- .2 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S705.1-01, Standard for Thermal Insulation Spray Applied Rigid Foam, Medium Density, Material Specification.
 - .2 CAN/ULC-S705.2-02, Standard for Thermal Insulation Spray Applied Rigid Foam, Medium Density, Installer's Responsibilities-Specification.

1.2 SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 Submittals Procedures.
- .2 Product Data
 - .1 Submit test reports, verifying qualities of insulation meet or exceed requirements of this specification.
- .3 Maintenance Manuals:
 - .1 Conform to Section 01 78 00 Closeout Submittals.

1.3 QUALITY ASSURANCE

- .1 Applicators to conform to CUFCA Quality Assurance Program.

1.4 SAFETY REQUIREMENTS

- .1 Protect workers as recommended by CAN/ULC-S705.2 and manufacturer's recommendations.

1.5 PROTECTION

- .1 Ventilate area to receive insulation by introducing fresh air and exhausting air continuously during and 24 hour after application to maintain non-toxic, unpolluted, safe working conditions.
- .2 Provide temporary enclosures to prevent spray and noxious vapours from contaminating air beyond application area.
- .3 Protect adjacent surfaces and equipment from damage by overspray, fall-out, and dusting of insulation materials.

1.6 ENVIRONMENTAL REQUIREMENTS

- .1 Apply insulation only when surfaces and ambient temperatures are within manufacturers' prescribed limits.

Part 2 Products

2.1 MATERIALS

- .1 Insulation: spray polyurethane to CAN/ULC-S705.1. Two component system combined on site using volume proportions as per manufacturer's written instructions. The material shall have the following physical properties:
 - .1 Density (core): ASTM D-1622: min. 30.4 kg/m².
 - .2 Dimension stability, % volume change after 28 days: -0.047% at -20°C, 8.45% at +100°C, 7.64% at +70°C with relative humidity > 90% ±3%.
 - .3 Compressive strength: ASTM D-1621 (parallel to rise 10%): 222 kPa.
 - .4 Tensile strength: ASTM D-1623: 337 kPa.
 - .5 Open cell content: ASTM D-2856: <1%.
 - .6 Water absorption by volume: ASTM D-2842: 2.5%.
 - .7 Thermal resistance: ASTM C-518: after 90 days at 23°C (m²x°C/W)/25mm of 1.46. Value for long term thermal performance CCMC shall be RSI 1.05 per 25mm. (R6 per inch).
 - .8 Water vapour permeance: ASTM E-96 without skins, core only: ng/Pa.s.m² of 125.
 - .9 Flame spread classification: for thickness of 50mm to CAN/ULC-S102 of 375, smoke developed 288.
 - .10 Emmissions/VOCs: below detection limit after 24 hours when tested to CAN/ULC-S774.
 - .11 Service temperatures: -40°C to +80°C.
 - .12 Air leakage to CAN/ULC-S705.1-01 and must be installed by certified contractor as per CAN/ULC-S705.2-05.
- .2 Primers: in accordance with manufacturer's recommendations for surface conditions.
- .3 Transition membranes as listed in CCMC report air barrier system #12932-R; self-adhering SBS modified bitumen with cross-laminated polyethylene film having the following properties:
 - .1 Thickness: 1.0mm
 - .2 Air Leakage: <0.003 L/s.m² @ 75 Pa to ASTM E283-91 (1999)
 - .3 Vapour permeance: 1,6 ng/Pa.m² (.03 Perms) to ASTM E96
 - .4 Low Temperature Flexibility: -30°C to CGSB 37 GP 56M
 - .5 Elongation: 200% to ASTM D412-modified.
 - .6 Acceptable material: Blueskin SA as manufactured by Bakor.

Part 3 Execution

3.1 APPLICATION

- .1 Surfaces to be covered with sprayed polyurethane foam must be clean and dry as required by CAN/ULC-S702.2-05. Substrates must be free of all frost, dust, oil, grease, oxidation or other materials that may affect adhesion

- .2 Apply insulation to clean surfaces in accordance with CAN/ULC-S705.2-05 and manufacturer's printed instructions.
- .3 Provide transition membranes where required by assembly and installed prior to application of foam insulation. Transition membranes shall be as listed in the CCMC report air barrier system #12932-R and be compatible with manufacturer's system.
- .4 Use primer where recommended by manufacturer.
- .5 Apply sprayed foam insulation in consecutive layers of no less than 12.5 mm (1/2") and no more than 50 mm (2") to a total thickness as indicated on drawings.
- .6 Polyurethane foam should be sprayed with a tolerance of +6/-0 mm (+1/4"/-0") in relation to the specified thickness.
- .7 The formation of sub-layer air pockets must be avoided.
- .8 Avoid spraying the foam on any surfaces other than those indicated. Protect all adjacent surfaces and equipment against any damage that may be caused by dispersion and overspray of insulation material beyond prescribed areas. Use drop sheets or masking tap to protect other surfaces.
- .9 Spray the polyurethane foam in overlapping layers, so as to obtain a smooth, uniform surface.
- .10 When applying on a flat surfaces of more than 30 lineal meters (100 lineal feet) in either direction, apply the first layer in 3 m (10 ft) strips at 1 m (3 ft) intervals. After the curing period (\pm 4 hrs.) has elapsed, spray the polyurethane foam on the unfilled spaces. The same procedure shall be applicable in cold weather but the minimum length shall be 15 lineal meters (50 lineal feet).
- .11 Do not spray polyurethane foam any closer than 75 mm (3") from chimneys, heating vents, steam pipes, recessed lighting fixtures and other heat sources. Do not spray the insides of any exit openings or electrical junction boxes.
- .12 Once the foam has hardened, remove all overspray from non-prescribed surfaces. Make good any damage to the work of others.
- .13 Do not allow polyurethane foam, once applied, to be damaged during the work of other trades unless prior agreement has been reached.
- .14 Ensure that subsequent coverage of the applied insulating foam will be completed within the manufacturer's prescribed timeframe.
- .15 Cleaning of equipment should be performed in areas designated for this purpose and contents of containers neutralized according to the procedure established by the CAN/ULC-S705.2-05.

END OF SECTION

Part 1 General

1.1 REFERENCES-

- .1 ASTM International
 - .1 ASTM E1677; Specification for Air Retarder Material or System for Framed Building Walls
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-51.33-M89, Vapour Barrier Sheet, Excluding Polyethylene, for Use in Building Construction.

1.2 SUBMITTALS

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

1.3 QUALITY ASSURANCE

- .1 Mock-Ups:
 - .1 Submit mock-ups in accordance with Section 01 45 00 - Quality Control.
 - .2 Convene pre-installation meeting prior to construction of mock-up, include major sub-trades..
 - .3 Install mock-up using approved air barrier assemblies including fasteners, flashing, tape and related accessories per manufacturer's current printed instructions and recommendations.
 - .1 Mock-up size: approximately 4 meters by 4 meters including wall opening.
 - .4 Mock-up will be used to judge workmanship, substrate preparation, and material application.
- .2 When accepted, mock-up will demonstrate minimum standard of quality required for this work. Approved mock-up may remain as part of finished work.
- .3 Allow 48 h for inspection of mock-up by Consultant before proceeding with air/vapour barrier Work.

1.4 SEQUENCING

- .1 Sequence work to permit installation of materials in conjunction with related materials and seals.

Part 2 Products

2.1 Air and Vapour Barrier membrane for Roofing is specified in Section 07 52 00 – Modified Bituminous Membrane Roofing

2.2 AIR VAPOUR BARRIER

.1 Self-Adhesive SBS rubberized asphalt laminated to high-density polyethylene film, minimum nominal total thickness of 1.0 mm.

- .1 Soprema: Sopraseal Stick 1100T
- .2 IKO: Aquabarrier AVB
- .3 Carlisle: CCW 705 A/V Barrier
- .4 Approved equivalent

2.3 VAPOUR PERMEABLE AIR BARRIER

.1 Self-adhered water resistive, vapour permeable, air barrier membrane to ASTM E 2178. Consisting of tri-laminate of modified polyolefin with two layers of non-woven polyethylene, suitable for full wall assemblies. Permeable self-adhesive layer with release film. Refer to details on drawings for locations and assembly.

- .1 Henry Company: BlueskinVP 100
- .2 Approved equivalent

2.4 ACCESSORIES-SHEET VAPOUR BARRIERS

- .1 Sealant: compatible with air barrier materials, recommended by air barrier manufacturer. Refer to Section 07 92 00 - Joint Sealing.
- .2 Foam Seal: Spray-applied medium density spray polyurethane foam insulation/air/vapour barrier.
- .3 Sheet steel: Galvanized steel, Z275 zinc coating; 0.8 mm thick core steel.
- .4 Attachments: Galvanized steel bars and anchors.
- .7 Primer: Appropriate to application.

Part 3 Execution

3.1 EXAMINATION

.1 Verify substrate and surface conditions are in accordance with manufacturer recommended tolerances prior to installation of barrier and accessories.

3.2 INSTALLATION - AIR VAPOUR BARRIER AND VAPOUR PERMEABLE AIR BARRIER

- .1 Refer to Wall Types and drawings for locations of air vapour barrier and vapour permeable air barrier.

- .2 Preparation
 - .1 Remove loose or foreign matter which might impair adhesion of materials.
 - .2 Ensure all substrates are clean of oil or excess dust; all masonry joints struck flush, and open joints filled; and all concrete surfaces free of large voids, spalled areas or sharp protrusions.
 - .3 Ensure all substrates are free of surface moisture prior to application of self-adhesive membrane and primer.
 - .4 Ensure metal closures are free of sharp edges and burrs.
 - .5 Prime substrate surfaces to receive adhesive in accordance with manufacturer's instructions.
- .3 Installation
 - .1 Install materials in accordance with manufacturer's instructions to create a continuous seal between all material junctions within the building envelope.
 - .2 Apply sealants and primers within recommended application temperature ranges. Consult manufacturer when products cannot be applied within these temperature ranges.
 - .3 Install membrane using a consecutive weatherboard method starting at base of wall and working upward, provide minimum 50mm side laps and 80mm end laps.
 - .4 Position membrane for alignment, remove protective film and firmly apply pressure to ensure adhesion. Eliminate all gaps and wrinkles.
 - .5 Roll entire membrane surface, including seams, to ensure full contact and adhesion.
 - .6 Seal membrane terminations, heads of mechanical fasteners, masonry tie fasteners, around penetrations, duct work, electrical and other apparatus extending through the water resistive air barrier membrane and around the perimeter edge of membrane terminations at window and door frames with manufacturer recommended sealant.

3.3 INSTALLATION – MASONRY CAVITY FLASHING

- .1 Install masonry cavity flashing in a shingle style manner integrated with other air barrier membranes, as indicated in drawings. Coordinate work with adjacent work to ensure proper lapping of membranes.

3.4 CLEANING

- .1 Proceed in accordance with Section 01 74 11 – Cleaning.
- .2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 American Society of Mechanical Engineers (ASME)
 - .1 ASME B18.6.3-2011, Machine Screws, Tapping Screws, and Metallic Drive Screws (Inch Series).
- .2 ASTM International
 - .1 ASTM D2369-10e1, Test Method for Volatile Content of Coatings.
 - .2 ASTM D2832-92(2011), Standard Guide for Determining Volatile and Nonvolatile Content of Paint and Related Coatings.
 - .3 ASTM D5116-10, Standard Guide For Small-Scale Environmental Chamber Determinations of Organic Emissions From Indoor Materials/Products.
- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-93.3-M91, Prefinished Galvanized and Aluminum-Zinc Alloy Steel Sheet for Residential Use.
 - .2 CAN/CGSB-93.4-92, Galvanized and Aluminum-Zinc Alloy Coated Steel Siding Soffits and Fascia, Prefinished, Residential.
 - .3 CAN/CGSB-93.5-92, Installation of Metal Residential Siding, Soffits and Fascia.

1.2 DESIGN AND PERFORMANCE REQUIREMENTS

- .1 Components: Design and size to withstand dead and live loads caused by positive and negative wind pressure acting normal to plane of panel as calculated in accordance with National Building Code of Canada.
- .2 Maximum Allowable Deflection of Panel: 1/180.
- .3 Movement: Accommodate movement within system without damage to system, components, or deterioration of seals; movement between system and perimeter components when subject to seasonal temperature cycling; dynamic loading and release of loads; deflection of structural support framing.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for metal siding and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Indicate dimensions, profiles, attachment methods, schedule of wall elevations, trim and closure pieces, metal furring, and related work.
- .4 Samples:

- .1 Submit duplicate 300 x 300 mm samples of siding material, of colour and profile specified.

1.4 DELIVERY, STORAGE AND HANDLING

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

Part 2 Products

2.1 STEEL CLADDING AND COMPONENTS

- .1 Strip siding: to CAN/CGSB-93.4, Vertical; Class: plain.
 - .1 Thickness: 0.72 mm base metal thickness. (22 gauge)
 - .2 Profile: Vicwest AD 300 profile. Hidden fastener system.
 - .3 Finish: factory prefinished 2 coat system.
 - .1 Base metal: ASTM A653 / ASTM A653M for Zinc coated steel (galvanized).
 - .2 Film thickness: To ASTM A755/A755M and AAMA 621-02. Minimum topcoat dry film thickness of 18microns (0.7 mils) and 5microns (0.2 mils) primer.
 - .3 Film hardness: to ASTM D3363.
 - .4 Gloss: to ASTM D523
 - .5 Humidity resistance: to ASTM D2247
 - .6 Film integrity: no evidence of cracking, flacking, or checking that is apparent on ordinary outdoor observations for first 40 years.
 - .7 Product Attributes: minimum of 70% Kynar 500 or Hylar 5000 PVDF resins, 10,000 Series.
 - .1 Medium gloss.
 - .2 Colour to be selected from manufacturer's standard range of colours.
 - .2 Subgirts: gauge to suit intended application, profile as required and as indicated; to attach panel system to building structure.
 - .3 Insulation: semi-rigid mineral fibre insulation and sprayed polyurethane insulation: thickness as indicated in drawings. Refer to Section 07 21 13 Board Insulation and Section 07 21 29 Sprayed Insulation.

- .4 Internal and External Corners: Same material, thickness, and finish as exterior sheets; profile to suit system; shop cut and factory mitered to required angles as recommended by manufacturer.

2.2 FASTENERS

- .1 Screws: ASME B18.6.3. Purpose made stainless steel hexagon head with neoprene washers.

2.3 CAULKING

- .1 Sealants: as recommended by manufacturer and in accordance with Section 07 92 00 - Joint Sealants.

2.4 ACCESSORIES

- .1 Exposed trim: inside corners, outside corners, cap strip, drip cap, undersill trim, starter strip and window/door trim of same material, colour, gloss as cladding, with fastener holes pre-punched.

2.5 WARRANTY

- .1 Provide manufacturer's written warranty for factory applied finish for 35 years from the date of Substantial Completion.
- .2 10,000 Series (Polyvinylidene Fluoride - PVDF) will not visibly (within 10 metres to the unaided naked eye) crack, chip, or peel (lose adhesion) for thirty-five (35) years from date of application. This does not include minute fracturing that may occur during the normal fabrication process. 10,000 Series (Polyvinylidene Fluoride - PVDF) will not chalk in excess of a number eight (8) rating, in accordance with ASTM D-4214-98 method D659 at any time for thirty-five (35) years from date of installation (35.5 yrs from application); will not change colour more than five (5.0) Hunter ΔE units as determined by ASTM method D-2244-02. }

Part 3 Execution

3.1 EXAMINATION

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

3.2 MANUFACTURER'S INSTRUCTIONS

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

3.3 INSTALLATION

- .1 Install cladding in accordance with CGSB 93.5 and manufacturer's written instructions.
- .2 Install cladding in locations and orientations indicated in drawings.

- .3 Install continuous starter strips, inside and outside corners, edgings, soffit, drip, cap, sill and window/door opening flashings as indicated.
- .4 Install outside corners, fillers and closure strips with carefully formed and profiled work.
- .5 Maintain joints in exterior cladding, true to line, tight fitting, hairline joints.
- .6 Attach components in manner not restricting thermal movement.
- .7 Caulk junctions with adjoining work with sealant. Do work in accordance with Section 07 92 00 - Joint Sealants.

3.4 PROTECTION

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

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 ASTM C 1177/C1177M-01, Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
- .2 ASTM D6164-00, Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Polyester Reinforcements.
- .2 Canadian General Standards Board (CGSB).
 - .1 CGSB 37-GP-19M-85, Cement, Plastic, Cutback Tar.
 - .2 CAN/CGSB-37.29-M89, Rubber-Asphalt Sealing Compound.
 - .3 CGSB 37-GP-56M-80b(A1985), Membrane, Modified, Bituminous, Prefabricated, and Reinforced for Roofing.
 - .4 CAN/CGSB-51.33-M89, Vapour Barrier Sheet, Excluding Polyethylene, for Use in Building Construction.
- .3 Canadian Roofing Contractors Association (CRCA).
 - .1 CRCA Roofing Specifications Manual-2011.
- .4 Canadian Standards Association (CSA International).
 - .1 CSA A123.21 Standard Test Method for The Dynamic Wind Uplift resistance of Membrane Roofing Systems.

1.2 PERFORMANCE REQUIREMENTS

- .1 Wind Uplift Resistance testing will be in accordance with CSA123.21
- .2 Building parameters
 - .1 Geometry: Low rise, low slope roof.
 - .2 Exposure: Open.
 - .3 Openings: Category 2
 - .4 Importance: High
- .3 Submit a report, issued by a certified materials testing laboratory, showing the roofing system offered was tested in accordance with CSA A 123.21-10, Standard Test Method for the Dynamic Wind Uplift Resistance of Membrane Roofing Systems. Test results shall demonstrate the roofing system provides a Dynamic Uplift Resistance pressure for the field, edges and corners of the roof that satisfy the wind load requirements per the NBCC.
- .4 Compatibility between components of roofing system is essential. Provide written declaration to Departmental Representative stating that materials and components, as assembled in system, meet this requirement.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

- .2 Submit two copies of most recent technical roofing components data sheets describing materials' physical properties.
- .3 Submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 33 00 - Submittal Procedures.
- .4 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 Indicate membrane flashing, and insulation details.
- .5 Manufacturer's Installation Instructions:
 - .1 Provide complete installation instructions for all materials and conditions.
 - .2 Indicate special precautions required for seaming membrane.
 - .3 Indicate minimum installation temperatures.
- .6 Maintenance Manuals:
 - .1 Conform to Section 01 78 00 - Closeout Submittals.

1.4 QUALITY ASSURANCE

- .1 Convene pre-installation meeting one week prior to beginning Work, with roofing contractor's representative to:
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Co-ordination with other building subtrades.
 - .4 Review manufacturer's installation instructions and warranty requirements.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Provide and maintain dry, off-ground weatherproof storage.
- .2 Store rolls of felt and membrane in upright position. Store membrane rolls with selvage edge up.
- .3 Remove only in quantities required for same day use.
- .4 Place plywood runways over completed Work and existing roof membranes to enable movement of material and other traffic.
- .5 Store sealants at +5 degrees C minimum.
- .6 Store insulation protected from daylight and weather and deleterious materials.
- .7 Handle roofing materials in accordance with manufacturer's written directives, to prevent damage or loss of performance.

1.6 PROTECTION

- .1 Fire Extinguishers: maintain one cartridge operated type or stored pressure rechargeable type with hose and shut-off nozzle, ULC labeled for A, B and C class protection on roof per torch applicator, within 6 m of torch applicator.

- .2 Maintain fire watch for 1 hour after each day's roofing operations cease.

1.7 ENVIRONMENTAL REQUIREMENTS

- .1 Do not install roofing materials or adhesives when temperature is below manufacturer's recommendations.
- .2 Install roofing on dry deck, free of snow and ice, use only dry materials and apply only during weather that will not introduce moisture into roofing system.

1.8 QUALIFICATIONS

- .1 Applicator: Company specializing in performing work of this section with minimum 5 years documented experience in installation of roof systems. roofing contractor will supply and install materials to acceptance of manufacturer in order to qualify for manufacturer's warranty.

1.9 WARRANTY

- .1 Contractor shall warrant that modified bituminous roofing and membrane flashings will stay in place and remain leakproof for two years.
- .2 Membrane manufacturer will issue a written and signed document in the Owner's name, valid for a 10-year period, stating it will repair any leaks in the roofing membrane to restore the roofing system to a dry and watertight condition should defects in either the membrane manufacturing or workmanship of the installation cause water infiltration. The warranty will cover the full cost of the repairs during the entire warranty period.

Part 2 Products

2.1 COMPATIBILITY

- .1 Compatibility between components of system and adjacent materials is essential. Provide a written declaration to the Departmental Representative stating that materials and components, as assembled in system, meet this requirement and are eligible for system warranty.

2.2 PRIMER

- .1 Elastomeric bitumen and solvent based for self-adhesive waterproofing membranes as recommended by vapour retarder membrane manufacturer. Primer must be suitable for temperatures at which it will be installed.

2.3 ADHESIVES

- .1 Dual component urethane, solvent free, cold process roofing adhesive as recommended by roof membrane manufacturer. Adhesive must be suitable for temperatures at which it will be installed.
 - .1 IKO Millennium: One Step Foamable Adhesive.
 - .2 Soprema: Duotack Adhesive.

.3 Or equivalent

2.4 VAPOUR RETARDER

- .1 SBS Modified Bitumen to ASTM D5147.
 - .1 Thickness: min 0.8mm
 - .2 Air permeability: ASTM E2853 (75 Pa).
 - .3 Water vapour permeance: ASTM E96 (procedure B).
 - .4 Top face: high density polyethylene grid laminated between two layers of polyethylene film.
 - .5 Thickness: 0.8 mm.
 - .6 Self-adhesive with silicone plastic release liner.
 - .7 Acceptable Products:
 - .1 IKO: IKO- MVP
 - .2 Soprema –Sopravap'R
 - .3 Approved alternate.

2.5 PROTECTION PANELS

- .1 Multi-ply, semi-rigid asphaltic roofing substrate board composed of a mineral fortified asphaltic core formed between two asphaltic saturated fibreglass liners.
 - .1 Insulation protection panels:1220mm x 2440mm, minimum thickness 4.8mm.
 - .2 Acceptable products:
 - .1 IKO: Protectoboard
 - .2 Soprema: Sopraboard
 - .3 Approved alternate.

2.6 ROOF BOARD

- .1 Glass Mat, Gypsum Board: to ASTM C1177 12 mm thick]
- .2 Acceptable products:
 - .1 Georgia-Pacific: DensDeck Prime
 - .2 Approved alternate.

2.7 FIRE PROTECTION TAPE

- .1 Self-adhesive membrane composed of a reinforced glass mat and SBS modified bitumen designed to prevent flames from penetrating into empty spaces and openings while installing heat-welded membranes

2.8 BOARD INSULATION

- .1 Refer to section 07 21 13 Board Insulation.
- .2 Roof Type 1 (R1):
 - .1 Rigid Cellular Polyisocyanurate:

- .1 Shape: flat and tapered as required to suit roof drainage slopes and plan.
- .2 Average RSI (R-Value): as noted in drawings.
- .2 Approved product:
 - .1 Compatible with roof membrane system and acceptable to membrane manufacturer as part of the specified extended warranty.
- .3 Adhere insulation to meet requirements of CSA 123.21 and in accordance with manufacturer's written instructions.

2.9 MEMBRANES

- .1 Base sheet membrane systems:
 - .2 Factory laminated base sheet to asphaltic board or base membrane torched to protection panels on site are both acceptable systems for base sheet installation. Selection of either base sheet system is at the discretion of the Contractor.
 - .3 To CGSB-37.56-M and ASTM D6164. Styrene Butadiene Styrene(SBS) elastomeric polymer prefabricated sheet, polyester reinforcement, having nominal weight of 180 g/m².
 - .1 Factory-laminated Base Sheet Panel:
 - .1 SBS modified base sheet membrane factory-laminated on a semi-rigid asphaltic board. Top surface is covered with thermofusible plastic film. base sheet has a duo selvedge composed of both self-adhesive and thermofusible sections. Minimum panel thickness including membrane : 6.5 mm. Minimum membrane thickness 2.0 mm.
 - .1 Soprema: Soprasmart Board 180.
 - .2 Approved equivalent.
 - .2 Fibre board panels are not acceptable.
 - .2 Base Sheet membrane (installed over protection panels):
 - .1 Non-woven reinforced polyester reinforcing mat coated and impregnated with SBS modified bitumen to a nominal thickness of 3.0 mm. Both sides covered with a thermofusible plastic film.
 - .1 IKO: Torchflex TP-180-FF-Base
 - .2 Soprema: Sopralene Flam 180
 - .3 Approved equivalent.
 - .4 Cap Sheet Membrane:
 - .1 To CGSB 37-GP-56M polyester fibres to ASTM D6164. Styrene Butadiene Styrene(SBS) elastomeric polymer prefabricated sheet, polyester reinforcement, having nominal weight of 250 g/m². Top face is covered with coloured granules. underface is covered with a thermofusible plastic film.
 - .2 Colour for granular surface: white, minimum SRI 75.
 - .1 IKO: Armourcool HD TP
 - .2 Soprema: Soprastar Flam HD GR

- .3 Approved equivalent.
- .5 Flashing Membranes
 - .1 Base Sheet Flashing: to CGSB 37 GP 56M. Styrene Butadiene Styrene elastomeric polymer, prefabricated sheet, heavy duty reinforcement, self-adhesive underface, top surface torchable polyethylene
 - .1 IKO: Armour Bond Flash.
 - .2 Soprema: Sopraflash Flam Stick
 - .3 Approved equivalent.
 - .2 Cap Sheet Flashing: to CGSB 37 GP 56M. Styrene Butadiene Styrene (SBS) elastomeric polymer, prefabricated sheet, heavy duty reinforcement. Fully adhered torched on membrane. Cap sheet flashing underface is covered with a plastic thermofusible film. Top face is protected by coloured granules to match cap sheet.
 - .1 IKO: TP-250-CAP
 - .2 Soprema: Sopralene Flam 250
 - .3 Approved equivalent.
- .6 Perimeter Fastening Strip
 - .1 Prefinished metal angle 22GA., galvanized, 100mm x 100mm metal angle, fabricated with 90 degree bend to be used for mechanical attachment of roofing base sheet panels to parapet or area divider walls and curbs greater than 600mm in length.

2.10 SEALERS

- .1 Plastic cement: asphalt, to CAN/CGSB-37.5
- .2 Sealing compound: to CAN/CGSB-37.29, rubber asphalt type.
- .3 Sealants:
 - .1 Urethanes Two Part.
 - .1 Non-sag to CAN/CGSB-19.24, Type 2, Class B, colour to match adjacent surfaces.

2.11 FASTENERS

- .1 As recommended by manufacturer.

Part 3 Execution

3.1 QUALITY OF WORK

- .1 Compliance: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.
- .2 Do examination, preparation and roofing Work in accordance with Roofing Manufacturer's Specification Manual, CRCA Roofing Specification Manual and to FM Design No. as specified.

3.2 SUBSTRATE EXAMINATION

- .1 Prepare surfaces and complete waterproofing work in conformance with manufacturer's written instructions. Install roofing elements on clean and dry surfaces, in conformance with manufacturer's instructions and recommendations.
- .2 Prior to beginning of work ensure:
 - .1 Decks are firm, straight, smooth, dry, free of snow, ice or frost, and swept clean of dust and debris. Do not use calcium or salt for ice or snow removal.
 - .2 Curbs have been built.
 - .3 Roof drains have been installed at proper elevations relative to finished roof surface.
 - .4 Sheathing has been installed to walls and parapets as indicated.
- .3 Inform Departmental Representative immediately of any damage or deterioration of existing substrates to remain in place. Do not proceed with Work until instructed by Departmental Representative
- .4 Do not install roofing materials during rain or snowfall.

3.3 PROTECTION

- .1 Cover walls, walks and adjacent work where materials hoisted or used.
- .2 Use warning signs and barriers. Maintain in good order until completion of Work.
- .3 Clean off drips and smears of bituminous material immediately.
- .4 Dispose of rain water off roof and away from face of building until roof drains or hoppers installed and connected.
- .5 Protect new and existing roof membranes from traffic and damage. Comply with precautions deemed necessary by Departmental Representative.
- .6 At end of each day's work or when stoppage occurs due to inclement weather, provide protection for completed Work and materials out of storage.
- .7 Metal connectors and decking will be treated with rust proofing or galvanization.

3.4 VAPOUR RETARDER

- .1 Install the self-adhesive vapour retarder membrane in conformance with the manufacturer's recommended methods.
- .2 Apply primer to roof substrates as recommended by membrane manufacturer. All surfaces to be primed must be free of rust, dust or any residue that may hinder adherence. Cover primed surfaces with roofing membrane as soon as possible.
- .3 Hold the membrane in place, remove the siliconized release film from the underside by pulling diagonally. Apply pressure with a roller to ensure positive adhesion to the surface. Install subsequent rolls in the same manner and overlap the side laps a minimum of 75 mm. Roll all laps for positive adhesion.

- .4 Ensure the membrane end lap is overlapped a minimum of 150mm (6") and roll the lap for positive adhesion.
- .5 Install vapour retarder membrane to vertical surfaces at perimeters, curbs, and other roof projections to permit a sealed connection with the base sheet layer. Vapour retarder extensions on vertical surfaces to be installed not more than 25mm above the level of the field base sheet membrane.
- .6 Metal Decking
 - .1 Unroll vapour retarder membrane onto roof underlayment board. Ensure the deck sheathing surface is clean, dry, and free of any loose material.
 - .2 Ensure the membrane end lap is overlapped a minimum of 150mm and roll the lap for positive adhesion.
 - .3 Roll two membrane end laps to ensure a complete end lap seal.
- .7 Concrete Deck
 - .1 Prime all concrete surfaces to receive membrane with specified primer. Ensure concrete surfaces are clean, dry, and free of any loose material or sharp edges.
 - .2 Only once primed surfaces are dry, install self-adhesive membrane in conformance with manufacturer's specifications and recommended methods. Unroll the vapour retarder membrane onto the substrate and align the longitudinal edge with the roof edge. At one end of the roll, remove approximately 1 meter of the siliconized release film from the underside and adhere to substrate. From the other end of the roll, pull the membrane taut and, with the membrane held in place, remove the siliconized release film from the underside by pulling diagonally. Apply pressure with a roller to ensure positive adhesion to the surface.
 - .3 Install subsequent rolls in the same manner taking care to overlap the side laps a minimum of 75 mm. Overlap the end laps a minimum of 150 mm. Roll all laps with a steel or nylon roller to ensure positive adhesion.

3.5 PRIMING PARAPET

- .1 Apply deck primer to substrate at rate recommended by manufacturer for adherence of self-adhesive parapet base membranes.

3.6 PROTECTION PANELS

- .1 Protection Panel is not required if factory-laminated base sheet panels are used.
- .2 Apply adhesive in strict conformance with manufacturer's written recommendations.
- .3 Measure and cut asphalt core panels to fit profile of curb or parapet. Cut sheets to proper length in maximum 1200mm widths.
- .4 Apply adhesive to substrate and carefully lay insulation protection panels onto adhesive. Avoid excessive sliding of boards and smearing of adhesive. Once panel is in place, use a 100lb steel roller over entire surface of panel to ensure complete contact with adhesive.
- .5 Measure and cut insulation protection panels to ensure minimum 1/2 size panels adjacent to parapets and roof dividers.

- .6 Install only as many panels as can be covered same day with waterproofing layer.

3.7 ROOF UNDERLAYMENT BOARD

- .1 Mechanically fasten to steel deck Glass Mat Gypsum Board with screws to steel deck's upper rib surfaces, spaced 400mm on centre each way.
- .2 Place with long axis of each sheet transverse to steel deck ribs, with end joints staggered and fully supported on ribs.

3.8 FIRE PROTECTION TAPE

- .1 Apply fire protection tape according to manufacturer's written instructions.
- .2 Install prior to torch-applied vapour retarders, base sheets or stripping membranes. Install over substrate cracks, voids, vertical abutments, panel joints and any locations subject to back drafts or entrance of flame from torch.

3.9 PERIMETER FASTENING

- .1 Prior to installation of base sheet panels, install the prefinished metal angle at all parapet and divider walls and curbs greater than 600mm in length.
- .2 Place the angle tight to the roof/wall connection and directly on top of the insulation panels. Mechanically attach the metal angle to the side walls @ 300mm o/c (or at stud spacing for gypsum substrates).

3.10 EXPOSED MEMBRANE ROOFING APPLICATION

- .1 Insulation: fully adhered. Refer to Section 07 21 13 Board Insulation.
- .2 Factory-laminated Base Sheet Application:
 - .1 Fully adhere factory-laminated base sheet panel directly to insulation layer. Insulation Protection Panel is not required if factory-laminated base sheet panels are used.
 - .2 Apply adhesive in strict conformance with manufacturer's written recommendations.
 - .3 Starting at low point or roof drain, install base sheet panels over insulation layer, aligned with edge of roof. Panels must be snugly fitted, without any significant differences in level.
 - .4 Install factory-laminated base sheet panel in strict accordance with manufacturer's written instructions.
 - .5 All vertical joints between substrate and base sheet panels will be staggered.
 - .6 Application to be free of blisters, wrinkles and fishmouths.
- .3 Base Sheet Membrane application (when factory laminated base sheet is not used).
 - .1 Install torch applied base sheet in strict accordance with manufacturer's written instructions.
 - .2 Unroll base sheet at drain with side lap lined up with drain centre and ensure roll is parallel to roof edge.

- .3 Torch apply base sheet directly to bituminous protection panels. Ensure adequate heat is used to liquefy bitumen and obtain positive adherence to substrate.
- .4 Ensure installation is free of wrinkles, air pockets, and fishmouths.
- .4 Cap Sheet Application:
 - .1 Install torch applied cap sheet in strict accordance with manufacturer's written instructions.
 - .2 Starting at low point on roof, perpendicular to slope, unroll cap sheet, align and reroll from both ends.
 - .3 Unroll and torch cap sheet onto base sheet taking care not to burn membrane or its reinforcement.
 - .4 Application to be free of blisters, fishmouths and wrinkles.
- .5 Membrane Flashings:
 - .1 Complete installation of flashing base sheet stripping prior to installing membrane cap sheet. Install flashing in strict accordance with manufacturer's written instructions.
 - .2 Lap flashing base sheet to membrane base sheet minimum 150 mm and seal torch welding.
 - .3 Lap flashing cap sheet to membrane cap sheet 250 mm minimum and torch weld.
 - .4 Provide 75 mm minimum side lap and seal.
 - .5 Properly secure flashings to their support, without sags, blisters, fishmouths, wrinkles or excessive bleed-out at joints.
- .6 Reinforced Gussets
 - .1 Install reinforcing gussets in all inside and outside corners in conformance to manufacturer's specifications.
 - .2 Install gussets after installation of base sheet membranes. Heat weld and butter gussets to provide a smooth finish.
- .7 Roof penetrations:
 - .1 Install roof drain pans, vent stack covers and other roof penetration flashings and seal to membrane in accordance with manufacturer's recommendations and details and as noted in drawings

3.11 CLEANING

- .1 Remove bituminous markings from finished surfaces.
- .2 In areas where finished surfaces are soiled caused by work of this section, consult manufacturer of surfaces for cleaning advice and complying with their documented instructions.
- .3 Repair or replace defaced or disfigured finishes caused by work of this section.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 American Society for Testing and Materials (ASTM International)
 - .1 ASTM A653/A653M-01a, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .2 Canadian Roofing Contractors Association (CRCA)
 - .1 Roofing Specifications Manual 1997.
- .3 Canadian Standards Association (CSA International)
 - .1 CSA B111-1974 (R1998), Wire, Nails, Spikes and Staples

1.2 SAMPLES

- .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit duplicate 100 x 100 mm samples of each type of sheet metal material, colour and finish.

1.3 WARRANTY

- .1 Contractor shall warrant that sheet metal flashings will stay in place and remain leakproof in accordance with General Conditions for two years.

Part 2 Products

2.1 SHEET METAL MATERIALS

- .1 Zinc coated steel sheet: 0.8 mm thickness, commercial quality to ASTM A653/A653M, with Z275 designation coating.

2.2 PREFINISHED STEEL SHEET

- .1 Prefinished steel with factory applied silicone modified polyester finish.
 - .1 Stelco / Dafasco 8000 Series
 - .2 Colour selected by Consultant from manufacturer's standard range of colours.

2.3 ACCESSORIES

- .1 Isolation coating: alkali resistant bituminous paint.
- .2 Plastic cement: to CAN/CGSB 37.5.
- .3 Sealants: two component polyurethane, colour to match adjacent materials.
- .4 Cleats: of same material, and temper as sheet metal, minimum 50 mm wide. Thickness same as sheet metal being secured.

- .5 Fasteners: of same material as sheet metal, to CSA B111, ring thread flat head roofing nails of length and thickness suitable for metal flashing application.
- .6 Washers: of same material as sheet metal, 1 mm thick with rubber packings.
- .7 Solder: to ASTM B32, alloy composition.
- .8 Touch-up paint: as recommended by prefinished material manufacturer.

2.4 METAL FLASHINGS AND CAP FLASHINGS

- .1 Form flashings, copings and fascias to profiles indicated of 0.8mm thick prefinished steel

Part 3 Execution

3.1 FABRICATION

- .1 Fabricate metal flashings and other sheet metal work in accordance with applicable CRCA 'FL' series details as indicated.
- .2 Form pieces in 2400 mm maximum lengths. Make allowance for expansion at joints.
- .3 Hem exposed edges on underside 12 mm. Mitre and seal corners with sealant.
- .4 Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.
- .5 Apply isolation coating to metal surfaces to be embedded in concrete or mortar.

3.2 INSTALLATION

- .1 Install sheet metal work in accordance with CRCA FL series details, FL Aluminum Sheet Metal Work in Building Construction and as detailed.
- .2 Use concealed fastenings except where approved before installation.
- .3 Counterflash bituminous flashings at intersections of roof with vertical surfaces and curbs. Flash joints using S-lock forming tight fit over hook strips, as detailed.
- .4 "S-Lock" end joints and caulk with sealant.
- .5 Install metal flashing under cap flashing to form weather tight junction.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Canadian General Standards Board (CGSB)
 - .1 CGSB 19-GP-5M-1984, Sealing Compound, One Component, Acrylic Base, Solvent Curing (Issue of 1976 reaffirmed, incorporating Amendment No. 1).
 - .2 CAN/CGSB-19.13-M87, Sealing Compound, One-component, Elastomeric, Chemical Curing.
 - .3 CGSB 19-GP-14M-1984, Sealing Compound, One Component, Butyl-Polyisobutylene Polymer Base, Solvent Curing (Reaffirmation of April 1976).
 - .4 CAN/CGSB-19.17-M90, One-Component Acrylic Emulsion Base Sealing Compound.
 - .5 CAN/CGSB-19.24-M90, Multi-component, Chemical Curing Sealing Compound.
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).

1.2 SUBMITTALS

- .1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data
 - .1 Manufacturer's product to describe.
 - .1 Caulking compound.
 - .2 Primers.
 - .3 Sealing compound, each type, including compatibility when different sealants are in contact with each other.
 - .2 Submit manufacturer's instructions in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 Instructions to include installation instructions for each product used.
- .3 Samples:
 - .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Submit duplicate samples of each type of material and colour.
 - .3 Submit cured samples of exposed sealants for each color where required to match adjacent material.
- .4 Maintenance Manuals:
 - .1 Conform to Section 01 78 00 - Closeout Submittals.

1.3 DELIVERY, STORAGE, AND HANDLING

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

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

1.4 PROJECT CONDITIONS

- .1 Environmental Limitations:
 - .1 Do not proceed with installation of joint sealants under following conditions:
 - .1 When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 5 degrees C.
 - .2 When joint substrates are wet.
 - .2 Joint-Width Conditions:
 - .1 Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.
 - .3 Joint-Substrate Conditions:
 - .1 Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

1.5 ENVIRONMENTAL REQUIREMENTS

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

Part 2 Products

2.1 SEALANT MATERIALS

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

2.2 SEALANT TYPES

- .1 Type 1 -Urethanes Multi-Part.
 - .1 Non-Sag to CAN/CGSB-19.24, Type 2, Class B, colour as selected by Consultant from standard range of manufacturer's colours.
 - .1 Acceptable material: Tremco "Dymeric 240",
 - .2 Or equivalent.

2.3 PREFORMED COMPRESSIBLE AND NON-COMPRESSIBLE BACK-UP MATERIALS.

- .1 Polyethylene, Urethane, Neoprene or Vinyl Foam.
 - .1 Extruded open closed cell foam backer rod.
 - .2 Size: oversize 30 to 50 %.
- .2 Neoprene or Butyl Rubber.
 - .1 Round solid rod, Shore A hardness 70.
- .3 High Density Foam.
 - .1 Extruded closed cell polyvinyl chloride (PVC), extruded polyethylene, closed cell, Shore A hardness 20, tensile strength 140 to 200 kPa, extruded polyolefin foam, 32 kg/m³ density, or neoprene foam backer, size as recommended by manufacturer.
- .4 Bond Breaker Tape.
 - .1 Polyethylene bond breaker tape which will not bond to sealant.

2.4 SEALANT SELECTION

- .1 Exterior sealant: Sealant Type: 1 (colour to be selected by consultant).
- .2 Masonry control joints, Sealant Type: 1 (match mortar colour)
- .3 Perimeters of exterior openings where door and window frames meet exterior facade of building : Sealant Type: 1.
- .4 In additional locations as noted on the drawings: confirm with Consultant.

2.5 JOINT CLEANER

- .1 Non-corrosive and non-staining type, compatible with joint forming materials and sealant recommended by sealant manufacturer.
- .2 Primer: as recommended by manufacturer.

Part 3 Execution

3.1 PROTECTION

- .1 Protect installed Work of other trades from staining or contamination.

3.2 SURFACE PREPARATION

- .1 Examine joint sizes and conditions to establish correct depth to width relationship for installation of backup materials and sealants.
- .2 Clean bonding joint surfaces of harmful matter substances including dust, rust, oil grease, and other matter that may impair Work.
- .3 Do not apply sealants to joint surfaces treated with sealer, curing compound, water repellent, or other coatings unless tests have been performed to ensure compatibility of materials. Remove coatings as required.

- .4 Ensure joint surfaces are dry and frost free.
- .5 Prepare surfaces in accordance with manufacturer's directions.

3.3 PRIMING

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

3.4 BACKUP MATERIAL

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

3.5 MIXING

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

3.6 APPLICATION

- .1 Refer to referenced Sections for specific installation instructions.
- .2 General Installation.
 - .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 Apply 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.
- .3 Curing.
 - .1 Cure sealants in accordance with sealant manufacturer's instructions.
 - .2 Do not cover up sealants until proper curing has taken place.
- .4 Cleanup.
 - .1 Clean adjacent surfaces immediately and leave Work neat and clean.
 - .2 Remove excess and droppings, using recommended cleaners as work progresses.
 - .3 Remove masking tape after initial set of sealant.

END OF SECTION

Part 1 General

1.1 RELATED SECTION

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 61 00 - Common Product Requirements.
- .3 Section 01 78 00 - Closeout Submittals.

1.2 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit catalogue details for each type of door illustrating profiles, dimensions and methods of assembly.

1.3 CLOSEOUT SUBMITTALS

- .1 Provide maintenance data for cleaning and maintenance of stainless steel finishes for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.4 DELIVERY, STORAGE AND HANDLING

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

Part 2 Products

2.1 ACCESS DOORS

- .1 Sizes: Except as indicated otherwise, to be minimum sizes as follows:
 - .1 For body entry: 600 x 600 mm.
 - .2 For hand entry: 300 x 300 mm.
- .2 Construction: Rounded safety corners, concealed hinges, screwdriver latch, anchor straps, able to open 180 degrees. Doors shall be of approved manufacturer with published literature.
- .3 Materials
 - .1 Tiled or marble surfaces and other special areas: Stainless steel with brushed satin.
 - .2 Other areas: Prime coated steel.

2.2 EXCLUSIONS

- .1 Lay-in tile ceilings: use unobtrusive identification locators.

Part 3 Execution

3.1 INSTALLATION

- .1 Installation:
 - .1 Tiled or marble surfaces: to Division 9.
 - .2 Masonry surfaces: to Division 4.
 - .3 Drywall surfaces: to Division 6.

3.2 LOCATION

- .1 Location: Ensure that equipment is within view and accessible for operating, inspecting, adjusting, servicing without using special tools.

END OF SECTION

Part 1 General

1.1 DESIGN AND PERFORMANCE REQUIREMENTS

- .1 Completed tubular skylight assemblies shall be capable of meeting the following performance requirements:
 - .1 Air Infiltration Test: Air infiltration will not exceed 0.30 cfm/sf aperture with a pressure delta of 1.57 psf across the tube when tested in accordance with ASTM E 283.
 - .2 Water Resistance Test: No uncontrolled water leakage at 10.5 psf pressure differential with water rate of 5 gallons/hour/sf when tested in accordance with ASTM E 547.
 - .3 Uniform Load Test:
 - .1 No breakage, permanent damage to fasteners, hardware parts, or damage to make system inoperable or cause excessive permanent deflection of any section when tested at a Positive Load of 150 psf (7.18 kPa) or Negative Load of 60 psf (2.87 kPa) in accordance with ICC AC-16 Section A, or Negative Load of 70 psf (3.35 kPa) if tested per ICC AC-16 Section B.
 - .2 All units shall be tested with a safety factor of (3) for positive pressure and (2) for negative pressure, acting normal to plane of roof in accordance with ASTM E 330.
 - .4 Fire Testing:
 - .1 Self-Ignition Temperature - Greater than 650 degrees F per ASTM D-1929.
 - .2 Smoke Density - Rating no greater than 450 per ASTM Standard E 84 in way intended for use. Classification C.
 - .3 Rate of Burn and/or Extent - Maximum Burning Rate: 2.5 inches/min (62 mm/min) Classification CC-2 per ASTM D 635.
 - .4 Rate of Burn and/or Extent - Maximum Burn Extent: 1 inch (25 mm) Classification CC-1 per ASTM D 635.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for tubular skylights and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Indicate layout, profiles and product components, including anchorage, flashings and accessories.

1.3 DELIVERY, STORAGE AND HANDLING

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

1.4 WARRANTY

- .1 Tubular skylight: Manufacturer's standard warranty for 10 years.

Part 2 Products

2.1 TUBULAR SKYLIGHTS

- .1 Transparent roof-mounted tubular skylight dome and self-flashing curb, reflective tube and diffuser assembly
 - .1 Flashing Base: one piece, seamless, leak-proof flashing functioning as base support for dome and top of tube
 - .2 Tube Ring: High impact acrylic
 - .3 Dual Glazed Diffuser Assembly: Full-tempered glass lens and decorative metal fasteners
 - .4 Ceiling Ring: Impact resistant acrylic
- .2 Acceptable Manufacturer/Product:
 - .1 Solatube Model 290 DS
 - .2 Approved equivalent

2.2 FASTENERS

- .1 Same material as metals being fastened, non-magnetic steel, non-corrosive metal of type recommended by manufacturer, or injection molded nylon.
- .2 Suspension Wire: steel, annealed, galvanized finish, size and type for application and ceiling system requirement.

2.3 CAULKING

- .1 Sealant: Polyurethane or copolymer based elastomeric sealant as provided or recommended by manufacturer

Part 3 Execution

3.1 EXAMINATION

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

3.2 MANUFACTURER'S INSTRUCTIONS

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

3.3 INSTALLATION

- .1 Install tubular skylights in accordance with manufacturer's written instructions.
- .2 Install tubular skylights in locations and orientations indicated in drawings.
- .3 Caulk junctions with adjoining work with sealant. Do work in accordance with Section 07 92 00 - Joint Sealants.
- .4 Field test to determine adequacy of installation of first skylight. Conduct water test in presence of Consultant. Correct Work if needed before proceeding with installation of subsequent units.

3.4 PROTECTION

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

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM C36/C36M-03e1, Specification for Gypsum Wallboard.
 - .2 ASTM C475-12, Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
 - .3 ASTM C840-11, Specification for Application and Finishing of Gypsum Board.
 - .4 ASTM C841-03(2008), Standard Specification for Installation of Interior Lathing and Furring.
 - .5 ASTM C1002-07, Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
 - .6 ASTM C1047-10a, Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.
 - .7 ASTM C1178/C1178M-11, Specification for Glass Mat Water-Resistant Gypsum Backing Board.
 - .8 ASTM C1396/C1396M-11, Standard Specification for Gypsum Board.
 - .9 ASTM C1629/C1629M-06(2011), Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels
- .2 Association of the Wall and Ceilings Industries International (AWEI)
- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-51.34-M86(R1988), Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
- .4 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S102-2007, Surface Burning Characteristics of Building Materials and Assemblies.

1.2 DELIVERY, STORAGE AND HANDLING

- .1 Deliver materials in original packages, containers or bundles bearing manufacturers brand name and identification.
- .2 Store materials inside, level, under cover. Keep dry. Protect from weather, other elements and damage from construction operations and other causes.
- .3 Handle gypsum boards to prevent damage to edges, ends or surfaces. Protect metal accessories and trim from being bent or damaged.
- .4 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

1.3 SITE ENVIRONMENTAL REQUIREMENTS

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

Part 2 Products

2.1 MATERIALS

- .1 Standard board: to ASTM C36/C36M, Type X, 16 mm thick, 1200 mm wide x maximum practical length, ends square cut, edges bevelled.
- .2 Moisture-and mold resistant gypsum board: to ASTM C1396/C1396M, regular, thickness as indicated in drawings thickness as indicated in drawings, 1200 mm wide x maximum practical length.
- .3 Metal Access doors: frameless, welded construction, push latching door, removable door, accepts 12.7 mm or 15.9 mm gypsum board, exposed frames paintable.
- .4 Metal furring runners, hangers, tie wires, inserts, and anchors required for installation to ASTM C841.
- .5 Drywall furring channels: 0.5 mm core thickness galvanized steel channels for screw attachment of gypsum board.
- .6 Resilient drywall furring: 0.5 mm base steel thickness galvanized steel for resilient attachment of gypsum board.
- .7 Metal channel stiffener: 19 x 1.4 mm thick cold rolled steel, coated with rust inhibitive coating.
- .8 Steel drill screws: to ASTM C1002.
- .9 Casing beads, corner beads, control joints and edge trim: to ASTM C1047, metal, zinc-coated by electrolytic process, 0.5 mm base thickness, perforated flanges, one piece length per location.
- .10 Joint compound: to ASTM C475, asbestos-free.

Part 3 Execution

3.1 ERECTION

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

- .2 Erect hangers and runner channels for suspended gypsum board ceilings in accordance with ASTM C840 except where specified otherwise.
- .3 Support light fixtures by providing additional ceiling suspension hangers within 150 mm of each corner and at maximum 600 mm around perimeter of fixture.
- .4 Install work level to tolerance of 1:1200.
- .5 Frame with furring channels, perimeter of openings for access panels, light fixtures, diffusers, and grilles.
- .6 Furr for gypsum board faced vertical bulkheads within and at termination of ceilings.
- .7 Install gypsum board fire and sound stops and to form plenum areas to underside of steel roof deck above suspended ceilings as indicated.
- .8 Install wall furring for gypsum board wall finishes in accordance with ASTM C840, except where specified otherwise.
- .9 Furr openings and around built-in equipment, cabinets, access panels, on four sides. Extend furring into reveals. Check clearances with equipment suppliers.
- .10 Furr duct shafts, beams, columns, pipes and exposed services where indicated.
- .11 Erect drywall resilient furring transversely across studs, spaced maximum 600 mm on centre and not more than 150 mm from ceiling/wall juncture. Secure to each support with 25 mm drywall screw.

3.2 APPLICATION

- .1 Do not apply gypsum board until bucks, anchors, blocking, sound attenuation, electrical and mechanical work are approved.
- .2 Apply single and double layer gypsum board (as indicated on drawings) to metal furring or framing using screw. Maximum spacing of screws, 300 mm on centre.
 - .1 Single-Layer Application:
 - .1 Apply gypsum board on ceilings prior to application of walls in accordance with ASTM C840.
 - .2 Apply gypsum board vertically or horizontally, providing sheet lengths that will minimize 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 Install ceiling boards in direction that will minimize number of end-butt joints. Stagger end joints at least 250 mm.
- .4 Install gypsum board on walls vertically to avoid end-butt joints. At stairwells and similar high walls, install boards horizontally with end joints staggered over studs, except where local codes or fire-rated assemblies require vertical application.
- .5 Install gypsum board with face side out.
- .6 Do not install damaged or damp boards.
- .7 Locate edge or end joints over supports. Stagger vertical joints over different studs on opposite sides of wall.
- .8 Apply moisture and mold resistant panels to interior side of all exterior walls. Thickness and type to match gypsum board specified in Wall Type.

3.3 **INSTALLATION**

- .1 Erect accessories straight, plumb or level, rigid and at proper plane. Use full length pieces where practical. Make joints tight, accurately aligned and rigidly secured. Mitre and fit corners accurately, free from rough edges. Secure at 150 mm on centre.
- .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.
- .4 Construct control joints of preformed units set in gypsum board facing and supported independently on both sides of joint.
- .5 Provide continuous polyethylene dust barrier behind and across control joints.
- .6 Apply 12 mm diameter bead of acoustic sealant continuously around perimeter of first layer of multiple layers of gypsum board to seal gypsum board/structure junction where partitions abut fixed building components. Seal full perimeter of cut-outs around electrical boxes, ducts, and penetrations, in partitions where perimeter sealed with acoustic sealant.
- .7 Install access doors to electrical and mechanical fixtures specified in respective sections.
 - .1 Rigidly secure frames to furring or framing systems.
- .8 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.
- .9 Gypsum Board Finish: finish gypsum board walls and ceilings to following levels in accordance with Association of the Wall and Ceiling Industries (AWCI) International Recommended Specification on Levels of Gypsum Board Finish:
 - .1 Levels of finish:
 - .1 Level 0: No taping, finishing or accessories required.

- .2 Level 1: Embed tape for joints and interior angles in joint compound. Surfaces to be free of excess joint compound; tool marks and ridges are acceptable.
- .3 Level 2: Embed tape for joints and interior angles in joint compound and apply one separate coat of joint compound over joints, angles, fastener heads and accessories; surfaces free of excess joint compound; tool marks and ridges are acceptable.
- .4 Level 3: Embed tape for joints and interior angles in joint compound and apply two separate coats of joint compound over joints, angles, fastener heads and accessories; surfaces smooth and free of tool marks and ridges.
- .5 Level 4: Embed tape for joints and interior angles in joint compound and apply three separate coats of joint compound over joints, angles, fastener heads and accessories; surfaces smooth and free of tool marks and ridges.
- .6 Level 5: Embed tape for joints and interior angles in joint compound and apply three separate coats of joint compound over joints, angles, fastener heads and accessories; apply a thin skim coat of joint compound to entire surface; surfaces smooth and free of tool marks and ridges.
- .10 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.
- .11 Fill screw head depressions with joint and taping compounds to bring flush with adjacent surface of gypsum board so as to be invisible after surface finish is completed.
- .12 Sand lightly to remove burred edges and other imperfections. Avoid sanding adjacent surface of board.
- .13 Completed installation to be smooth, level or plumb, free from waves and other defects and ready for surface finish.
- .14 Mix joint compound slightly thinner than for joint taping.
- .15 Apply thin coat to entire surface using trowel or drywall broadknife to fill surface texture differences, variations or tool marks.
- .16 Allow skim coat to dry completely.
- .17 Remove ridges by light sanding or wiping with damp cloth.
- .18 Provide protection that ensures gypsum drywall work will remain without damage or deterioration at time of substantial completion.

3.4 CONTROL JOINTS

- .1 Provide control joints at not greater than 9 m spacing on continuous gypsum board walls in a single plane and at not greater than 9 m spacing on ceilings and bulkheads except where indicated otherwise in the drawings.
 - .1 Confirm location of control joints with the Consultant prior to installation of gypsum board

- .2 Provide control joints of preformed units set in gypsum board facing and supported independently on both sides of joint. Interrupt top and bottom tracks at location of control joint.
- .3 Install control joints straight and true. Finish control joints as required with two coats of joint compound and one coat of taping compound, feathered out onto panel faces.

3.5 FINISH SCHEDULES

- .1 Levels of finish: Interior partitions;
 - .1 Level 1:
 - .1 Plenums above suspended ceilings, inside of duct shafts and other gypsum board wall areas not exposed to view.
 - .2 Level 4:
 - .1 Vertical surfaces (walls) exposed to view.
 - .2 Ceilings and underside of bulkheads exposed to view.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM A 641 Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
 - .2 ASTM B 209 Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

1.2 DESIGN REQUIREMENTS

- .1 Maximum deflection: 1/360th of span to ASTM C635 deflection test.

1.3 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data
 - .1 Submit manufacturer's technical data for each type of ceiling unit and suspension system required.
- .3 Installation Instructions
 - .1 Submit manufacturer's installation instructions.

1.4 DELIVERY, STORAGE AND HANDLING

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

Part 2 Products

2.1 MATERIALS

- .1 Linear Metal Soffits (Exterior)
 - .1 Material: Electrogalvanized steel.
 - .2 Finish: Post-production, powder-coat painted.
 - .3 Thickness: 0.71 mm (0.028 inch).
 - .4 Size: Nominal 100 mm (4 inch) wide panels including 25 mm (1 inch) reveal, 15.87 mm (5/8 inch) high x 2440 mm (8 feet) long.
 - .5 Edge Details: Square with extended flange.
 - .6 Color: selected from manufacturers standard range of colours.
 - .7 Perforation Option: Unperforated.
 - .8 Texture: Smooth.
- .2 Acceptable Manufacturer/Product:

- .1 Armstrong World Industries: Metalworks Linear Exterior or equivalent.

2.2 SUPSPENSION

- .1 Exterior: meet wind uplift Class 90.
- .2 Carrier: Provide carrier to suit installation as recommended by manufacturer.
- .3 Splices as needed for installation.
- .4 Hanger Wire: Minimum 12 gauge pre-stretched galvanized steel wire.
- .5 Hanger Clip: Provide carrier steel clip to connect carriers to hanger wires.
- .6 Accessories: Provide accessories including panel splices, end caps, trim molding and pressure spring as required to suit installation.

Part 3 Execution

3.1 INSTALLATION

- .1 Comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.
- .2 Comply with applicable industry standards and local regulations in effect including requirements for wind uplift performance.
- .3 Secure hangers to overhead structure using industry approved attachment methods.
- .4 Ensure suspension system is co-ordinated with location of related components.
- .5 Install wall moulding to provide correct ceiling height.
- .6 Completed suspension system to support super-imposed loads, such as lighting fixtures.
- .7 Frame at openings for penetrations through metal ceiling such as light fixtures.
- .8 Adjust ceiling components to provide a consistent finish and appearance in conformity.
- .9 Finished linear metal ceiling system to be square with adjoining walls and level within 1:1000.

3.2 CLEANING

- .1 Proceed in accordance with Section 01 74 11 – Cleaning.
- .2 Touch up scratches, abrasions, voids and other defects in painted surfaces.

END OF SECTION

Part 1 - General

1. RELATED WORK

- | | | |
|----|---|-------------|
| .1 | Access Doors | Division 08 |
| .2 | Heating, Ventilating and Air Conditioning | Division 23 |

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.
- .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 conflicts.
- .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.

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 Remove from site and dispose of packaging materials at appropriate recycling facilities.
 - .2 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

- .3 Divert unused metal materials from landfill to metal recycling facility as approved by Departmental Representative.
- .4 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.
- .5 Fold up metal and plastic banding, flatten and place in designated area for recycling.
- .6 Handle and dispose of hazardous materials in accordance with CEPA, TDGA, Regional and Municipal regulations.
- .7 Provide manifests describing and listing waste created. Transport containers by approved means to licenced landfill for burial.

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.

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.

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.

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.

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 0-5 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 0-5 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 (six in total).

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 Engineer's original tracings and for providing the Departmental Representative with set of sepia 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.

10. IDENTIFICATION

- .1 Refer to Section 23 05 54, Mechanical Identification.

11. TEMPORARY FACILITIES

- .1 Refer to General Requirements - Division 01.

12. SUPERVISION

- .1 Refer to General Requirements - Division 01.

13. TEMPORARY HEAT AND/OR VENTILATION

- .1 Refer to General Requirements - Division 01.

- .2 Do not use the permanent system for temporary heating or ventilation purposes, without written permission from the Departmental Representative.
- .3 Thoroughly clean and overhaul permanent equipment used during the construction period, replacing worn or damaged parts. Exchange equipment or components operating improperly at final inspection with new equipment or components.
- .4 Use of permanent systems for temporary heat shall not modify the terms of warranty.
- .5 Operate heating systems under conditions which ensure no temporary or permanent damage. Operate fans at proper resistance with filters installed. Change filters at regular intervals. Operate with proper safety devices and controls installed and fully operational. Operate water systems with proper water treatment.
- .6 Where air systems are used during temporary heating, provide filter media on return and exhaust air outlets. Clean duct systems which have become dirty.
- .7 When permanent systems are used for temporary heat, provide alarm indicating system failure. Connect alarm to independent alarm company system.
- .8 Replace mechanical seals in pumps used for temporary heating purposes with new mechanical seals, regardless of condition.
- .9 Provide one year warranty from date of Substantial Completion.

14. 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 Operate, drain and flush out bearings and refill with new change of oil, before final acceptance.
- .4 Thoroughly clean piping, ducts and equipment of dirt, cuttings and other foreign substances.
- .5 Protect bearings and shafts during installation. Grease shafts and sheaves to prevent corrosion. Supply and install necessary extended nipples for lubrication purposes.
- .6 Ensure that existing equipment is carefully dismantled and not damaged or lost. Do not re-use existing materials and equipment unless specifically indicated.

15. TEMPORARY OR TRIAL USAGE

- .1 Temporary or trial usage by the Departmental Representative of mechanical equipment supplied under contract and claimed complete before final acceptance shall not represent acceptance.
- .2 Repair or replace permanent equipment used temporarily.
- .3 Take responsibility for damage caused by defective materials or workmanship during temporary or trial usage.

16. ELECTRICAL MOTORS

- .1 Supply mechanical equipment complete with electrical motors.
- .2 Provide NEMA premium efficiency motors to CEMA and CSA standards for hard, continuous service, designed to limit temperature rise to 40 deg.C (100 deg.F) for open housing and 50 deg.C (125 deg.F) for drip proof housing, and operate at 1800 RPM unless otherwise specified.
- .3 Motors shall have ball or roller type bearings with grease lubrication fittings.
- .4 Motors used in conjunction with variable frequency drives shall be suitable for inverter duty, as specified by NEMA MGI-1993, Part 31. Refer to electrical specifications for inverters.
- .5 Refer to electrical specification for voltage, phase and cycle.

17. ACCESS DOORS

- .1 Supply access doors for furred ceilings, ducts or spaces for servicing equipment and accessories or for inspection of safety, operating and fire devices for installation under section erecting the walls or ceilings.
- .2 Provide access doors in ductwork in accordance with Section 23 33 00 - Air Duct Accessories
- .3 Provide service access door in accordance with Section 08 31 00.01 - Access Doors - Mechanical.

18. WASTE MANAGEMENT AND DISPOSAL

- .1 Packing, shipping, handling and unloading:
 - .1 Deliver, store and handle all mechanical components in accordance with Section 01 61 00 - Common Product Requirements.
 - .2 Deliver, store and handle all 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 Remove from site and dispose of packaging materials at appropriate recycling facilities.
 - .2 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
 - .3 Divert unused metal materials from landfill to metal recycling facility as approved by Departmental Representative.
 - .4 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.
 - .5 Fold up metal and plastic banding, flatten and place in designated area for recycling.
 - .6 Handle and dispose of hazardous materials in accordance with CEPA, TDGA, Regional and Municipal regulations.

- .7 Disposal of asbestos waste generated by removal activities must comply with Federal, Provincial, Territorial and Municipal regulations. Dispose of asbestos waste in sealed double thickness 6 ml bags or leak proof drums. Label containers with appropriate warning labels.
- .8 Provide manifests describing and listing waste created. Transport containers by approved means to licenced landfill for burial.

19. DEMOLITION

- .1 Mechanical Contractor shall include in his Base Price the cost to provide the removal of all existing mechanical equipment and material that is not to be reused under this contract. Equipment shall be Departmental Representatives' salvage unless noted otherwise.

20. COMMISSIONING

- .1 Mechanical Contractor is responsible to ensure all mechanical systems are fully commissioned and detailed commissioning forms are completed and reviewed with Departmental Representative. Refer to Sections 01 91 13 General Commissioning (Cx) Requirements, 01 91 33 Commissioning Forms, 01 91 41 Commissioning Training for details on Mechanical Contractors responsibilities in addition to all commissioning activities identified under Division 21, and 23. As part of the commissioning process, the contractor is required to complete the Site Standard Equipment Labelling and Tracking sheets for the equipment they supplied, the sheets will be provided by the owner.

20. INSTRUCTION OF OPERATING STAFF

- .1 Provide trained personnel to instruct operating staff on maintenance, adjustment and operation of mechanical equipment. Instruct staff on changes or modification in equipment made under terms of guarantee.
- .2 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, trouble-shooting and servicing of all systems and equipment during regular work hours, prior to acceptance.
- .3 Where specified elsewhere in Mechanical manufacturers to provide demonstrations and instructions.
- .4 Use operation and maintenance data manual for instruction purposes. On completion of instruction, turn one manual over to chief operating personnel, the balance to Departmental Representative.
- .5 Record every instruction and training session on digital video.
- .6 Time allocated for Instruction:
- Louver and Electric Force Flows One (1) hour instruction

21. 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

22. 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 \$750.00 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.

23. ALTERNATE AND SEPARATE PRICES

- .1 Referenced specification sections and drawings contain pertinent requirements for materials and methods to achieve work described herein.
- .2 Coordinate pertinent related work and modify surrounding work as required to complete project under each alternate designated.
- .3 Alternate products may vary in operation or construction, but shall meet or exceed the requirements of the specifications, drawings and the specified equipment for performance capacities, controllability and equipment options.
- .4 Revisions required to adapt equipment other than that specified shall be made without extra charge to the Departmental Representative.

24. 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. 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.

- .4 The following products shall be supplied as specified, there is no other products/
manufacturers that will be accepted:
- .1 EMCS (Building Controls): shall be Andover Controls or Honeywell only
 - .2 Steam Traps: Spirax Sarco

Part 2 - Materials

2.1 NOT USED

- .1 Not Used

Part 3 - Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

Part 1 General

1.1 GENERAL

- .1 Provide labour and materials required to install, test and place into operation a complete electrical system with facilities and services to meet the requirements described herein, as shown on the drawings, and in complete accord with applicable codes and ordinances.
- .2 All work shall be done in accordance with the 2012 Canadian Electrical Code, Saskatchewan Human Rights Accessibility Standard, local by-laws, and utility requirements. Work involving fire protection shall also be in accordance with Underwriters' Laboratory of Canada, National Building Code, National Fire Code, National Standard of Canada/Underwriters' Laboratories of Canada Standards CAN/ULC-S524-06, CAN/ULC-S536-04, and CAN/ULC-S537-04.
- .3 All work shall comply with SaskPower's requirements and regulations. Submit to SaskPower the necessary number of drawings and specifications for examination and approval prior to commencement of work. Pay associated fees. In the event of any inspection authority requesting deviation from the design, notify the consultant, and obtain approval before proceeding with any change.
- .4 Electrical wording provided establish scope, material and installation quality, and are not detailed installation instructions. Follow manufacturer's recommended installation details and procedures for equipment supplemented by details given herein and on plans subject to approval of the consultant.
- .5 The electrical contractor shall connect to equipment furnished in other divisions and by owner. Cooperate fully with the consultant and other trades of electrically operated equipment to ensure proper arrangement of, and provisions for all electrical equipment.
- .6 Before commencing the work, the electrical contractor shall examine the work of other sub-trades, and report at once any defects or interference affecting the work under this contract, or the guarantee of same.
- .7 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 the satisfaction of the consultant at no extra cost.
- .8 As this project involves a renovation to an occupied existing building, the contractor shall visit the site during the tendering period, and thoroughly satisfy himself that the work contained in these drawings and specifications can be carried out. No allowance will be made after contract award for any expense incurred by the contractor for having to adjust this work to provide a complete, fully operational installation.
- .9 All materials and workmanship shall be guaranteed for a period of one year from date of substantial completion. Properly repair and replace all defective work and other work which becomes defective during the term of warranty. Service on equipment or systems critical to the owner's operation shall be provided on emergency basis which may necessitate overtime and service outside the normal working hours. The contractor shall ensure that all suppliers comply with this requirement.

- .10 All conduit and cable penetrations in horizontal and vertical fire barriers shall be sealed with an approved fire seal system consisting of a fireproof cement and/or sealant. All fire seals shall comply with the requirements of the Provincial Fire Commissioner and the local authority having jurisdiction. Coordinate with general contractor and confirm fire barrier locations.
- .11 Conduit and cables in finished areas shall be run concealed, above finished ceilings, and in walls and partitions.
- .12 Proper supports of manufactured channels shall be installed, and shall be spaced in compliance with the Canadian Electrical Code.
- .13 Conduit and cables shall be installed to avoid proximity to water and heating pipes. They shall not run within 150mm of such pipes, except where crossings are unavoidable, in which case they shall be kept at least 25mm from covering of pipe crossed.
- .14 Flexible conduit and EMT connectors shall be of the insulated throat type.
- .15 EMT entering boxes or enclosures shall be terminated with nylon insulated concrete tight connectors.
- .16 Provide outlet boxes suitable for the application and location of the devices. All boxes shall be sized in accordance with CSA C22.1.
- .17 Metal wall plates shall be provided for all receptacles. The wall plates shall be of suitable configuration for the device for which it is to cover with color matched mounting screws. Use ganged plate where more than one device occurs at one location. Metal wall plates shall be stainless steel.
- .18 All metallic raceways and conduits for conductors shall be grounded.
- .19 All branch circuits shall include a ground wire. Conduit shall not be used as a ground.
- .20 All panel directories affected by this project shall be updated. Provide a new updated typed panel directory within a clear plastic cover as required. Stickers or writing on the panel door is not acceptable.

END OF SECTION

Part 1 General

1.1 REFERENCES

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

Part 2 Products

2.1 PIPE

- | | <u>Service</u> | <u>Material</u> |
|----|--|---|
| .1 | Sanitary drainage and vent above grade (not including return air plenum) | Type "M" or "DWV" copper. Cast iron, plastic PVC |
| .2 | Sanitary drainage and vent above grade in ceiling return air plenum | Type "M" or "DWV" copper, cast iron, plastic PVC-XFR-15/50 |

2.2 FITTINGS

- | | <u>Service</u> | <u>Material</u> | <u>Joint</u> |
|----|--|--|--|
| .1 | Sanitary drainage and vent unburied (not including return air ceiling plenum.) | Wrought copper or cast brass. | 95-5 solder |
| | | Cast iron. | Hub & Spigot Gasket & Clamp |
| | | PVC C.S.A. | Solvent weld or grooved mechanical |
| .2 | Sanitary drainage and Vent unburied (in return air ceiling plenum) | Wrought copper or cast iron PVC-XFR-15/50 | 95-5 solder Hub & Spigot Solvent weld or grooved mechanical |
| .3 | Sanitary drainage and vent buried under building | Wrought copper or cast brass. | 95-5 solder |
| | | Cast iron. PVC | Hub & Spigot Gasket & Clamp or grooved mechanical Solvent weld or grooved mechanical |

Part 3 Execution

3.1 CONNECTIONS TO EQUIPMENT

- .1 In accordance with manufacturer's instructions unless otherwise indicated.
- .2 Use valves and unions or flanges (as indicated) for isolation and ease of maintenance and assembly.
- .3 Use double swing joints when equipment mounted on vibration isolation and when piping subject to movement.

3.2 CLEARANCES

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

3.3 DRAINS

- .1 Install piping with grade in direction of flow except as indicated.
- .2 Install drain valve complete with isolation at low points in piping systems, at equipment and at section isolating valves.
- .3 Pipe each drain valve discharge separately to nearest floor drain where indicated. Discharge to be visible.
- .4 Drain valves: NPS 3/4 gate or globe valves unless indicated otherwise, with hose end male thread, cap and chain.

3.4 AIR VENTS

- .1 Install manual air vents at high points in piping systems complete with isolation valve and u-bend copper tubing to allow discharge to bucket.
- .2 Install automatic air valve at each air separator and where indicated.
- .3 Install isolating valve at each automatic air valve.
- .4 Install drain piping to approved location and terminate where discharge is visible.

3.5 DIELECTRIC COUPLINGS

- .1 General: Compatible with system, to suit pressure rating of system.
- .2 Locations: Where dissimilar metals are joined.

- .3 NPS 2 and under: isolating unions or bronze valves.
- .4 Over NPS 2: Isolating flanges.

3.6 ROUTE 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 Make reductions in water pipes with eccentric reducing fittings installed to provide drainage and venting.
- .3 Grade horizontal drainage and vent piping 20 mm per meter minimum.

3.7 PIPEWORK INSTALLATION

- .1 Screwed fittings jointed with Teflon tape.
- .2 Protect openings against entry of foreign material.
- .3 Install to isolate equipment and allow removal without interrupting operation of other equipment or systems.
- .4 Assemble piping using fittings manufactured to ANSI standards.
- .5 Saddle type branch fittings may be used on mains if branch line is no larger than half the size of main.
 - .1 Hole saw (or drill) and ream main to maintain full inside diameter of branch line prior to welding saddle.
 - .2 Do not project brach pipe inside the main pipe.
- .6 Install exposed piping, equipment, rectangular cleanouts and similar items parallel or perpendicular to building lines.
- .7 Install concealed pipework to minimize furring space, maximize headroom, conserve space.
- .8 Slope piping, except where indicated, in direction of flow for positive drainage and venting.
- .9 Install, except where indicated, to permit separate thermal insulation of each pipe.
- .10 Provide clearance for proper installation of insulation and for access to valves, air vents, drains and unions. Valves to be complete with valve handle extensions where insulation is thicker than 25mm, extension to suit insulation thickness.
- .11 Group piping wherever possible.

- .12 Ream pipes, remove scale, welding slag and other foreign material, inside and outside before assembly.
- .13 Use eccentric reducers at pipe size changes to ensure positive drainage and venting.
- .14 Install piping to allow for expansion and contraction without unduly stressing pipe or equipment connected.
- .15 Screw joint steel piping up to and including 38 mm . Weld piping 63 mm and larger, including branch connections. Screw or weld 50 mm piping.
- .16 Make screwed joints with full cut standard taper pipe threads with red lead and linseed oil or other approved non-toxic joint compound applied to male threads only.
- .17 Clamp cast iron water pipe at fittings with 20 mm rods and properly anchor and support.
- .18 Use grooved mechanical couplings and mechanical fasteners in accessible locations, risers, pipe chases, and in other locations as approved by Departmental Representative. Use flexible couplings at pumps, coils and all vibration isolated equipment in lieu of flexible connectors, all other couplings to be rigid.
 - .1 Grooved joints shall be installed in accordance with the manufacturer's latest published installation instructions.
 - .2 The grooved coupling manufacturer's factory trained representative shall provide on-site training for Contractor's field personnel in the use of grooving tools and installation of grooved joint products. The representative shall periodically visit the job site and review Contractor is following best recommended practices in grooved product installation. (A distributor's representative is not considered qualified to conduct the training or job site visits.)
- .19 Make connections to equipment and branch mains with unions or flanges, as indicated:
 - .1 Unions are not required in installations using grooved mechanical joint couplings (The couplings shall serve as disconnect points.)
- .20 Provide non-conducting type connections wherever jointing dissimilar metals in systems. Brass adaptors and valves are acceptable. Refer to dielectric couplings.
- .21 Pressfit piping and fittings are not permitted.
- .22 Install piping to allow for expansion and contraction without unduly stressing pipe or equipment connected.
 - .1 For mechanical pipe jointing systems, use adequate numbers of Victaulic Style 77 flexible couplings in header piping to accommodate thermal growth and contraction, and for the elimination of expansion loops. (In accordance with Victaulic instructions and as approved by the Departmental Representative.) Where expansion loops are required, use Victaulic Style 77 couplings on the loops.
- .23 Install piping material specified as inside the building to 2.4 meters outside of building.

- .24 Use of PVC plastic pipe allowed where approved by the authority having jurisdiction. PVC pipe run in plenum spaces shall have flame and smoke rating for that purpose. PVC pipe to be complete with ULC labelled fire stopping wherever penetrating fire separations.
- .25 Valves:
- .1 Shall be flanged for steam and condensate 38 mm and larger.
 - .2 Install in accessible locations.
 - .3 Remove interior parts before soldering.
 - .4 Install with stems upright or horizontal, not inverted.
 - .5 Valves accessible for maintenance without removing adjacent piping.
 - .6 Install globe valves in bypass around control valves.
 - .7 Use ball valves up to 50 mm or butterfly valves 63 mm and larger at branch take-offs for isolating purposes except where otherwise specified.
 - .8 Install butterfly valves on chilled water and related condenser water systems only.
 - .9 Install butterfly valves between weld neck flanges to ensure full compression of liner.
 - .10 Install ball valves for glycol service and domestic water.
 - .11 Install gate valves on steam and condensate.
 - .12 Use chain operators on valves NPS 2-1/2 and larger where installed more than 2400 mm above floor in Mechanical Rooms.
 - .13 Install gate, ball and butterfly valves for isolating service, to isolate equipment, part of systems or vertical risers.
 - .14 Install globe, ball or angle valves for throttling service.
 - .15 Use plug cocks in water systems for throttling service. Use non-lubricated plug cocks only when shut-off or isolation valves are also provided.
 - .16 Grooved end triple service valves shall be 2068 kPa bubble tight dead end shutoff and non-slamming backflow prevention. Victualic Tri-Service valve assembly.
 - .17 Use butterfly valves in fire protection systems where approved.
 - .18 Provide drain valves at main shut-off valves, low points of piping and apparatus.
 - .19 Valve operators to be complete with extensions on systems with insulation thicker than 25mm, extension to suit insulation thickness.
- .26 Check Valves:
- .1 Install silent check valves on discharge of pumps and in vertical pipes with downward flow and elsewhere as indicated.
 - .2 Install swing check valves in horizontal lines on discharge of pumps and elsewhere as indicated.
 - .3 Provide spring loaded check valves on discharge of condensate pumps and condenser water.
- .27 Provide thermometers, thermometer wells, and DDC sensor wells where thermometers are indicated on drawings and schematics.
- .28 Provide plug cocks at all pressure tapping locations.

3.8 SLEEVES

- .1 General: Install where pipes pass through masonry, concrete structures, fire rated assemblies, and elsewhere as indicated.
- .2 Material: Schedule 40 black steel pipe.
- .3 Construction: Foundation walls and where sleeves extend above finished floors to have annular fins continuously welded on at mid-point.
- .4 Sizes: 6 mm minimum clearance between sleeve and uninsulated pipe or between sleeve and insulation.
- .5 Installation:
 - .1 Concrete, masonry walls, concrete floors on grade: Terminate flush with finished surface.
 - .2 Other floors: Terminate 25 mm above finished floor.
 - .3 Before installation, paint exposed exterior surfaces with heavy application of zinc-rich paint to CAN/CGSB-1.181.
- .6 Sealing:
 - .1 Foundation walls and below grade floors: Fire retardant, waterproof non-hardening mastic.
 - .2 Elsewhere: Provide space for firestopping. Maintain fire rating integrity.
 - .3 Sleeves installed for future use: Fill with lime plaster or other easily removable filler.
 - .4 Ensure no contact between copper pipe or tube and sleeve.

3.9 ESCUTCHEONS

- .1 Install on pipes passing through walls, partitions, floors, and ceilings in finished areas.
- .2 Construction: One piece type with set screws. Chrome or nickel plated brass or type 302 stainless steel.
- .3 Sizes: Outside diameter to cover opening or sleeve. Inside diameter to fit around pipe or outside of insulation if so provided.

3.10 PREPARATION FOR FIRESTOPPING

- .1 Material and installation within annular space between pipes, ducts, insulation and adjacent fire separation to Section 07 84 00 - Firestopping.
- .2 Uninsulated unheated pipes not subject to movement: No special preparation.
- .3 Uninsulated heated pipes subject to movement: Wrap with non-combustible smooth material to permit pipe movement without damaging firestopping material or installation.
- .4 Insulated pipes and ducts: Ensure integrity of insulation and vapour barriers.

3.11 FLUSHING OUT OF PIPING SYSTEMS

- .1 Before start-up, clean interior of piping systems in accordance with requirements of Section 01 74 11-Cleaning supplemented as specified in relevant sections of Mechanical.
- .2 Preparatory to acceptance, clean and refurbish equipment and leave in operating condition, including replacement of filters in piping systems.

3.12 PRESSURE TESTING OF EQUIPMENT AND PIPEWORK

- .1 Advise Departmental Representative 48 hours minimum prior to performance of pressure tests.
- .2 Pipework: Test as specified in relevant sections of Mechanical or to 1.5 times maximum operating pressure. All installed piping to be tested unless noted otherwise.
- .3 Maintain specified test pressure without loss for 4 hours minimum unless specified for longer period of time in relevant sections of Mechanical.
- .4 Prior to tests, isolate equipment and other parts which are not designed to withstand test pressure or media.
- .5 Conduct tests in presence of Departmental Representative.
- .6 Pay costs for repairs or replacement, retesting, and making good. Departmental Representative to determine whether repair or replacement is appropriate.
- .7 Insulate or conceal work only after approval and certification of tests by Departmental Representative.

3.13 EXISTING SYSTEMS

- .1 Connect into existing piping systems at times approved by Departmental Representative.
- .2 Request written approval 10 days minimum, prior to commencement of work.
- .3 Be responsible for damage to existing plant by this work.
- .4 Ensure daily clean-up of existing areas.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 Section Includes:
 - .1 Bronze - valves.
- .2 Sustainable requirements for construction and verification.

1.2 REFERENCES

- .1 American National Standards Institute (ANSI)/ American Society of Mechanical Engineers (ASME).
 - .1 ANSI/ASME B1.20.1-1983(R2001), Pipe Threads, General Purpose (Inch).
 - .2 ANSI/ASME B16.18-2001, Cast Copper Alloy Solder Joint Pressure Fittings.
- .2 American Society for Testing and Materials International, (ASTM).
 - .1 ASTM A276-04, Specification for Stainless Steel Bars and Shapes.
 - .2 ASTM B62-02, Specification for Composition Bronze or Ounce Metal Castings.
 - .3 ASTM B283-99a, Specification for Copper and Copper Alloy Die Forgings (Hot-Pressed).
 - .4 ASTM B505/B505M-02, Specification for Copper-Base Alloy Continuous Castings.
- .3 Manufacturers Standardization Society of the Valve and Fittings Industry, Inc. (MSS).
 - .1 MSS-SP-25-1998, Standard Marking System for Valves, Fittings, Flanges and Unions.
 - .2 MSS-SP-80-2003, Bronze Gate Globe, Angle and Check Valves.
 - .3 MSS-SP-110-1996, Ball Valves, Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

1.3 SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data: submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 02 81 01 - Hazardous Materials.
 - .1 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Submit data for valves specified in this section.
- .3 Closeout Submittals:
 - .1 Submit maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

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.

Part 2 Products

2.1 MATERIALS

- .1 Valves:
 - .1 Except for specialty valves, to be single manufacturer.
 - .2 All products to have CRN registration numbers.
- .2 End Connections:
 - .1 Connection into adjacent piping/tubing:
 - .1 Steel pipe systems: Screwed ends to ANSI/ASME B1.20.1.
 - .2 Copper tube systems: Solder ends to ANSI/ASME B16.18.
 - .3 Provide flanged ends as indicated under 23 05 05, Installation of Pipework.
- .3 Lockshield Keys:
 - .1 Where lockshield valves are specified, provide 10 keys of each size: malleable iron cadmium plated.
- .4 Gate Valves:
 - .1 Requirements common to gate valves, unless specified otherwise:
 - .1 Standard specification: MSS SP-80.
 - .2 Bonnet: union with hexagonal shoulders.
 - .3 Connections: screwed with hexagonal shoulders.
 - .4 Inspection and pressure testing: to MSS SP-80. Tests to be hydrostatic.
 - .5 Packing: non-asbestos.
 - .6 Handwheel: non-ferrous.
 - .7 Handwheel Nut: bronze to ASTM B62.
 - .2 NPS 2 and under, non-rising stem, solid wedge disc, Class 125
 - .1 Body: with long disc guides, screwed bonnet with stem retaining nut.
 - .2 Operator: Handwheel.
 - .3 NPS 2 and under, non-rising stem, solid wedge disc, Class 150:
 - .1 Body: with long disc guides, screwed bonnet with stem retaining nut.
 - .2 Operator: Handwheel.
 - .4 NPS 2 and under, rising stem, split wedge disc, Class 125:
 - .1 Body: with long disc guides, screwed bonnet.
 - .2 Disc: split wedge, bronze to ASTM B283, loosely secured to stem.
 - .3 Operator: Handwheel.
 - .5 NPS 2 and under, rising stem, solid wedge disc, Class 125:
 - .1 Body: with long disc guides, screwed bonnet.
 - .2 Operator: Handwheel.
 - .6 NPS 2 and under, rising stem, solid wedge disc, Class 150:
 - .1 Body: with long disc guides, screwed bonnet.
 - .2 Operator: Handwheel.
- .5 Globe Valves:
 - .1 Requirements common to globe valves, unless specified otherwise:
 - .1 Standard specification: MSS SP-80.
 - .2 Bonnet: union with hexagonal shoulders.
 - .3 Connections: screwed with hexagonal shoulders.

- .4 Pressure testing: to MSS SP-80. Tests to be hydrostatic.
- .5 Stuffing box: threaded to bonnet with gland follower, packing nut, high grade non-asbestos packing.
- .6 Handwheel: non-ferrous.
- .7 Handwheel Nut: bronze to ASTM B62.
- .2 NPS 2 and under, composition disc, Class 125:
 - .1 Body and bonnet: screwed bonnet.
 - .2 Disc and seat: renewable rotating PTFE disc, composition to suit service conditions, regrindable bronze seat, loosely secured to bronze stem to ASTM B505.
 - .3 Operator: Handwheel.
- .3 NPS 2 and under, composition disc, Class 150:
 - .1 Body and bonnet: union bonnet.
 - .2 Disc and seat: renewable rotating PTFE disc in easily removable disc holder, regrindable bronze seat, loosely secured to bronze stem to ASTM B505.
 - .3 Operator: Handwheel.
- .4 NPS 2 and under, plug disc, Class 150, screwed ends:
 - .1 Body and bonnet: union bonnet.
 - .2 Disc and seat ring: tapered plug type with disc stem ring of AISI S420 stainless steel to ASTM A276, loosely secured to stem.
 - .3 Operator: Handwheel.
- .5 Angle valve, NPS 2 and under, composition disc, Class 150:
 - .1 Body and bonnet: union bonnet.
 - .2 Disc and seat: renewable rotating PTFE disc in slip-on easily removable disc holder having integral guides, regrindable bronze seat, loosely secured to stem.
 - .3 Operator: Handwheel.
- .6 Check Valves:
 - .1 Requirements common to check valves, unless specified otherwise:
 - .1 Standard specification: MSS SP-80.
 - .2 Connections: screwed with hexagonal shoulders.
 - .2 NPS 2 and under, swing type, bronze disc, Class 125:
 - .1 Body: Y-pattern with integral seat at 45 degrees, screw-in cap with hex head.
 - .2 Disc and seat: renewable rotating disc, two-piece hinge disc construction; seat: regrindable.
 - .3 NPS 2 and under, swing type, bronze disc:
 - .1 Body: Y-pattern with integral seat at 45 degrees, screw-in cap with hex head.
 - .2 Disc and seat: renewable rotating disc, two-piece hinge disc construction; seat: regrindable.
 - .4 NPS 2 and under, swing type, composition disc, Class 200:
 - .1 Body: Y-pattern with integral seat at 45 degrees, screw-in cap with hex head.
 - .2 Disc: renewable rotating disc of number 6 composition to suit service conditions, bronze two-piece hinge disc construction.
 - .5 NPS 2 and under, horizontal lift type, composition disc, Class 150:
 - .1 Body: with integral seat, union bonnet ring with hex shoulders, cap.

- .2 Disc: renewable PTFE rotating disc in disc holder having guides top and bottom, of bronze to ASTM B62.
- .6 NPS 2 and under, vertical lift type, bronze disc, Class 125:
 - .1 Disc: rotating disc having guides top and bottom, disc guides, retaining rings.
- .7 Silent Check Valves:
 - .1 NPS 2 and under:
 - .1 Body: cast high tensile bronze to ASTM B62 with integral seat.
 - .2 Pressure rating: Class 125.
 - .3 Connections: screwed ends to ANSI B1.20.1 and with hex. shoulders.
 - .4 Disc and seat: renewable rotating disc.
 - .5 Stainless steel spring, heavy duty.
 - .6 Seat: regrindable.
- .8 Ball Valves:
 - .1 NPS 2 and under:
 - .1 Body and cap: cast high tensile brass to C37700.
 - .2 Pressure rating: Class 150 WSP/600 WOG.
 - .3 Connections: Screwed ends to ANSI B1.20.1 and with hexagonal shoulders or solder ends to ANSI.
 - .4 Stem: tamperproof ball drive.
 - .5 Stem packing nut: external to body.
 - .6 Ball and seat: replaceable solid hard chrome full port ball and teflon seals.
 - .7 Stem seal: TFE with external packing nut.
 - .8 Operator: removable lever handle.

Part 3 Execution

3.1 INSTALLATION

- .1 Install rising stem valves in upright position with stem above horizontal.
- .2 Remove internal parts before soldering.
- .3 Install valves with unions or flanges at each piece of equipment arranged to allow servicing, maintenance, and equipment removal. Refer to 23 05 05 - Installation of Pipework.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 Section Includes:
 - .1 Valves, gate, globe, and check.
- .2 Sustainable requirements for construction and verification.

1.2 REFERENCES

- .1 American National Standards Institute (ANSI)/American Society of Mechanical Engineers (ASME).
 - .1 ANSI/ASME B16.1-1998, Cast Iron Pipe Flanges and Flanged Fittings.
- .2 American Society for Testing and Materials International (ASTM).
 - .1 ASTM A49-01, Specification for Heat-Treated Carbon Steel Joint Bars.
 - .2 ASTM A126-95(2001), Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
 - .3 ASTM B61-93, Specification for Steam or Valve Bronze Castings.
 - .4 ASTM B62-93, Specification for Composition Bronze or Ounce Metal Castings.
 - .5 ASTM B85-03, Specification for Aluminum-Alloy Die Castings.
 - .6 ASTM B209-04, Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- .3 Manufacturers Standardization Society of the Valve and Fittings Industry, Inc. (MSS).
 - .1 MSS SP-70-1998, Cast Iron Gate Valves, Flanged and Threaded Ends.
 - .2 MSS SP-71-1997, Grey Iron Swing Check Valves, Flanged and Threaded Ends.
 - .3 MSS SP-82-1992, Valve Pressure Testing Methods.
 - .4 MSS SP-85-2002, Cast Iron Globe and Angle Valves, Flanged and Threaded Ends.

1.3 SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data: submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 02 81 01 - Hazardous Materials.
 - .1 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Submit data for valves specified in this section.
- .3 Closeout Submittals:
 - .1 Submit maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

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.

Part 2 Products

2.1 MATERIAL

- .1 Valves:
 - .1 Except for specialty valves, to be of single manufacturer.
- .2 Standard specifications:
 - .1 Gate valves: MSS SP-70.
 - .2 Globe valves: MSS SP-85.
 - .3 Check valves: MSS SP-71.
- .3 Requirements common to valves, unless specified otherwise:
 - .1 Body, bonnet: cast iron to ASTM B209 Class B.
 - .2 Connections: flanged ends with 2 mm raised face with serrated finish to ANSI B16.1.
 - .3 Inspection and pressure testing: to MSS SP-82.
 - .4 Bonnet gasket: non-asbestos.
 - .5 Stem: to have precision-machined Acme or 60 degrees V threads, top screwed for handwheel nut.
 - .6 Stuffing box: non-galling two-piece ball-jointed packing gland, gland bolts and nuts.
 - .7 Gland packing: non-asbestos.
 - .8 Handwheel: Die-cast aluminum alloy to ASTM B85 or malleable iron to ASTM A49. Nut of bronze to ASTM B62.
 - .9 Identification tag: with catalogue number, size, other pertinent data.
- .4 All products to have CRN registration numbers.

2.2 GATE VALVES

- .1 NPS 2 1/2 - 8, non rising stem, inside screw, bronze trim, solid wedge disc:
 - .1 Body and multiple-bolted bonnet: with bosses in body and bonnet for taps and drains, full length disc guides designed to ensure correct re-assembly. Class 300.
 - .2 Disc: solid offset taper wedge, bronze to ASTM B62.
 - .3 Seat rings: renewable bronze to ASTM B62, screwed into body.
 - .4 Stem: bronze to ASTM B62.
 - .5 Disc: solid offset taper wedge, cast iron to ASTM A126 Class B, secured to wrought steel stem.
 - .6 Seat: Integral with body.
 - .7 Stem: wrought steel.
 - .8 Operator: Handwheel.
- .2 NPS 2 1/2-8, outside screw and yoke (OS&Y), bronze trim, solid wedge disc:
 - .1 Body and multiple-bolted bonnet: with bosses in body and bonnet for taps and drains, full length disc guides designed to ensure correct re-assembly, yoke, yoke hub, yoke sleeve and nut. Class 300.
 - .2 Disc: solid offset taper wedge, bronze to ASTM B62 up to NPS 3, cast iron with bronze disc rings on other sizes, secured to stem through integral forged T-head disc-stem connection.
 - .3 Seat rings: renewable bronze screwed into body.
 - .4 Stem: nickel-plated steel.
 - .5 Disc: solid offset taper all-cast iron, secured to stem through integral forged T-head disc-stem connection.

- .6 Seat rings: integral with body.
- .7 Stem: nickel-plated steel.
- .8 Pressure-lubricated operating mechanism.
- .9 Operator: Handwheel.
- .10 Bypass: complete with union and NPS globe valve as Section 23 05 05 - Installation of Pipework.

2.3 UNDERWRITERS APPROVED GATE VALVE

- .1 NPS 2 1/2 - 14, OS&Y:
 - .1 Approvals: UL and FM approved for fire service.
 - .2 UL and FM Label: on valve yoke.
 - .3 Body, Bonnet: cast iron to ASTM A126 Class B. Wall thicknesses to ANSI B16.1 and ULC 262 (B).
 - .4 Bonnet bushing, yoke sleeve: bronze, to FM requirements.
 - .5 Packing gland: bronze.
 - .6 Stem: manganese bronze. Diameter to ULC C-262 (B).
 - .7 Stuffing box dimensions, gland bolt diameter: to ULC C-262 (B).
 - .8 Bosses for bypass valve, drain: on NPS 4 and over.
 - .9 Disc: solid taper wedge. Up to NPS 3: bronze. NPS 4 and over: cast iron with bronze disc rings.
 - .10 Disc seat ring: self-aligning, Milwood undercut on NPS 3 - 12.
 - .11 Pressure rating:
 - .1 NPS 2-1/2 - 12: 1.7 Mpa CWP.
 - .12 Operator: handwheel.
 - .13 Bypass: complete with union and NPS globe valve as Section 23 05 23.01 - Valves - Bronze.

2.4 GLOBE VALVES

- .1 NPS 2 1/2 - 10, OSY:
 - .1 Body: with multiple-bolted bonnet, Class 300.
 - .2 WP: 860 kPa steam, 1.4 MPa CWP.
 - .3 Bonnet-yoke gasket: non-asbestos.
 - .4 Disc: bronze to ASTM B62, fully guided from bottom, securely yet freely connected to stem for swivel action and accurate engagement with disc.
 - .5 Seat ring: renewable, regrindable, screwed into body.
 - .6 Stem: bronze to ASTM B62.
 - .7 Operator: Handwheel.

2.5 BYPASSES FOR GATE AND GLOBE VALVES

- .1 Locations: on valves as indicated.
- .2 Position of bypass valve on main valves.
- .3 Size of bypass valve:
 - .1 Main valve up to NPS 8: NPS 3/4.
- .4 Type of bypass valves:
 - .1 On gate valve: globe, with composition disc, bronze trim, to Section 23 05 23.01 - Valves - Bronze. Pressure rating to match main valve.

- .2 On globe valve: globe, with composition disc, bronze trim, to Section 23 05 23.01 - Valves - Bronze. Pressure rating to match main valve.

2.6 VALVE OPERATORS

- .1 Install valve operators as follows:
 - .1 Handwheel: on valves except as specified.
 - .2 Handwheel with chain operators: on valves installed more than 2400 mm above floor in boiler rooms and mechanical equipment rooms.

2.7 CHECK VALVES

- .1 Swing check valves, Class 300:
 - .1 Body and bolted cover: cast iron to ASTM A126 Class B with tapped and plugged opening on each side for hinge pin.
 - .2 Flanged ends: 2 mm raised face with serrated finish.
 - .3 Rating: 300 psi steam; 500 psi CWP.
 - .4 Disc: rotating for extended life.
 - .1 Up to NPS 3: bronze to ASTM B61.
 - .2 NPS 4 - 8: Iron faced with ASTM B61 bronze.
 - .5 Seat rings: renewable bronze to ASTM B61, screwed into body.
 - .6 Hinge pin, bushings: renewable, bronze to ASTM B61.
 - .7 Hinge: galvanized malleable iron.
 - .8 Identification tag: fastened to cover.

Part 3 Execution

3.1 INSTALLATION

- .1 Install rising stem valves in upright position with stem above horizontal.
- .2 Install valves with unions or flanges at each piece of equipment arranged to allow servicing, maintenance and equipment removal. Refer to Section 23 05 05 Installation of Pipework.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 Section Includes:
 - .1 Valves Cast Steel, gate, globe, and check.

1.2 REFERENCES

- .1 American National Standards Institute (ANSI)/American Society of Mechanical Engineers (ASME).
 - .1 ANSI/ASME B16.5-2003, Pipe Flanges and Flanged Fittings.
 - .2 ANSI/ASME B16.10-1992, Face-to-Face and End-to-End Dimensions Valves.
 - .3 ANSI/ASME B16.25-1997, Buttwelding Ends.
 - .4 ANSI/ASME B16.34-1996, Valves - Flanged, Threaded and Welding End.
- .2 American Petroleum Institute (API).
 - .1 API 598-1996, Valve Inspection and Testing.
- .3 American Society for Testing and Materials International, (ASTM).
 - .1 ASTM A49-01, Specification for Heat-Treated Carbon Steel Joint Bars.
 - .2 ASTM A193/A193M-04, Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service.
 - .3 ASTM A194/A194M-03b, Specification for Carbon and Alloy Steel Nuts for Bolts for High-Pressure and High-Temperature Service.
 - .4 ASTM A216/A216M-1993(03), Specification for Steel Castings, Carbon Suitable for Fusion Welding for High-Temperature Service.
 - .5 ASTM B85-03, Specification for Aluminum-Alloy Die Castings.
- .4 Manufacturers Standardization Society of the Valve and Fittings Industry, Inc. (MSS).
 - .1 MSS SP-25-1998, Standard Marking System for Valves, Fittings, Flanges and Unions.
 - .2 MSS SP-61-2003, Pressure Testing of Steel Valves.

1.3 SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data: submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 02 81 01 - Hazardous Materials.
 - .1 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Submit data for valves specified this section.
 - .3 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.
- .3 Closeout Submittals:
 - .1 Submit maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

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.

Part 2 Products

2.1 MATERIAL

- .1 Valves:
 - .1 Except for specialty valves, to be of single manufacturer.
 - .2 Valves to be individually tested.
- .2 Requirements common to valves, unless specified otherwise:
 - .1 Pressure-temperature ratings: to ANSI B16.34.
 - .2 Inspections and tests: to API 598.
 - .3 Pressure Testing: to MSS SP-61.
 - .4 Flanged valves:
 - .1 Face-to-face dimensions: to ANSI B16.10.
 - .2 Flange dimensions: to ANSI B16.5 with 1.6 mm raised face.
 - .5 Butt-weld valves:
 - .1 End-to-end dimensions: to ANSI B16.10.
 - .2 End dimensions: to ANSI B16.25 bored for standard pipe schedule.
 - .6 Handwheel: non-heating type with raised rim of die-cast aluminum alloy to ASTM B85 or malleable iron to ASTM A49.
 - .7 Markings: to MSS SP-25.
 - .8 Identification:
 - .1 Plate showing catalogue number, size, material of body disc, stem seat, fluid, pressure-temperature rating.
 - .2 Body markings: manufacturer, size, primary service rating, material symbol.
 - .9 CRN registration number required for all products.

2.2 GATE VALVES

- .1 NPS 2 1/2 - 12, rising stem, OS&Y, solid flexible wedge disc, flanged or butt-weld ends, Class 300:
 - .1 Body and multiple-bolted integral yoke and bonnet: cast steel to ASTM A216/A216M WCB, with full length disc guides designed to ensure correct re-assembly.
 - .2 Body/bonnet joint: Flat face with corrugated metallic gasket.
 - .3 Bonnet studs: to ASTM A193/A193M Type B7.
 - .4 Bonnet nuts: to ASTM A194/A194M Type 2H.
 - .5 Stuffing box: including non-galling two-piece ball jointed packing gland, with swing-type eye bolts and nuts.
 - .6 Gland packing: containing corrosion inhibitor to prevent stem pitting.
 - .7 Yoke sleeve: Ni-Resist, minimum melting point above 954 degrees C.
 - .8 Hydraulic grease fitting: for lubrication of yoke sleeve bearing surfaces.

- .9 Disc: with disc stem ring to connect to stem, guided throughout its travel.
 - .1 NPS 2 1/2 - 6: Solid corrosion and heat resistant 13% chromium steel with minimum hardness of 350 HB.
 - .2 NPS 8 and larger: Carbon steel faced with corrosion and heat resistant 13 chromium steel with minimum hardness of 350 HB.
- .10 Seat ring: seamless carbon steel with hard-faced cobalt-chromium-tungsten alloy seating surface, slipped in, seal welded, ground to match disc.
- .11 Stem: heat treated corrosion and heat resistant 13% chromium steel with accurately-cut precision-machined Acme or 60 degrees V threads, top screwed for handwheel nut, T-head disc-stem connection.
- .12 Operator: see elsewhere this section.

2.3 GLOBE VALVES

- .1 NPS 2 1/2 - 12, rising stem, OS&Y, flanged or butt-weld ends, Class 300:
 - .1 Body and multiple-bolted integral yoke and bonnet: cast steel to ASTM A216/A216M WCB.
 - .2 Body/bonnet joint: Flat face with corrugated metallic gasket.
 - .3 Bonnet studs: to ASTM A193/A193M Type B7.
 - .4 Bonnet nuts: to ASTM A194/A194M Type 2H.
 - .5 Stuffing box: including non-galling two-piece ball-jointed packing gland, with swing-type eye bolts and nuts.
 - .6 Gland packing: containing corrosion inhibitor to prevent stem pitting.
 - .7 Yoke bushing: Ni-Resist, minimum melting point above 954 degrees C.
 - .8 Hydraulic grease fitting: for lubrication of yoke sleeve bearing surfaces.
 - .9 Disc: Plug type with 15 degrees taper seat and bottom guide or ball type with 35 degrees taper seat.
 - .10 Seat rings: with 1.6 mm thick cobalt-chromium-tungsten alloy facings with minimum hardness of 375 HB (cold), slipped in, seal welded, ground to match disc.
 - .11 Stem: heat treated corrosion and heat resistant 13% chromium steel with bonnet bushing, long engagement with yoke bushing for accurate seating, accurately-cut precision-machined Acme or 60 degrees V threads, top screwed for handwheel nut.
 - .12 Operator: see elsewhere this section.

2.4 VALVE OPERATORS

- .1 Handwheel: on all valves except as specified.
- .2 Handwheel with chain operators: on valves installed more than 2400 mm above floor in Boiler Rooms and Mechanical Equipment Rooms.

2.5 BYPASSES FOR GATE AND GLOBE VALVES

- .1 Locations: on valves as indicated.
- .2 Position of bypass valve on main valves.

- .3 Size of bypass valve:
 - .1 Main valve up to NPS 8: NPS 3/4.
- .4 Type of bypass valves:
 - .1 On gate valve: globe, with composition disc, bronze trim, to Section 23 05 22 - Valves - Bronze.
 - .2 On globe valve: globe, with composition disc, bronze trim, to Section 23 05 22 - Valves - Bronze.

2.6 CHECK VALVES

- .1 NPS 2 1/2 and over, flanged or butt-weld ends, Class 300: swing check.
 - .1 Body and multiple-bolted cap: cast steel to ASTM A216/A216M WCB.
 - .2 Cap studs: to ASTM A193/A193M Type B7.
 - .3 Cap nuts: to ASTM A194/A194M Type 2H.
 - .4 Body/cap joint: male-female face with corrugated metallic gasket.
 - .5 Disc: heat treated corrosion and heat resistant 13% chromium steel.
 - .6 Seat rings: heat treated corrosion and heat resistant 13% chromium steel, slipped in, seal welded, ground to match disc.
 - .7 Hinge: cast carbon steel.
 - .8 Hinge pin: stainless steel (410).

2.7 SILENT CHECK VALVES

- .1 Construction:
 - .1 Body: Cast steel to ASTM A216 WCB with integral seat.
 - .2 Pressure rating: Class 300.
 - .3 Connections: Flanged or Wafer ends.
 - .4 Double bronze disc with SS seat and stem. Renewable disc, seat, stem and spring. Spring rating must match system design for silent operation and installation.
 - .5 Stainless steel spring, heavy duty.
 - .6 Seat: regrindable.

Part 3 Execution

3.1 INSTALLATION

- .1 Install in accordance with manufacturer's recommendations in upright position with stem above horizontal.
- .2 Install valves with unions or flanges to each piece of equipment arranged to allow servicing, maintenance, and equipment removal. Refer to Section 23 05 05 Installation of Pipework.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 Section Includes:
 - .1 Plug Valves - Lubricated plug valves, Eccentric plug valves.
- .2 Sustainable requirements for construction and verification.

1.2 REFERENCES

- .1 American National Standards Institute (ANSI)/ American Society of Mechanical Engineers (ASME).
 - .1 ANSI/ASME B1.20.1-1983(R2001), Pipe Threads, General Purpose (Inch).
 - .2 ANSI/ASME B16.1-1998, Cast Iron Pipe Flanges and Flanged Fittings.
 - .3 ANSI/ASME B16.11-2001, Forged Fittings, Socket-Welding and Threaded.
 - .4 ANSI/ASME B16.25-1997, Buttwelding Ends.
 - .5 ANSI/ASME B16.34-1996, Valves - Flanged, Threaded and Welding End.
 - .6 ANSI/ASME B16.10-2000, Face to Face and End to End Dimensions of Valves.
- .2 American Society for Testing and Materials International (ASTM).
 - .1 ASTM A126-95(2000), Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
 - .2 ASTM B62-02, Specification for Composition Bronze or Ounce Metal Castings.
 - .3 ASTM B209-04, Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- .3 Manufacturer's Standardization Society of the Valves and Fittings Industry Inc. (MSS).
 - .1 MSS SP-78-1998, Cast Iron Plug Valves, Flanged and Threaded Ends.

1.3 SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data: submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 02 81 01 - Hazardous Materials.
 - .1 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.
 - .3 Submit data for valves specified this Section.
- .3 Closeout Submittals:
 - .1 Submit maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

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.

Part 2 Products

2.1 MATERIAL

- .1 Valves:
 - .1 Except for specialty valves, to be of single manufacturer.
 - .2 Products to have CRN registration number.

2.2 ECCENTRIC PLUG VALVES

- .1 General:
 - .1 Dead-tight shut-off on liquids and gases at pressure differentials up to 1.2 MPa in forward direction, 520 kPa in reverse direction.
- .2 Up to NPS 2, screwed ends:
 - .1 Body: cast iron to ASTM B209 Class B.
 - .2 Plug:
 - .1 NPS 1/2 and 3/4: bronze to ASTM B62.
 - .2 NPS 1 to NPS 2: bronze to ASTM B62.
 - .3 Bearings: permanently lubricated, bronze to ASTM B62 in upper and lower journals.
 - .4 Seals: double-seal consisting of:
 - .1 Plastic seat coating between plug and body.
 - .2 Resilient seal moulded into groove in plug face.
 - .3 Seal materials: BUNA Stem seals with Neoprene (gas service) plug seals.
 - .4 VITON stem seals with Fluorinated hydrocarbon plug seals (over 149 deg.C).
 - .5 Isobutene Isoprene stem seal with isobutene-isoprene plug seals (up to 121 deg.C)
 - .5 End connections: screwed.
 - .6 Operators: lever with adjustable memory stop.
- .3 NPS 2 1/2 to NPS 4, flanged ends:
 - .1 Body: cast iron to ASTM B209 Class B.
 - .2 Plug: nickel-plated cast iron to ANSI.
 - .3 Bearings: permanently lubricated, bronze to ASTM B62 in upper and lower journals.
 - .4 Seals: double-seal consisting of:
 - .1 Plastic seat coating between plug and body.
 - .2 Resilient seal moulded into groove in plug face.
 - .3 Seal materials: BUNA Stem seals with Neoprene plug seals (gas service)

- .4 VITON stem seals with Fluorinated hydrocarbon plug seals (over 149 deg.C).
- .5 Isobutene Isoprene stem seal with isobutene-isoprene plug seals (up to 121 deg.C)
- .5 End connections: flanged to ANSI B16.1 or roll grooved.
- .6 Operators: lever.

2.3 LUBRICATED PLUG VALVES

- .1 Principle of operation:
 - .1 Special sealing compound used to effect tight seal. When line pressure applied to valve in closed position, parallel plug forced against downstream side of valve. The metal-to-metal contact and sealing compound ensures leak-tight seal.
- .2 Testing to specifications: MSS SP-78 for non-shock pressure at specified temperature.
- .3 End connections:
 - .1 NPS 1/2 to 2: screwed ends.
 - .2 NPS 2½ to 12: flanged ends.
- .4 Valve:
 - .1 Body: cast iron to ASTM A126 Class B semi-steel.
 - .2 Pressure rating: NPS 1/2 to 12:
 - .1 Screwed end valves: screwed to NPT standards.
 - .2 Flanged end valves: flanged to ANSI B16.1 Class 300. Flanged valves NPS 2-8 face dimensions in accordance with ANSI B16.10 short pattern, making them interchangeable with Class 300 flanged cast iron gate valves.
 - .3 Hydrostatic tests: body 300 psig. Seat: 100 psig.
 - .3 Plug: tapered, with regular pattern port - 90 degrees from full open to fully closed, complete with PFTE thrust ring: 100% full port.
 - .4 Number of ports: as required.
 - .5 Ends: with ends screwed to ANSI B1.20.1, butt welding to ANSI B16.25, socket-welding to ANSI B16.11.
 - .6 Lubrication system, nickel-plated.
 - .7 Lubricant: to suit type, temperature and pressure of contained fluid.
 - .8 Provide sealing compound injection gun designed for use with pre-packed sealing compound cartridges and valve fitted with button head nipples and combination sealing screws.
 - .9 Feeding system: lubricant forced into lubrication grooves between seating surfaces of plug and body to form positive seal, leakproof operation, and corrosion preventing film. Lubricant receptacle to hold additional lubricant. Lubricant screw for lubrication. Check valve to prevent reverse flow of lubricant. O-rings between body and plug.
- .5 Operator:
 - .1 Up to NPS 5: manual lever.

- .6 3 port and 4 port valves:
 - .1 To be supplied transflow pattern, to allow reduced flow through ports during rotation of plug from one position to another.
 - .2 Limit stops: to be provided.
- .7 Accessories: lubricant gun.

Part 3 Execution

3.1 INSTALLATION OF LUBRICATED PLUG VALVES

- .1 Install with line pressure acting to hold plug against body ports which are to be cut-off from higher pressure.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 Section Includes:
 - .1 Butterfly Valves.
- .2 Sustainable requirements for construction and verification.

1.2 REFERENCES

- .1 American National Standards Institute (ANSI)/American Society of Mechanical Engineers (ASME).
 - .1 ANSI/ASME B1.20.1-1983(R2001), Pipe Threads, General Purpose (Inch).
 - .2 ANSI/ASME B16.1-1998, Cast Iron Pipe Flanges and Flanged Fittings.
 - .3 ANSI/ASME B16.5-03, Pipe Flanges and Flanged Fittings.
 - .4 ANSI/ASME B16.11-01, Forged Fittings, Socket-Welding and Threaded.
 - .5 ANSI/ASME B16.25-1997, Buttwelding Ends.
 - .6 ANSI/ASME B16.34-1996, Valves - Flanged, Threaded and Welding Ends.
- .2 American National Standards Institute (ANSI)/American Petroleum Institute (API).
 - .1 ANSI/API 609-1997, Lug- and Water-Type Butterfly Valves.
- .3 American Society for Testing and Materials International, (ASTM).
 - .1 ASTM A126-95(01), Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
 - .2 ASTM B62-02, Specification for Composition Bronze or Ounce Metal Castings.
 - .3 ASTM B209M-04, Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- .4 Manufacturers Standardization Society of the Valve and Fittings Industry, Inc. (MSS).
 - .1 MSS SP-67-02, Butterfly Valves.

1.3 SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data: submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 02 81 01 - Hazardous Materials.
 - .1 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.
 - .3 Submit data for valves specified this section.
- .3 Closeout Submittals:
 - .1 Submit maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

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.

Part 2 Products

2.1 BUTTERFLY VALVES - RESILIENT SEAT - 300 PSIG

- .1 Sizes: Lug type: NPS 2 to 48.
- .2 Pressure rating: 300 psig at 135 degrees C.
- .3 Lug body: 300 ANSI bolt pattern.
- .4 Full lug body (threaded).
- .5 Application: for on-off service.
- .6 Operators:
 - .1 NPS 2 - 6: Handles capable of locking in any of ten (10) positions - 0 degrees to 90 degrees. Handle and release trigger - ductile iron. Return spring and hinge pin: carbon steel. Latch plate and mounting hardware: cadmium plated carbon steel.
 - .2 Install parallel or perpendicular to pipeline.
- .7 Designed to comply with MSS SP-67 and API 609.
- .8 Compatible with ANSI B16.1 Class 250 (iron) and ANSI B16.5 Class 300 (steel) flanges.
- .9 Construction:
 - .1 Body: ductile iron.
 - .2 Disc: aluminum bronze.
 - .3 Seat: EPDM.
 - .4 Shaft: NPS 2 - 12: 416 stainless steel.
 - .5 Taper pin: 316 SS.
 - .6 Blowout proof stem.
 - .7 O-Ring: Buna-N.
 - .8 Bushings: teflon.
 - .9 Disc shall not be pinned to shaft.
 - .10 Bubble tight shutoff with downstream flanges removed, class 6 shutoff.

2.2 MOUNTING FLANGES

- .1 Class 300 steel to B16.5 pipe flanges.

2.3 ELECTRIC ACTUATORS

- .1 Operation: designed to provide precise quarter turn electric operation.
 - .1 Torque range: up to 1.130 N-m and speed ranges from 10 seconds to 30 seconds to move from fully open to fully closed.
 - .2 Gear train within actuator to provide smooth continuous rotary power stroke for accurate automatic valve positioning. Factory-set, field adjustable cam-actuated travel limit switches to provide precise control of shaft rotation.
- .2 Construction:
 - .1 Castings: heavy duty industrial grade for rugged use.
 - .2 Actuators: continuous duty with high efficiency single phase reversing capacitor motor with thermal overload protection.
 - .3 Gears and pinions constructed from hardened steel.
 - .4 Gear train to be permanently lubricated.
 - .5 Mechanical brake to ensure that gear is locked in precise position.
- .3 Electrical:
 - .1 Standard voltage: 120 VAC. 60 Hz.
 - .2 Control options: 4-20 Ma DC or 0-10 V DC.
 - .3 CSA approved.
 - .4 Electrical rating: NEMA IV.

Part 3 Execution

3.1 PREPARATION

- .1 Valve and mating flange preparation.
 - .1 Inspect adjacent pipeline, remove rust, scale, welding slag, other foreign material.
 - .2 Ensure that valve seats and pipe flange faces are free of dirt or surface irregularities which may disrupt flange seating and cause external leakage.
 - .3 Install butterfly valves with disc in almost closed position.
 - .4 Inspect valve disc seating surfaces and waterway and eliminate dirt or foreign material.

3.2 INSTALLATION OF VALVES

- .1 Install in accordance with manufacturer's instructions.
- .2 Do not use gaskets between pipe flanges and valves unless instructed otherwise by valve manufacturer.
- .3 Verify suitability of valve for application by inspection of identification tag.
- .4 Mount actuator on to valve prior to installation.
- .5 Handle valve with care so as to prevent damage to disc and seat faces.

- .6 Valves in horizontal pipe lines should be installed with stem in horizontal position to minimize liner and seal wear.
- .7 Ensure that valves are centered between bolts before bolts are tightened and then opened and closed to ensure unobstructed disc movement. If interference occurs due, for example to pipe wall thickness, taper bore adjacent piping to remove interference.

3.3 ACTUATOR INSTALLATION

- .1 Electrical connections to be made by actuator manufacturer.
- .2 Cycle valve operation from fully closed to fully open then back to fully closed.
- .3 At same time, check travel stop settings for proper disc alignment.

END OF SECTION

1 General

1.1 SECTION INCLUDES

- .1 Materials and requirements for the identification of piping systems, duct work, valves and controllers, including the installation and location of identification systems

1.2 REFERENCES

- .1 ASME A13.1 - Scheme for the Identification of Piping Systems.

1.3 SUBMITTALS

- .1 Section 01 33 00: Procedures for submittals.
- .2 Submit list of wording, symbols, letter size, and colour coding for mechanical identification.
- .3 Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.
- .4 Product Data: Provide manufacturers catalogue literature for each product required.

1.4 PROJECT RECORD DOCUMENTS

- .1 Section 01 78 00: Submittals for project closeout.
- .2 Record actual locations of tagged valves.

2 Products

2.1 LANGUAGE

- .1 Identification in English.

2.2 EXISTING IDENTIFICATION SYSTEMS

- .1 Apply existing identification system to new work.
- .2 Where existing identification system does not cover for new work, use identification system specified this section

2.3 PIPING SYSTEMS GOVERNED BY CODES

- .1 Identification of Natural gas: to CSA/CGA B149.1 and authority having jurisdiction.
- .2 Identification of Sprinkler System: to NFPA 13

2.4 NAMEPLATES

- .1 3 mm thick laminated plastic or white anodized aluminum, matte finish, with square corners, letters accurately aligned and machine engraved into core.

- .2 Colours:
 - .1 Hazardous: red letters, white background
 - .2 Elsewhere: black letters, white background (except where required otherwise by applicable Codes)

- .3 Sizes: Conform to following table using a maximum of 25 characters per line.

| Size # mm | Sizes (mm) | No. of Lines | Height of Letters (mm) |
|-----------|------------|--------------|------------------------|
| 1 | 10 x 50 | 1 | 3 |
| 2 | 13 x 75 | 1 | 5 |
| 3 | 13 x 75 | 2 | 3 |
| 4 | 20 x 100 | 1 | 8 |
| 5 | 20 x 100 | 2 | 5 |
| 6 | 20 x 200 | 1 | 8 |
| 7 | 25 x 125 | 1 | 12 |
| 8 | 25 x 125 | 2 | 8 |
| 9 | 35 x 200 | 1 | 20 |

Description: Laminated three-layer plastic with engraved black letters on light contrasting background colour.

2.5 TAGS

- .1 Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background colour. Tag size minimum 40 mm diameter.
- .2 Control Tag: Laminated plastic card with black letters on light contrasting background colour in multiple lines. Tag size minimum 85mm x 55mm. Inscriptions to include function and (where appropriate) fail-safe position
- .3 Metal Tags: Brass with stamped letters; tag size minimum 40 mm diameter with smooth edges.
- .4 Chart: Typewritten letter size list in anodized aluminum frame.

2.6 STENCILS

- .1 Stencils: With clean cut symbols and letters of following size:
 - .1 20-30 mm Outside Diameter of Insulation or Pipe: 200 mm long colour field, 15 mm high letters.
 - .2 40-50 mm Outside Diameter of Insulation or Pipe: 200 mm long colour field, 20 mm high letters.
 - .3 65-150 mm Outside Diameter of Insulation or Pipe: 300 mm long colour field, 30 mm high letters.
 - .4 200-250 mm Outside Diameter of Insulation or Pipe: 600 mm long colour field, 65 mm high letters.

- .5 Over 250 mm Outside Diameter of Insulation or Pipe: 800 mm long colour field, 90 mm high letters.
- .6 Ductwork and Equipment: 65 mm high letters.
- .2 Stencil Paint: As specified in Section 09 91 10, semi - Painting.1.

2.7 PIPE MARKERS

- .1 Colour: Conform to ASME A13.1.
- .2 Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.
- .3 Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.
- .4 Underground Plastic Pipe Markers: Bright coloured continuously printed plastic ribbon tape, minimum 150 mm wide by 0.10 mm thick, manufactured for direct burial service.

2.8 CEILING TACKS

- .1 Description: Steel with 20 mm diameter colour coded head.
- .2 Colour code as follows:
 - .1 Yellow - HVAC equipment
 - .2 Red - Fire dampers/smoke dampers
 - .3 Green - Plumbing valves
 - .4 Blue - Heating/cooling valves

2.9 IDENTIFICATION OF PIPING SYSTEMS

- .1 Identify contents by background colour marking, pictogram (as necessary), legend; direction of flow by arrows. To CAN/CGSB 24.3 except where specified otherwise.
- .2 Pictograms: where required to Workplace Hazardous Materials Information System (WHMIS) regulations.
- .3 Legend: Block capitals to sizes and colours listed in CAN/CGSB 24.3.
- .4 Arrows showing direction of flow:
 - .1 Outside diameter of pipe or insulation less than 75 mm: 100 mm long x 50 mm high.
 - .2 Outside diameter of pipe or insulation 75 mm and greater: 150 mm long x 50 mm high.

- .3 Use double-headed arrows where flow is reversible

- .5 Extent of background colour marking.
 - .1 To full circumference of pipe or insulation.
 - .2 Length to accommodate pictogram, full length of legend and arrows.

- .6 Extent of background colour marking.

- .7 Materials for background colour marking, legend, arrows:
 - .1 Pipes and tubing 20 mm and smaller: waterproof and heat-resistant pressure sensitive plastic marker tags.
 - .2 Other pipes: pressure sensitive plastic-coated cloth or vinyl with protective overcoating, waterproof contact adhesive undercoating, suitable for ambient of 100% RH and continuous operating temperature of 150 degrees C and intermittent temperature of 200 degrees C

- .8 Colours and Legends:
 - .1 Where not listed, obtain direction from Departmental Representative.
 - .2 Colours for legends, arrows: to following table:

| Background colour: | Legend, arrows: |
|--------------------|-----------------|
| Yellow | BLACK |
| Green | WHITE |
| Red | WHITE |
 - .3 Background colour marking and legends for piping systems:

| Contents | Background colour marking | Legend |
|---------------------------------|---------------------------|-----------------------|
| City water | Green | CITY WATER |
| Chilled water supply | Green | CH. WTR. SUPPLY |
| Chilled water return | Green | CH. WTR. RETURN |
| Steam High Pressure | Yellow | H.P. STEAM (___ kPa) |
| Steam Low Pressure | Yellow | L.P. STEAM (103 kPa) |
| Steam condensate (gravity) | Yellow | ST.COND.RET (GRAVITY) |
| Steam condensate (pumped) | Yellow | ST.COND.RET (PUMPED) |
| Safety valve vent | Yellow | STEAM VENT |
| Domestic hot soft water | Green | DOM. HSW |
| Dom. Hot water recirculation | Green | DOM. HW CIRC |
| Domestic cold hard water supply | Green | DOM. CHW |
| Domestic cold soft water supply | Green | DOM. CSW |
| Sanitary | Green | SAN |
| Plumbing vent | Green | SAN. VENT |

| | | |
|-----------------------|----------|----------------|
| Natural gas | to Codes | |
| Gas regulator vents | to Codes | |
| Fire protection water | Red | FIRE PROT. WTR |
| Sprinklers | Red | SPRINKLERS |

2.10 IDENTIFICATION OF DUCTING SYSTEMS

- .1 50 mm high stencilled letters and directional arrows 150 mm long x 50 mm high.
- .2 Colours: back, or co-ordinated with base colour to ensure strong contrast

2.11 VALVES AND CONTROLLERS

- .1 Valves to be complete with brass tags with 12 mm stamped identification data filled with black paint coordinated with Valve Tag List.
- .2 Include flow diagrams for each system, of approved size, showing charts and schedules with identification of each tagged item, valve type, service, function, normal position, location of tagged item.
- .3 Controllers to be complete with controls laminated identification tag.
- .4 Identify all control systems components including but not limited to equipment, components, controls, sensors with control tags specified in this section.

2.12 FIRE DAMPERS

- .1 All new fire dampers shall be tagged with unique tag (FD-1, FD-2 etc.), 12 mm stamped identification data filled with black paint. Contractor shall compile a Fire Damper Tag List and include in O&M. List to identify fire damper tag and location in building.

2.13 EQUIPMENT WITHIN CEILING SPACE

- .1 Provide identification (equipment labels and colour coded dots) on the ceiling for all equipment concealed within a ceiling space in addition to identification on equipment.
- .2 Equipment Labels:
 - .1 Colours: Black lettering on transparent background.
 - .2 Height of letter: 5 mm.
 - .3 T-bar ceilings: Label shall be located on the metal ceiling grid beside the ceiling tile that provides service access to the equipment. The label shall include the equipment tag and an arrow indicating the ceiling tile to remove for servicing and access to the equipment.
 - .4 Solid ceilings: Label shall be located on the trim of the access panel used for servicing the equipment and include the equipment tag.

- .3 Colour Coded Dots:
 - .1 Confirm site standard colour coding with the Departmental Representative prior to commencing work. Coordinate with all trades.
 - .2 Provide a Legend in the operating and maintenance manual identifying the colour coding utilized on site.
 - .3 T-bar ceilings: Dot shall be located on the metal ceiling grid beside the ceiling tile that provides service access to the equipment.
 - .4 Solid ceilings: Dot shall be located on the trim of the access panel used for servicing the equipment.

3 Execution

3.1 PREPARATION

- .1 Degrease and clean surfaces to receive adhesive for identification materials.
- .2 Prepare surfaces to Section 09 91 23 for stencil painting.

3.2 INSTALLATION

- .1 Perform work in accordance with CAN/CGSB-24.3 except as specified otherwise.
- .2 Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
- .3 Install tags with corrosion resistant chain.
- .4 Apply stencil painting to Section 09 91 23.
- .5 Install plastic pipe markers to manufacturer's written instructions.
- .6 Install plastic tape pipe markers complete around pipe to manufacturer's written instructions.
- .7 Install underground plastic pipe markers 150 to 200 mm below finished grade, directly above buried pipe.
- .8 Identify equipment including air handling units, pumps, heat transfer equipment, tanks, and water treatment devices with plastic nameplates. Small devices, such as small in-line pumps, may be identified with tags.
- .9 Identify control panels and major control components outside panels with control tags.
- .10 Identify thermostats relating to terminal boxes or valves with nameplates.
- .11 Identify valves in main and branch piping with tags.
- .12 Identify air terminal units and radiator valves with numbered tags.
- .13 Tag automatic controls, instruments, and relays. Key to control schematic.

- .14 Identify piping, concealed or exposed, with plastic pipe markers. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Location of identification not to exceed 6 m on straight runs including risers and drops, adjacent to each valve and Tee, adjacent to each change in direction, at each side of penetration of structure or enclosure, and at each obstruction. Provide additional identification at point immediately upstream of major manually operated or automatically controlled valves, and dampers. Where this is not possible, place identification as close as possible, preferably on upstream side
- .15 Identify ductwork with stencilled painting. Identify with air handling unit identification number and area served. Locate identification at air handling unit, at each side of penetration of structure or enclosure, and at each obstruction.
- .16 Provide ceiling tacks to locate valves or dampers above T-bar type panel ceilings. Locate in corner of panel closest to equipment.
- .17 Identify electric starting switches and remote push button stations with nametags.
- .18 Provide identification on the ceiling for all equipment concealed within a ceiling space in addition to identification on the equipment.
- .19 Tag new fire dampers sequentially and record on Fire Damper Tag List.

3.3 VALVE, CONTROLLERS

- .1 Valves and operating controllers, except at plumbing fixtures, radiation, or where in plain sight of equipment they serve: Secure tags with non-ferrous chains or closed "S" hooks.
- .2 Install one copy of flow diagrams, valve schedules mounted in frame behind non-glare glass where directed by Owner. Provide one copy (reduced in size if required) in each operating and maintenance manual.
- .3 Number valves in each system consecutively.

END OF SECTION