SPECIFICATION

WATER TREATMENT PLAN
NEW CONSTRUCTION/
PUMP HOUSE RENOVATION

NORWAY HOUSE, MANITOBA

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Part 1 General

1.1 WORK COVERED BY CONTRACT DOCUMENTS

.1 Work of this Contract comprises construction of a new Water Treatment Plant in Norway House, Manitoba, as indicated in the contract documents, briefly summarized as follows:

- .1 Construction of a new single story building.
- .2 Demolition and re-construction of an existing pump house.
- .3 Installation of new water treatment plant equipment.
- .4 For the duration of the construction phase: A subscription to a cloud-based project management site to provide a centralized and secure location for storage and sharing of contract documents and related communications. General Contractor to ensure that all sub-contractors are part of cloud system.

1.2 CONTRACT METHOD

.1 Refer to instructions to Invitation to Tender and all reference documents.

.2 Work of Project which will be executed after completion of Work of this Contract, and which is specifically excluded from this Contract.

- .1 Installation of the building security system.

.3 Work of this project must include provisions for co-ordinating related work, identified in contract documents, for following principal items.

- .1 Installation of conduit and other provisions for installation of security systems. This is to include site confirmation of final install location for security components and preparation of associated fixtures, frames, and finishes to receive installation of systems.

1.3 CONTRACTOR USE OF PREMISES

.1 Unrestricted use of site until Substantial Performance.

1.4 EXISTING SERVICES

.1 Notify, departmental representative and consultant and utility companies of intended interruption of services and obtain required permission.

.2 Provide alternative routes for personnel and vehicular traffic.

.3 Establish location and extent of service lines in area of work before starting Work. Notify Departmental representative and consultant of findings.

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

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

.6 Where unknown services are encountered, immediately advise Departmental representative and consultant and confirm findings in writing.

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

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

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

1.5 DOCUMENTS REQUIRED

.1 Maintain at job site, one copy each document as follows:

.1 Contract Drawings.
.2 Specifications.
.3 Addenda.
.4 Reviewed Shop Drawings.
.5 List of Outstanding Shop Drawings.
.6 Change Orders.
.7 Other Modifications to Contract.
.8 Field Test Reports.
.9 Copy of Approved Work Schedule.
.10 Health and Safety Plan and Other Safety Related Documents.
.11 Other documents as specified.

Part 2 Products

2.1 NOT USED

.1 Not used.

Part 3 Execution

3.1 NOT USED

.1 Not used.

END OF SECTION

Part 1 General

1.1 ACCESS AND EGRESS

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

1.2 USE OF SITE AND FACILITIES

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

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

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

1.3 BUILDING SMOKING ENVIRONMENT

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

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Project Supplementary Conditions

1.2 CASH ALLOWANCES

.1 Include in Contract Price specified cash allowances.

.2 Cash allowances, unless otherwise specified, cover net cost to Contractor subcontractor of services, products, construction machinery and equipment, freight, handling, unloading, storage installation and other authorized expenses incurred in performing Work.

.3 Contract Price, and not cash allowance, includes Contractor's overhead and profit in connection with such cash allowance.

.4 Contract Price will be adjusted by written order to provide for excess or deficit to each cash allowance.

.5 Where costs under a cash allowance exceed amount of allowance, Contractor will be compensated for excess incurred and substantiated plus allowance for overhead and profit as set out in Contract Documents.

.6 Include progress payments on accounts of work authorized under cash allowances in Consultant's monthly certificate for payment.

.7 Prepare schedule jointly with Consultant and Contractor to show when items called for under cash allowances are to be scheduled All work under the cash allowances to be authorized by Departmental Representative for ordering purposes so that progress of Work will not be delayed.

.8 Amount of each allowance, for Work specified in respective specification Sections is as follows:

.1 Roof and Building Envelope Inspections $10,000.00

.1 Minimum one roof inspections

.2 Minimum three air barrier inspections

.3 Minimum two blower door test

.2 Concrete Testing: $5,000.00

.3 Manitoba Hydro: $15,000.00

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 ADMINISTRATIVE

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

.2 Prepare agenda for meetings.

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

.4 Provide physical space and make arrangements for meetings.

.5 Preside at meetings.

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

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

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

1.2 PRECONSTRUCTION MEETING

.1 After award of Contract, request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities. Meeting will be held at the location and time designated by the departmental representative.

.2 Senior representatives of Departmental Representative Consultant, Contractor, major Subcontractors, field inspectors and supervisors will be in attendance.

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

.4 Agenda to include:

.1 Appointment of official representative of participants in the Work.

.2 Schedule of Work: in accordance with Section 01 32 16.07 - Construction Progress Schedules - Bar (GANTT) Chart.

.3 Schedule of submission of shop drawings, samples, colour chips. Submit submittals in accordance with Section 01 33 00 - Submittal Procedures.

.4 Requirements for temporary facilities, site sign, offices, storage sheds, utilities, fences in accordance with Section 01 52 00 - Construction Facilities.

.5 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.

.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.

.5 Coordinate filed engineering and layout work with consultant

1.3 PROGRESS MEETINGS

.1 During course of Work at the discretion of the Departmental Representative, schedule progress meetings monthly.

.2 Contractor, major Subcontractors involved in Work, Departmental Representative and Consultant are to be in attendance.

.3 Notify parties minimum 5 days prior to meetings.

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

.5 Agenda to include the following:

.1 Review, approval of minutes of previous meeting.

.2 Review of Work progress since previous meeting.

.3 Field observations, problems, conflicts.

.4 Problems which impede construction schedule.

.5 Review of off-site fabrication delivery schedules.

.6 Corrective measures and procedures to regain projected schedule.

.7 Revision to construction schedule.

.8 Progress schedule, during succeeding work period.

.9 Review submittal schedules: expedite as required.

.10 Maintenance of quality standards.

.11 Review proposed changes for affect on construction schedule and on completion date.

.12 Other business.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 DEFINITIONS

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

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

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

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

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

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

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

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

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

1.2 REQUIREMENTS

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

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

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

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

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Submit to Departmental Representative 10 within working days of Award of Contract Bar (GANTT) Chart as Master Plan for planning, monitoring and reporting of project progress.

.3 Submit Project Schedule to Departmental Representative within 5 working days of receipt of acceptance of Master Plan.

1.4 PROJECT MILESTONES

.1 Project milestones form interim targets for Project Schedule.

.1 As per the main contract documents

1.5 MASTER PLAN

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

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

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

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

1.6 PROJECT SCHEDULE

.1 Develop detailed Project Schedule derived from Master Plan.

.2 Ensure detailed Project Schedule includes as minimum milestones and activity types as follows:

.1 Award.
.2 Shop Drawings, Samples.
.3 Permits.
.4 Mobilization.
.5 Excavation.
.6 Backfill.
.7 Building footings.
.8 Structural Steel.
.9 Siding and Roofing.
.10 Interior Architecture (Walls, Floors and Ceiling).
.11 Plumbing.
.12 Lighting.
.13 Electrical.
.14 Piping.
.15 Controls.

.16 Heating, Ventilating, and Air Conditioning.

.17 Millwork.

.18 Fire Systems.

.19 Testing and Commissioning.

.20 Supplied equipment long delivery items.

1.7 PROJECT SCHEDULE REPORTING

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

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

1.8 PROJECT MEETINGS

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

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

Part 2 Products

2.1 NOT USED

.1 Not used.

Part 3 Execution

3.1 NOT USED

.1 Not used.

END OF SECTION

Part 1 General

1.1 ADMINISTRATIVE

.1 Submit to Departmental Representative and Consultant 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 and Consultant. 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 and Consultant, 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 and Consultant's review of submittals.

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

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

1.2 SHOP DRAWINGS AND PRODUCT DATA

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

.2 Submit drawings stamped and signed by professional engineer registered or licensed in Province of 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 and Consultant's review of each submission.

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

.6 Make changes in shop drawings as Departmental Representative and Consultant may require, consistent with Contract Documents. When resubmitting, notify Departmental Representative and Consultant 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 and Consultant's review, distribute copies.

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

.11 Submit electronic copies of test reports for requirements requested in specification Sections and as requested by Departmental Representative and Consultant.

.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.

.12 Submit 6 electronic copies of certificates for requirements requested in specification Sections and as requested by Departmental Representative and Consultant.

.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.

.13 Submit electronic copies of manufacturers instructions for requirements requested in specification Sections and as requested by Departmental Representative and Consultant.

.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.

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

.15 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 and Consultant.

.17 Delete information not applicable to project.

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

.19 If upon review by Departmental Representative and Consultant, 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.

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 and Consultant's business address.

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

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

.7 Reviewed and accepted samples will become standard of workmanship and material against which installed Work will be verified.

1.4 MOCK-UPS

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

1.5 PHOTOGRAPHIC DOCUMENTATION

.1 Submit electronic digital photography in ".jpg" format, fine resolution monthly with progress statement and as directed by Departmental Representative and Consultant.

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

.3 Number of viewpoints: 4 locations.

.1 Viewpoints and their location as determined by Departmental Representative and Consultant.

.4 Frequency of photographic documentation: as directed by Departmental Representative and Consultant.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 REFERENCES

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

.2 Province of Manitoba

.1 The Workers Compensation Act RSM 1987 - Updated 2013.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Submit site-specific Health and Safety Plan: Within 7 days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include:

.1 Results of site specific safety hazard assessment.

.2 Results of safety and health risk or hazard analysis for site tasks and operation found in work plan.

.3 Submit 2 copies of Contractor's authorized representative's work site health and safety inspection reports to authority having jurisdiction, and Consultant.

.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 47 15 - Sustainable Requirements: Construction and Section 02 81 01 - Hazardous Materials.

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

.8 Consultant'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 Consultant.

.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.

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

1.4 SAFETY ASSESSMENT

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

1.5 MEETINGS

.1 Schedule and administer Health and Safety meeting with Consultant 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 Consultant may respond in writing, where deficiencies or concerns are noted and may request re-submission with correction of deficiencies or concerns.

.3 Contractor to be CORE Certified and to maintain certification throughout the life of the project.

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 The Workers Compensation Act, Workplace Safety Regulation, Manitoba.

.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, advise Safety Officer and follow procedures in accordance with Acts and Regulations of Province having jurisdiction and advise Consultant verbally and in writing.

1.11 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 Consultant.

1.12 CORRECTION OF NON-COMPLIANCE

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

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

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

1.13 POWDER ACTUATED DEVICES

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

1.14 WORK STOPPAGE

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

Part 2 Products

2.1 NOT USED

.1 Not used.

Part 3 Execution

3.1 NOT USED

.1 Not used.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Definitions:

.1 Environmental Pollution and Damage: presence of chemical, physical, biological elements or agents which adversely affect human health and welfare; unfavourably alter ecological balances of importance to human life; affect other species of importance to humans; or degrade environment aesthetically, culturally and/or historically.

.2 Environmental Protection: prevention/control of pollution and habitat or environment disruption during construction.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit 2 copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements 01 35 43 - Environmental Procedures.

.3 Before commencing construction activities or delivery of materials to site, submit Environmental Protection Plan for review by Departmental Representative and Consultant.

.4 Environmental Protection Plan must include comprehensive overview of known or potential environmental issues to be addressed during construction.

.5 Address topics at level of detail commensurate with environmental issue and required construction tasks.

.6 Include in Environmental Protection Plan:

.1 Names of persons responsible for ensuring adherence to Environmental Protection Plan.

.2 Names and qualifications of persons responsible for manifesting hazardous waste to be removed from site.

.3 Names and qualifications of persons responsible for training site personnel.

.4 Descriptions of environmental protection personnel training program.

.5 Erosion and sediment control plan identifying type and location of erosion and sediment controls to be provided including monitoring and reporting requirements to assure that control measures are in compliance with erosion and sediment control plan, Federal, Provincial, and Municipal laws and regulations and EPA 832/R-92-005, Chapter 3.

.6 Drawings indicating locations of proposed temporary excavations or embankments for haul roads, stream crossings, material storage areas, structures, sanitary facilities, and stockpiles of excess or spoil materials including methods to control runoff and to contain materials on site.

.7 Traffic Control Plans including measures to reduce erosion of temporary roadbeds by construction traffic, especially during wet weather.

.1 Plans to include measures to minimize amount of material transported onto paved public roads by vehicles or runoff.

.8 Work area plan showing proposed activity in each portion of area and identifying areas of limited use or non-use.

.1 Plan to include measures for marking limits of use areas and methods for protection of features to be preserved within authorized work areas.

.9 Spill Control Plan to include procedures, instructions, and reports to be used in event of unforeseen spill of regulated substance.

.10 Non-Hazardous solid waste disposal plan identifying methods and locations for solid waste disposal including clearing debris.

.11 Air pollution control plan detailing provisions to assure that dust, debris, materials, and trash, are contained on project site.

.12 Contaminant Prevention Plan identifying potentially hazardous substances to be used on job site; intended actions to prevent introduction of such materials into air, water, or ground; and detailing provisions for compliance with Federal, Provincial, and Municipal laws and regulations for storage and handling of these materials.

.13 Historical, archaeological, cultural resources biological resources and wetlands plan that defines procedures for identifying and protecting historical, archaeological, cultural resources, biological resources and wetlands.

.14 Pesticide treatment plan to be included and updated, as required.

1.3 FIRES

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

.2 Where fires or burning is permitted, prevent staining or smoke damage to structures, materials or vegetation which is to be preserved.

.1 Restore, clean and return to new condition stained or damaged work.

.3 Provide supervision, attendance and fire protection measures as directed.

1.4 DRAINAGE

.1 Develop and submit Erosion and Sediment Control Plan (ESC) identifying type and location of erosion and sediment controls provided. Plan to include monitoring and reporting requirements to assure that control measures are in compliance with erosion and sediment control plan, Federal, Provincial, and Municipal laws and regulations.

.2 Storm Water Pollution Prevention Plan (SWPPP) to be substituted for erosion and sediment control plan.

.3 Provide temporary drainage and pumping required to keep excavations and site free from water.

.4 Ensure pumped water into waterways, sewer or drainage systems is free of suspended materials.

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

1.5 SITE CLEARING AND PLANT PROTECTION

.1 Protect trees and plants on site and adjacent properties as indicated.

.2 Protect trees and shrubs adjacent to construction work, storage areas and trucking lanes, and encase with protective wood framework from grade level to height of 2 m minimum.

.3 Protect roots of designated trees to dripline during excavation and site grading to prevent disturbance or damage.

.1 Avoid unnecessary traffic, dumping and storage of materials over root zones.

.4 Minimize stripping of topsoil and vegetation.

.5 Restrict tree removal to areas indicated designated by Departmental Representative DCC Representative Departmental Representative and Consultant.

1.6 WORK ADJACENT TO WATERWAYS

.1 Construction equipment to be operated on land only.

.2 Use waterway beds for borrow material only after written receipt of approval from Departmental Representative and Consultant.

.3 Waterways to be kept free of excavated fill, waste material and debris.

.4 Design and construct temporary crossings to minimize erosion to waterways.

.5 Do not skid logs or construction materials across waterways.

.6 Avoid indicated spawning beds when constructing temporary crossings of waterways.

.7 Blasting is allowed only above water and 100 m minimum from indicated spawning beds.

1.7 POLLUTION CONTROL

.1 Maintain temporary erosion and pollution control features installed under this Contract.

.2 Control emissions from equipment and plant in accordance with local authorities' emission requirements.

.3 Prevent sandblasting and other extraneous materials from contaminating air and waterways beyond application area.

.1 Provide temporary enclosures where directed by Departmental Representative and Consultant.

.4 Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads.

1.8 NOTIFICATION

.1 Departmental Representative will notify Contractor in writing of observed noncompliance with Federal, Provincial or Municipal environmental laws or regulations, permits, and other elements of Contractor's Environmental Protection plan.

.2 Contractor: after receipt of such notice, inform Departmental Representative of proposed corrective action and take such action for approval by Departmental Representative and or Consultant.

.1 Take action only after receipt of written approval by Departmental Representative.

.3 Departmental Representative will issue stop order of work until satisfactory corrective action has been taken.

.4 No time extensions granted or equitable adjustments allowed to Contractor for such suspensions.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Ensure public waterways, storm and sanitary sewers remain free of waste and volatile materials disposal.

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

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 No Smoking allowed on site.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 INSPECTION

.1 Allow 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 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.

1.2 INDEPENDENT INSPECTION AGENCIES

.1 Independent Inspection/Testing Agencies will be engaged by Consultant for purpose of inspecting and/or testing portions of Work.

.2 Allocated costs: to Section 01 21 00 - Allowances.

.3 Provide equipment required for executing inspection and testing by appointed agencies.

.4 Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.

.5 If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by Consultant at no cost to Consultant. Pay costs for retesting and reinspection.

1.3 ACCESS TO WORK

.1 Allow inspection/testing agencies access to Work, off site manufacturing and fabrication plants.

.2 Co-operate to provide reasonable facilities for such access.

1.4 PROCEDURES

.1 Notify appropriate agency and Consultant in advance of requirement for tests, in order that attendance arrangements can be made.

.2 Submit samples and/or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in orderly sequence to not cause delays in Work.

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

1.5 REJECTED WORK

.1 Remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by

Consultant or 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.

1.6 REPORTS

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

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

1.7 TESTS AND MIX DESIGNS

.1 Furnish test results and mix designs as requested.

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

1.8 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.

.3 Prepare mock-ups for Departmental Representative 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, Consultant will assist in preparing schedule fixing dates for preparation.

.6 Specification section identifies whether mock-up may remain as part of Work or if it is to be removed and when.

1.9 MILL TESTS

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

1.10 EQUIPMENT AND SYSTEMS

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

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 U.S. Environmental Protection Agency (EPA) / Office of Water

.1 EPA 832R92005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

1.3 INSTALLATION AND REMOVAL

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

.2 Remove from site all such work after use.

1.4 WATER SUPPLY

.1 Will be available from nearby buildings.

1.5 TEMPORARY HEATING AND VENTILATION

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

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

.3 Provide temporary heat and ventilation in enclosed areas as required to:

.1 Facilitate progress of Work.

.2 Protect Work and products against dampness and cold.

.3 Prevent moisture condensation on surfaces.

.4 Provide ambient temperatures and humidity levels for storage, installation and curing of materials.

.5 Provide adequate ventilation to meet health regulations for safe working environment.

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

.5 Ventilating:

.1 Prevent accumulations of dust, fumes, mists, vapours or gases in areas occupied during construction.

.2 Provide local exhaust ventilation to prevent harmful accumulation of hazardous substances into atmosphere of occupied areas.

.3 Dispose of exhaust materials in manner that will not result in harmful exposure to persons.

.4 Ventilate storage spaces containing hazardous or volatile materials.

.5 Ventilate temporary sanitary facilities.

.6 Continue operation of ventilation and exhaust system for time after cessation of work process to assure removal of harmful contaminants.

.6 Permanent heating system of building, not to be used when available. Be responsible for damage to heating system if use is permitted.

.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.

1.6 TEMPORARY POWER AND LIGHT

.1 Provide and pay for temporary power during construction for temporary lighting and operating of power tools, to a maximum supply of 230 volts 30 amps.

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

.3 Temporary power for electric cranes and other equipment requiring in excess of above is responsibility of Contractor.

.4 Provide and maintain temporary lighting throughout project. Ensure level of illumination on all floors and stairs is not less than 162 lx.

.5 Electrical power and lighting systems installed under this Contract may be used for construction requirements only with prior approval of Departmental Representative provided that guarantees are not affected. Make good damage to electrical system caused by use under this Contract. Replace lamps which have been used for more than 3 months.

1.7 FIRE PROTECTION

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

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

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL

.1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.

.2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

.3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Canadian General Standards Board (CGSB)

.1 CAN/CGSB 1.189-00, Exterior Alkyd Primer for Wood.

.2 CGSB 1.59-97, Alkyd Exterior Gloss Enamel.

.2 Canadian Standards Association (CSA International)

.1 CSA-A23.1/A23.2-04, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

.2 CSA-0121-M1978(R2003), Douglas Fir Plywood.

.3 CAN/CSA-S269.2-M1987(R2003), Access Scaffolding for Construction Purposes.

.4 CAN/CSA-Z321-96(R2001), Signs and Symbols for the Occupational Environment.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

1.3 INSTALLATION AND REMOVAL

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

.2 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 temporary stairs.

1.5 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.

1.6 CONSTRUCTION PARKING

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

.2 Provide and maintain adequate access to project site.

1.7 OFFICES

.1 Provide office heated to 22 degrees C, lighted 750 lx and ventilated, of sufficient size to accommodate site meetings and furnished with drawing laydown table.

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

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

1.8 EQUIPMENT, TOOL AND MATERIALS STORAGE

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

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

1.9 SANITARY FACILITIES

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

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

.3 When permanent water and drain connections are completed, provide temporary water closets and urinals complete with temporary enclosures, inside building. Permanent facilities may be used on approval of Departmental Representative.

1.10 CONSTRUCTION SIGNAGE

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

.2 Maintain approved signs and notices in good condition for duration of project, and dispose of offsite on completion of project or earlier if directed by Departmental Representative.

1.11 PROTECTION AND MAINTENANCE OF TRAFFIC

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

.2 Maintain and protect traffic on affected roads during construction period except as otherwise specifically directed by Departmental Representative.

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

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

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

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

.7 Construct access and haul roads necessary.

.8 Haul roads: constructed with suitable grades and widths; sharp curves, blind corners, and dangerous cross traffic shall be avoided.

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

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

.11 Location, grade, width, and alignment of construction and hauling roads: subject to approval by Departmental Representative.

.12 Lighting: to assure full and clear visibility for full width of haul road and work areas during night work operations.

.13 Provide snow removal during period of Work.

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

1.12 CLEAN-UP

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

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

.3 Store materials resulting from demolition activities that are salvageable.

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

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL

.1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction sediment and erosion control drawings sediment and erosion control plan, specific to site, that complies with EPA 832/R-92-005 or requirements of authorities having jurisdiction, whichever is more stringent.

.2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

.3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Canadian General Standards Board (CGSB)

.1 CGSB 1.59-97, Alkyd Exterior Gloss Enamel.

.2 CAN/CGSB 1.189-00, Exterior Alkyd Primer for Wood.

.2 Canadian Standards Association (CSA International)

.1 CSA-O121-M1978(R2003), Douglas Fir Plywood.

1.2 INSTALLATION AND REMOVAL

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

.2 Remove from site all such work after use.

1.3 HOARDING

.1 Erect temporary site enclosure using new 1.2 m high snow fence wired to rolled steel "T" bar fence posts spaced at 2.4 m on centre. Provide two lockable truck gate. Maintain fence in good repair.

.2 Provide barriers around trees and plants designated to remain. Protect from damage by equipment and construction procedures.

1.4 GUARD RAILS AND BARRICADES

.1 Provide secure, rigid guard rails and barricades around deep excavations, open shafts, open stair wells, open edges of floors and roofs.

.2 Provide as required by governing authorities.

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, finished areas of Work and public.

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

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 FIRE ROUTES

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

1.9 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.

1.10 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.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 REFERENCES

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

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

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

1.2 QUALITY

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

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

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

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

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

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

1.3 AVAILABILITY

.1 Immediately upon signing Contract, review product delivery requirements and anticipate foreseeable supply delays for items. If delays in supply of products are foreseeable, notify Departmental Representative and Consultant 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 Consultant 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 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.

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

1.6 MANUFACTURER'S INSTRUCTIONS

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

.2 Notify 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.

.2 Protect, relocate or maintain existing active services. When services are encountered, cap off in manner approved by authority having jurisdiction. Stake and record location of capped service.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 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 Existing base horizontal and vertical control points are designated on drawings.

.2 Locate, confirm and protect control points prior to starting site work. Preserve permanent reference points during construction.

.3 Make no changes or relocations without prior written notice to Departmental Representative and Departmental Representative.

.4 Report to Departmental Representative when reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.

.5 Require surveyor to replace control points in accordance with original survey control.

1.3 SURVEY REQUIREMENTS

.1 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.

.2 Establish lines and levels, locate and lay out, by instrumentation.

.3 Stake for grading, fill and top soil placement and landscaping features.

.4 Stake slopes and berms.

.5 Establish pipe invert elevations.

.6 Stake batter boards for foundations.

.7 Establish foundation column locations and floor elevations.

.8 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.

.2 Remove abandoned service lines within 2m of structures. Cap or otherwise seal lines at cut-off points as directed by Departmental Representative.

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.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Submit written request in advance of cutting or alteration which affects:

.1 Structural integrity of elements of project.

.2 Integrity of weather-exposed or moisture-resistant elements.

.3 Efficiency, maintenance, or safety of operational elements.

.4 Visual qualities of sight-exposed elements.

.5 Work of Owner or separate contractor.

.3 Include in request:

.1 Identification of project.

.2 Location and description of affected Work.

.3 Statement on necessity for cutting or alteration.

.4 Description of proposed Work, and products to be used.

.5 Alternatives to cutting and patching.

.6 Effect on Work of Owner or separate contractor.

.7 Written permission of affected separate contractor.

.8 Date and time work will be executed.

1.2 MATERIALS

.1 Required for original installation.

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

1.3 PREPARATION

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

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

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

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

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

1.4 EXECUTION

.1 Execute cutting, fitting, and patching 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 fire stopping material in accordance with Section 07 84 00 – Fire Stopping, full thickness of the construction element.

.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.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 PROJECT CLEANLINESS

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

.2 Remove waste materials from site at daily regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site.

.3 Clear snow and ice from access to building, bank/pile snow in designated areas only.

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

.5 Provide and use marked separate bins for recycling. Refer to Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.6 Dispose of waste materials and debris off site.

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

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

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

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

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

1.2 FINAL CLEANING

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

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

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

.4 Remove waste products and debris including that caused by Owner or other Contractors.

.5 Remove waste materials from site at regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site.

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

.7 Clean and polish glass, mirrors, hardware, wall tile, stainless steel, chrome, porcelain enamel, baked enamel, plastic laminate, and mechanical and electrical fixtures. Replace broken, scratched or disfigured glass.

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

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

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

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

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

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

.14 Remove dirt and other disfiguration from exterior surfaces.

.15 Clean and sweep roofs, gutters, areaways, and sunken wells.

.16 Sweep and wash clean paved areas.

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

.18 Clean roofs, downspouts, and drainage systems.

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

.20 Remove snow and ice from access to building.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Definitions:

.1 Class III: non-hazardous waste - construction renovation and demolition waste.

.2 Inert Fill: inert waste - exclusively asphalt and concrete.

.3 Waste Source Separation Program (WSSP): implementation and co-ordination of ongoing activities to ensure designated waste materials will be sorted into pre-defined categories and sent for recycling and reuse, maximizing diversion and potential to reduce disposal costs.

.4 Recyclable: ability of product or material to be recovered at end of its life cycle and re-manufactured into new product for reuse.

.5 Recycle: process by which waste and recyclable materials are transformed or collected for purpose of being transferred into new products.

.6 Recycling: process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for purpose of using in altered form. Recycling does not include burning, incinerating, or thermally destroying waste.

.7 Reuse: repeated use of product in same form but not necessarily for same purpose. Reuse includes:

.1 Salvaging reusable materials from re-modelling projects, before demolition stage, for resale, reuse on current project or for storage for use on future projects.

.2 Returning reusable items including pallets or unused products to vendors.

.8 Salvage: removal of structural and non-structural materials from deconstruction/disassembly projects for purpose of reuse or recycling.

.9 Separate Condition: refers to waste sorted into individual types.

.10 Source Separation: act of keeping different types of waste materials separate beginning from the point they became waste.

.2 Reference Standards:

.1 Canadian Construction Association (CCA)

.1 CCA 81-2001: A Best Practices Guide to Solid Waste Reduction.

1.2 DISPOSAL OF WASTES

.1 Do not bury rubbish or waste materials.

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

.3 Keep records of construction waste including:

.1 Number and size of bins.

.2 Waste type of each bin.

.3 Total tonnage generated.

.4 Tonnage reused or recycled.

.5 Reused or recycled waste destination.

.4 Remove materials on-site as Work progresses.

.5 Prepare project summary to verify destination and quantities on a material-by-material basis as identified in the waste audit.

1.3 SCHEDULING

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

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 APPLICATION

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

3.2 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

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

END OF SECTION

Part 1 General

1.1 SCOPE OF WORK

.1 This Section Applies to:

.1 Raw Water Intake System and Pumps
.2 Water Treatment Equipment
.3 Distribution Pumps
.4 Control Panel(s)

1.2 DEFINITIONS

.1 Pre-Start-Up: Pre-start-up consists of the non-operating functions required to bring Work to a state of readiness for placing systems into service. It includes, but is not limited to; cleaning, leakage and pressure testing, cold alignment checks, disinfection, system flushing, lubrication of mechanical equipment, rotation checks and wiring loop checks. Contractor shall conduct inspections of all components and sub-components and shall arrange for inspections of equipment installations by qualified equipment manufacturers' representatives as required by Contract Documents. At this stage, deficiency lists are prepared and Contractor is to remedy outstanding incomplete or incorrect work in accordance with terms of Contract.

.2 Start-Up: Once the equipment has completed the Pre-Start-up Phase, then the system shall be started and tested. Both "Dry-Run" and "Wet-Run" tests are required. Contractor shall conduct performance tests of all equipment in conjunction with the manufacturers' representatives as required by the Contract Documents and under the witness of Engineer. Deficiencies that are uncovered shall be corrected and retesting shall be conducted as required.

.3 Commissioning: Commissioning consists of placing all the various systems in Work into continuous operation in an orderly manner. Contractor is responsible for the commissioning activities and shall have equipment manufacturer representatives at the site, as well as qualified mechanical, electrical, control and instrumentation personnel available on call. Contractor may be assisted by Engineer relative to process considerations and by Owner's operations and maintenance staff. Commissioning is considered to be complete when all systems have been operating continuously for a period of two (2) weeks without fault and in accordance with the specified performance requirements. During this period, the Contractor shall visit the site regularly to ensure the system remains operating properly.

1.3 SAFETY

.1 Ensure all requisite safety equipment, devices, detectors, materials and procedures are in place, tested and operational before commencing.

.2 Conform to requirements of all regulatory authorities having jurisdiction.

.3 Maintain communications with fire, police, environmental and health authorities.

1.4 ENVIRONMENTAL PROTECTION

.1 Comply with all requirements of federal, provincial and local jurisdictions having authority.

1.5 PRE-START-UP

.1 Identify all valves and pieces of equipment by Tag Numbers developed by Contractor. Submit Tag list to Engineer when all piping and equipment is installed.

.2 To extent practical, remove all scaffolding, debris, planks tools and other construction-related material.

.3 Remove all sand, silt, dirt and debris from tanks, channels, chambers, instrumentation and control panels and electrical panels and vacuum clean.

.4 Clean all surfaces of tanks and conduits, including walls, roofs, floors and columns with high pressure water jets or as specified in individual Sections.

.5 Clean interior of all pipes and fluid-carrying equipment, including pumps and inspect with Engineer present.

.6 Conduct leakage and pressure tests in accordance with individual Sections.

.7 Conduct disinfection procedures in accordance with requirements of individual Sections.

.8 Equipment Manufacturer's Representatives to inspect equipment in accordance with applicable individual Sections. Certify equipment has been properly installed and is ready to start.

.9 Request, in writing, a Pre-Start-Up Inspection by Engineer. Once Engineer has conducted the Pre-Start-Up Inspection and is satisfied that each piece of equipment has been properly checked-out, the Contractor may begin Start-up.

1.6 START-UP

.1 Conduct workshop with Owner's Representatives and Engineer to identify and integrate activities of all parties in start-up of Work. Prepare Start-up Plan which includes the following:

.1 Plan objectives.
.2 Facilities to be started.
.3 Sequence of events and start-up schedule.
.4 Responsibilities of each party.
.5 List of individuals involved complete with contact telephone numbers.
.6 English language description of each systems' intended means of operation.
.7 Initial operating conditions and parameters.
.8 Intended final operating conditions and parameters.
.9 Laboratory requirements and arrangements for outside testing services.
.10 Sampling and monitoring requirements.

.11 Contingency plans to respond to potential emergencies.

.12 Safety and environmental considerations.

.2 Develop Owner Training plan and implement.

.3 Provide Operating and Maintenance Manuals as required by individual Sections.

.4 Conduct Dry Run Tests for all equipment, witnessed by Engineer.

.5 Conduct Wet Run Tests for all equipment, witnessed by Engineer.

.6 Correct any deficiencies uncovered during testing.

1.7 COMMISSIONING

.1 Assemble Contractor's commissioning team to respond to requests for assistance by Engineer or Owner. Team to consist of representatives of Contractor and Contractor's mechanical, electrical and instrumentation staff or subcontractors, as appropriate.

.2 Contractor's representative shall visit the site regularly during normal working hours for entire commissioning period. Contractor's commissioning team to be on call during normal working hours during commissioning and available within 24 hours' notice during commissioning period. Contractor's representative and the commissioning team may be required to be at site outside of normal working hours during the commissioning period, at the discretion of Owner or Engineer and shall be available within 24 hours' notice.

.3 Remove and clean or replace as required all permanent and temporary filters and strainers in pipeline systems; replace HVAC filters; dewater and clean sumps and leave process systems clean and filled with clean water, unless otherwise directed by Engineer.

.4 Period of time for continuous automatic operation for acceptance of commissioning is two (2) weeks with all systems operating continuously without fault and all process, mechanical, control and electrical equipment free of vibration, overloading or overheating and functioning in accordance with specified rates, methods and performance.

.5 Failure of any part of Work during the period of continuous automatic operation will require restart of that portion or system of Work, following rectification of the fault or failure.

.6 If it is necessary to suspend start-up, commissioning or continuous operation during the commissioning period due to deficiencies or failure in any system, the full cost of interruption, call-back, testing and resumption of start-up, commissioning, or continuous operation shall be paid by Contractor.

END OF SECTION

Part 1 General

1.1 ADMINISTRATIVE REQUIREMENTS

.1 Acceptance of Work Procedures:

.1 Contractor's Inspection: Contractor: conduct inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents.

.1 Notify Departmental Representative and Consultant in writing of satisfactory completion of Contractor's inspection and submit verification that corrections have been made.

.2 Request Departmental Representative and Consultant's inspection.

.2 Departmental Representative and Consultant's Inspection:

.1 Departmental Representative and Consultant and Contractor to inspect Work and identify defects and deficiencies.

.2 Contractor to correct Work as directed.

.3 Completion Tasks: submit written certificates in English that tasks have been performed as follows:

.1 Work: completed and inspected for compliance with Contract Documents.

.2 Defects: corrected and deficiencies completed.

.3 Equipment and systems: tested, adjusted balanced and fully operational.

.4 Certificates required by Fire Commissioner Utility companies: submitted.

.5 Operation of systems: demonstrated to Owner's personnel.

.6 Commissioning of mechanical systems: and copies of final Commissioning Report submitted to Departmental Representative and Consultant.

.7 Work: complete and ready for final inspection.

.4 Final Inspection:

.1 When completion tasks are done, request final inspection of Work by Departmental Representative and Consultant, and Contractor.

.2 When Work incomplete according to Departmental Representative and Consultant, complete outstanding items and request re-inspection.

1.2 FINAL CLEANING

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

.1 Remove surplus materials, excess materials, rubbish, tools and equipment.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 ADMINISTRATIVE REQUIREMENTS

.1 Pre-warranty Meeting:

.1 Convene meeting one week prior to contract completion with Departmental Representative and Consultant, in accordance with Section 01 31 19 - Project Meetings to:

.1 Verify Project requirements.

.2 Review warranty requirements manufacturer’s installation instructions.

.2 Departmental Representative and Consultant to establish communication procedures for:

.1 Notifying construction warranty defects.

.2 Determine priorities for type of defects.

.3 Determine reasonable response time.

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

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

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

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

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

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

1.3 FORMAT

.1 Organize data as instructional manual.

.2 Binders: vinyl, hard covered, 3 'D' ring, loose leaf 219 x 279 mm with spine and face pockets.

.3 When multiple binders are used correlate data into related consistent groupings.

.1 Identify contents of each binder on spine.

.4 Cover: identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.

.5 Arrange content by systems, process flow, under Section numbers and sequence of Table of Contents.

.6 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.

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

.8 Drawings: provide with reinforced punched binder tab.

.1 Bind in with text; fold larger drawings to size of text pages.

.9 Provide 1:1 scaled CAD files in ".dwg" format on CD.

.10 Provide all data on CD in PDF Format

1.4 CONTENTS - PROJECT RECORD DOCUMENTS

.1 Table of Contents for Each Volume: provide title of project;

.1 Date of submission; names.

.2 Addresses, and telephone numbers of Consultant and Contractor Design-Builder with name of responsible parties.

.3 Schedule of products and systems, indexed to content of volume.

.2 For each product or system:

.1 List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.

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

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

.5 Typewritten Text: as required to supplement product data.

.1 Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 01 45 00 - Quality Control.

.6 Training: refer to Section 01 79 00 - Demonstration and Training.

1.5 AS -BUILT DOCUMENTS AND SAMPLES

.1 Maintain, in addition to requirements in General Conditions, at site for Departmental Representative and Consultant 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.

.9 Electronic CAD, PDF

.2 Store record documents and samples in field office apart from documents used for construction.

.1 Provide files, racks, and secure storage.

.3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual.

.1 Label each document "PROJECT RECORD" in neat, large, printed letters.

.4 Maintain record documents in clean, dry and legible condition.

.1 Do not use record documents for construction purposes.

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

1.6 RECORDING INFORMATION ON PROJECT RECORD DOCUMENTS

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

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

.3 Record information concurrently with construction progress.

.1 Do not conceal Work until required information is recorded.

.4 Contract Drawings and shop drawings: mark each item to record actual construction, including:

.1 Measured depths of elements of foundation in relation to finish first floor datum.

.2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.

.3 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.

.4 Field changes of dimension and detail.

.5 Changes made by change orders.

.6 Details not on original Contract Drawings.

.7 References to related shop drawings and modifications.

.5 Specifications: mark each item to record actual construction, including:

.1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.

.2 Changes made by Addenda and change orders.

.6 Other Documents: maintain manufacturer's certifications, inspection certifications, and field test records required by individual specifications sections.

.7 Provide digital photos, if requested, for site records.

1.7 FINAL SURVEY

.1 Submit final site survey certificate in accordance with Section 01 71 00 - Examination and Preparation, certifying that elevations and locations of completed Work are in conformance, or non-conformance with Contract Documents.

1.8 EQUIPMENT AND SYSTEMS

.1 For each item of equipment and each system include description of unit or system, and component parts.

.1 Give function, normal operation characteristics and limiting conditions.

.2 Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.

.2 Panel board circuit directories: provide electrical service characteristics, controls, and communications.

.3 Include installed colour coded wiring diagrams.

.4 Operating Procedures: include start-up, break-in, and routine normal operating instructions and sequences.

.1 Include regulation, control, stopping, shut-down, and emergency instructions.

.2 Include summer, winter, and any special operating instructions.

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

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

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

.8 Include sequence of operation by controls manufacturer.

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

.10 Provide installed control diagrams by controls manufacturer.

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

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

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

.14 Include test and balancing reports as specified in Section 01 45 00 - Quality Control

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

1.9 MATERIALS AND FINISHES

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

.1 Provide information for re-ordering custom manufactured products.

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

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

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

1.10 MAINTENANCE MATERIALS

.1 Spare Parts:

.1 Provide spare parts, in quantities specified in individual specification sections.

.2 Provide items of same manufacture and quality as items in Work.

.3 Deliver to site; place and store.

.4 Receive and catalogue items.

.1 Submit inventory listing to Departmental Representative.

.2 Include approved listings in Maintenance Manual.

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

.2 Extra Stock Materials:

.1 Provide maintenance and extra materials, in quantities specified in individual specification sections.

.2 Provide items of same manufacture and quality as items in Work.

.3 Deliver to site; place and store.

.4 Receive and catalogue items.

.1 Submit inventory listing to Departmental Representative.

.2 Include approved listings in Maintenance Manual.

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

.3 Special Tools:

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

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

.3 Deliver to site; place and store.

.4 Receive and catalogue items.

.1 Submit inventory listing to Departmental Representative.

.2 Include approved listings in Maintenance Manual.

1.11 DELIVERY, STORAGE AND HANDLING

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

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

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

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

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

1.12 WARRANTIES AND BONDS

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

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

.3 Warranty management plan to include required actions and documents to assure that Departmental Representative receives warranties to which it is entitled.

.4 Provide plan in narrative form and contain sufficient detail to make it suitable for use by future maintenance and repair personnel.

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

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

.1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.

.2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

.3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten days after completion of applicable item of work.

.4 Verify that documents are in proper form, contain full information, and are notarized.

.5 Co-execute submittals when required.

.6 Retain warranties and bonds until time specified for submittal.

.7 Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial Performance is determined.

.8 Conduct joint 4 month and 9 month warranty inspection, measured from time of acceptance, by Consultant.

.9 Include information contained in warranty management plan as follows:

.1 Roles and responsibilities of personnel associated with warranty process, including points of contact and telephone numbers within the organizations of Contractors, subcontractors, manufacturers or suppliers involved.

.2 Listing and status of delivery of Certificates of Warranty for extended warranty items, to include roofs, HVAC balancing, pumps, motors, transformers, commissioned systems fire protection, alarm systems, sprinkler systems, lightning protection systems,.

.3 Provide list for each warranted equipment, item, and feature of construction or system indicating:

.1 Name of item.

.2 Model and serial numbers.

.3 Location where installed.

.4 Name and phone numbers of manufacturers or suppliers.

.5 Names, addresses and telephone numbers of sources of spare parts.

.6 Warranties and terms of warranty: include one-year overall warranty of construction. Indicate items that have extended warranties and show separate warranty expiration dates.

.7 Cross-reference to warranty certificates as applicable.

.8 Starting point and duration of warranty period.

.9 Summary of maintenance procedures required to continue warranty in force.

.10 Cross-Reference to specific pertinent Operation and Maintenance manuals.

.11 Organization, names and phone numbers of persons to call for warranty service.

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

.4 Contractor's plans for attendance at 4 and 9 month post-construction warranty inspections.

.5 Procedure and status of tagging of equipment covered by extended warranties.

.6 Post copies of instructions near selected pieces of equipment where operation is critical for warranty and/or safety reasons.

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

.11 Written verification to follow oral instructions.

.1 Failure to respond will be cause for the Departmental Representative to proceed with action against Contractor.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 ADMINISTRATIVE REQUIREMENTS

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

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

.3 Preparation:

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

.2 Verify designated personnel are present.

.3 Ensure testing, adjusting, and balancing has been performed and equipment and systems are fully operational.

.4 Demonstration and Instructions:

.1 Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, and maintenance of each item of equipment at agreed upon times, at the designated location.

.2 Instruct personnel in phases of operation and maintenance using operation and maintenance manuals as basis of instruction.

.3 Review contents of manual in detail to explain aspects of operation and maintenance.

.4 Prepare and insert additional data in operations and maintenance manuals when needed during instructions.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Submit schedule of time and date for demonstration of each item of equipment and each system two weeks prior to designated dates, for Departmental Representative's approval.

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

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

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

1.3 QUALITY ASSURANCE

.1 When specified in individual Sections requiring manufacturer to provide authorized representative to demonstrate operation of equipment and systems:

.1 Instruct Owner's personnel.

.2 Provide written report that demonstration and instructions have been completed.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section Includes:

.1 This section is limited to portions of the Building Management Manual (BMM) provided to Departmental Representative by Contractor.

.2 Acronyms:

.1 BMM - Building Management Manual.

.2 Cx - Commissioning.

.3 HVAC - Heating, Ventilation and Air Conditioning.

.4 PI - Product Information.

.5 PV - Performance Verification.

.6 TAB - Testing, Adjusting and Balancing.

.7 WHMIS - Workplace Hazardous Materials Information System.

1.2 GENERAL REQUIREMENTS

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

.2 Methodology used to facilitate updating.

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

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

1.3 APPROVALS

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

1.4 GENERAL INFORMATION

.1 Provide Consultant the following for insertion into appropriate Part and Section of BMM:

.1 Complete list of names, addresses, telephone and fax numbers of contractor, sub-contractors that participated in delivery of project - as indicated in Section 1.2 of BMM.

.2 Summary of architectural, structural, fire protection, mechanical and electrical systems installed and commissioned - as indicated in Section 1.4 of BMM.

.1 Including sequence of operation as finalized after commissioning is complete as indicated in Section 2.0 of BMM.

.3 Description of building operation under conditions of heightened security and emergencies as indicated in Section 2.0 of BMM.

.4 System, equipment and components Maintenance Management System (MMS) identification - Section 2.1 of BMM.

.5 Information on operation and maintenance of architectural systems and equipment installed and commissioned - Section 2.0 of BMM.

.6 Information on operation and maintenance of fire protection and life safety systems and equipment installed and commissioned - Section 2.0 of BMM.

.7 Information on operation and maintenance of mechanical systems and equipment installed and commissioned - Section 2.0 of BMM.

.8 Operating and maintenance manual - Section 3.2 of BMM.

.9 Final commissioning plan as actually implemented.

.10 Completed commissioning checklists.

.11 Commissioning test procedures employed.

.12 Completed Product Information (PI) and Performance Verification (PV) report forms, approved and accepted by Departmental Representative.

.13 Commissioning reports.

1.5 CONTENTS OF OPERATING AND MAINTENANCE MANUAL

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

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

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

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

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

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

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

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

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

.10 Warranty information.

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

.12 Maintenance program supporting information including:

.1 Recommended maintenance procedures and schedule.

.2 Information to removal and replacement of equipment including, required equipment, points of lift and means of entry and egress.

1.6 SUPPORTING DOCUMENTATION FOR INSERTION INTO SUPPORTING APPENDICES

.1 Provide Departmental Representative supporting documentation relating to installed equipment and system, including:

.1 General:
- .1 Finalized commissioning plan.
- .2 WHMIS information manual.
- .3 Approved "as-built" drawings and specifications.
- .4 Procedures used during commissioning.
- .5 Cross-Reference to specification sections.

.2 Architectural and structural:
- .1 Inspection certificates, construction permits.
- .2 Roof anchor log books.
- .3 PV reports.

.3 Fire prevention, suppression and protection:
- .1 Test reports.
- .2 Smoke test reports.
- .3 PV reports.

.4 Mechanical:
- .1 Installation permits, inspection certificates.
- .2 Piping pressure test certificates.
- .3 Ducting leakage test reports.
- .4 TAB and PV reports.
- .5 Charts of valves and steam traps.
- .6 Copies of posted instructions.

.5 Electrical:
- .1 Installation permits, inspection certificates.
- .2 TAB and PV reports.
- .3 Electrical work log book.
- .4 Charts and schedules.
- .5 Locations of cables and components.
- .6 Copies of posted instructions.

.2 Assist Departmental Representative with preparation of BMM.

1.7 USE OF CURRENT TECHNOLOGY

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

.2 Obtain Departmental Representative's approval before starting Work.

Part 2 Products

2.1 NOT USED

.1 Not used.

Part 3 Execution

3.1 NOT USED

.1 Not used.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Definitions:

.1 Dangerous Goods: product, substance, or organism specifically listed or meets hazard criteria established in Transportation of Dangerous Goods Regulations.

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

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

.2 Reference Standards:

.1 Canadian Environmental Protection Act, 1999 (CEPA 1999)

.1 Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations (SOR/2005-149).

.2 Department of Justice Canada (Jus)

.1 Transportation of Dangerous Goods Act, 1992 (TDG Act) 1992, (c. 34).

.2 Transportation of Dangerous Goods Regulations (T-19.01-SOR/2001-286).

.3 Green Seal Environmental Standards (GS)

.1 GS-11-2008, 2nd Edition, Paints and Coatings.

.2 GS-36-00, Commercial Adhesives.

.4 Health Canada / Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

.5 National Research Council Canada Institute for Research in Construction (NRC-IRC)

.1 National Fire Code of Canada-2005.

.3 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards

.1 SCAQMD Rule 1113-A2007, Architectural Coatings.

.2 SCAQMD Rule 1168-A2005, Adhesive and Sealant Applications.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.1 Construction Waste Management:

.1 Submit project Waste Management Plan Waste Reduction Work Plan highlighting recycling and salvage requirements.

.2 Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating that 50 75 % of construction wastes were recycled or salvaged

.2 Low-Emitting Materials: submit listing of adhesives and sealants paints and coatings used in building, comply with VOC and chemical component limits or restrictions requirements.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

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

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

.1 When exporting hazardous waste to another country, ensure compliance with Export and Import of Hazardous Waste and Hazardous Recyclable Materials Regulations.

.4 Storage and Handling Requirements:

.1 Co-ordinate storage of hazardous materials Departmental Representative and abide by internal requirements for labelling and storage of materials and wastes.

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

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

.4 Keep no more than 45 litres of flammable and combustible liquids such as gasoline, kerosene and naphtha for ready use.

.1 Store flammable and combustible liquids in approved safety cans bearing the Underwriters' Laboratory of Canada or Factory Mutual seal of approval.

.2 Storage of quantities of flammable and combustible liquids exceeding 45 litres for work purposes requires the written approval of the Departmental Representative.

.5 Transfer of flammable and combustible liquids is prohibited within buildings.

.6 Transfer flammable and combustible liquids away from open flames or heat-producing devices.

.7 Solvents or cleaning agents must be non-flammable or have flash point above 38 degrees C.

.8 Store flammable and combustible waste liquids for disposal in approved containers located in safe, ventilated area. Keep quantities to minimum.

.9 Observe smoking regulations, smoking is prohibited in areas where hazardous materials are stored, used, or handled.

.10 Storage requirements for quantities of hazardous materials and wastes in excess of 5 kg for solids, and 5 litres for liquids:

.1 Store hazardous materials and wastes in closed and sealed containers.

.2 Label containers of hazardous materials and wastes in accordance with WHMIS.

.3 Store hazardous materials and wastes in containers compatible with that material or waste.

.4 Segregate incompatible materials and wastes.

.5 Ensure that different hazardous materials or hazardous wastes are stored in separate containers.

.6 Store hazardous materials and wastes in secure storage area with controlled access.

.7 Maintain clear egress from storage area.

.8 Store hazardous materials and wastes in location that will prevent them from spilling into environment.

.9 Have appropriate emergency spill response equipment available near storage area, including personal protective equipment.

.10 Maintain inventory of hazardous materials and wastes, including product name, quantity, and date when storage began.

.11 When hazardous waste is generated on site:

.1 Co-ordinate transportation and disposal with Departmental Representative.

.2 Comply with applicable federal, provincial and municipal laws and regulations for generators of hazardous waste.

.3 Use licensed carrier authorized by provincial authorities to accept subject material.

.4 Before shipping material obtain written notice from intended hazardous waste treatment or disposal facility it will accept material and it is licensed to accept this material.

.5 Label containers with legible, visible safety marks as prescribed by federal and provincial regulations.

.6 Only trained personnel handle, offer for transport, or transport dangerous goods.

.7 Provide photocopy of shipping documents and waste manifests to Departmental Representative.

.8 Track receipt of completed manifest from consignee after shipping dangerous goods. Provide photocopy of completed manifest to Departmental Representative.

.9 Report discharge, emission, or escape of hazardous materials immediately to Departmental Representative and appropriate provincial authority. Take reasonable measures to control release.

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

.13 Report spills or accidents immediately to Departmental Representative. Submit a written spill report to Departmental Representative within 24 hours of incident.

Part 2 Products

2.1 MATERIALS

.1 Description:

.1 Bring on site only quantities hazardous material required to perform Work.

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

.3 Sustainability Characteristics:

.1 Primers Paints Coatings in accordance with manufacturer's recommendations for surface conditions and Section 09 91 23 - Interior Painting, 09 91 23.01 - Interior Re-Painting.

.1 Primer: maximum VOC limit 250 g/L to GS-11 to SCAQMD Rule 1113.

.2 Paints: maximum VOC limit 50 g/L to GS-11 to SCAQMD Rule 1113.

Part 3 Execution

3.1 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

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

.3 Waste Management:

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

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

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

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

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

.6 Dispose of hazardous wastes in timely fashion in accordance with applicable provincial regulations.

.7 Minimize generation of hazardous waste to maximum extent practicable. Take necessary precautions to avoid mixing clean and contaminated wastes.

.8 Identify and evaluate recycling and reclamation options as alternatives to land disposal, such as:

.1 Hazardous wastes recycled in manner constituting disposal.

.2 Hazardous waste burned for energy recovery.

.3 Lead-acid battery recycling.

.4 Hazardous wastes with economically recoverable precious metals.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 03 30 00, 03 35 05, 04 05 12.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)

- .1 CSA-A23.1-04/A23.2-04, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
- .2 CSA-O86S1-05, Supplement No. 1 to CAN/CSA-O86-01, Engineering Design in Wood.
- .3 CSA O121-M1978 (R2003), Douglas Fir Plywood.
- .4 CSA O151-04, Canadian Softwood Plywood.
- .5 CSA O153-M1980 (R2003), Poplar Plywood.
- .6 CAN/CSA-O325.0-92(R2003), Construction Sheathing.
- .7 CSA O437 Series-93(R2006), Standards for OSB and Waferboard.
- .8 CSA S269.1-1975(R2003), Falsework for Construction Purposes.
- .9 CAN/CSA-S269.3-M92 (R2003), Concrete Formwork, National Standard of Canada

.2 Underwriters' Laboratories of Canada (ULC)

- .1 CAN/ULC-S701-05, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Submit shop drawings for formwork and falsework.

- .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province Manitoba of Canada.

.3 Submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 47 15 - Sustainable Requirements: Construction and Section 02 81 01 - Hazardous Materials.

.4 Co-ordinate submittal requirements and provide submittals required by Section 01 47 15 - Sustainable Requirements: Construction.

.5 Indicate method and schedule of construction, shoring, stripping and re-shoring procedures, materials, arrangement of joints, special architectural exposed finishes, ties, liners, and locations of temporary embedded parts.

.6 Indicate formwork design data: permissible rate of concrete placement, and temperature of concrete, in forms.

.7 Indicate sequence of erection and removal of formwork/falsework as directed by Consultant.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Store and manage hazardous materials in accordance with Section 01 47 15 - Sustainable Requirements: Construction.

.2 Waste Management and Disposal:

.1 Separate waste materials for reuse and recycling in accordance with Section 01 47 21 - Construction/Demolition Waste Management and Disposal.

.2 Place materials defined as hazardous or toxic in designated containers.

.3 Divert unused form release material from landfill to an official hazardous material collections site as approved by the Owner.

Part 2 Products

2.1 MATERIALS

.1 Materials and resources in accordance with Section 01 47 15 - Sustainable Requirements: Construction.

.2 Do verification requirements in accordance with Section 01 47 17 - Sustainable Requirements: Contractor's Verification.

.3 Formwork materials:

.1 For concrete without special architectural features, use wood and wood product formwork materials to CSA-O121, CAN/CSA-O86CSA O437 Series, CSA-O153.

.2 For concrete with special architectural features, use formwork materials to CSA-A23.1/A23.2.

.3 Rigid insulation board: to CAN/ULC-S701.

.4 Tubular column forms: round, spirally wound laminated fibre forms, internally treated with release material.

.1 Spiral pattern to show in hardened concrete.

.5 Form ties:

.1 For concrete not designated 'Architectural', use removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm diameter in concrete surface.

.2 For Architectural concrete, use snap ties complete with plastic cones and light grey concrete plugs.

.6 Form liner:

.1 Plywood: high density overlay Douglas Fir to CSA O121, Canadian Softwood Plywood to CSA O151, Poplar to CSA O153, T and G square edge, 19 mm thick.

.7 Form release agent: biodegradable.

.8 Form stripping agent: colourless mineral oil, biodegradable, free of kerosene, with viscosity between 70 and 110s Saybolt Universal 15 to 24 mm^2/s at 40 degrees C, flashpoint minimum 150 degrees C, open cup.

.9 Falsework materials: to CSA-S269.1.

.10 Sealant: to Section 07 92 00 - Joint Sealants.

Part 3 Execution

3.1 FABRICATION AND ERECTION

.1 Verify lines, levels and centres before proceeding with formwork/falsework and ensure dimensions agree with drawings.

.2 Obtain Consultant's approval for use of earth forms framing openings not indicated on drawings.

.3 Hand trim sides and bottoms and remove loose earth from earth forms before placing concrete.

.4 Fabricate and erect falsework in accordance with CSA S269.1.

.5 Refer to architectural drawings for concrete members requiring architectural exposed finishes.

.6 Do not place shores and mud sills on frozen ground.

.7 Provide site drainage to prevent washout of soil supporting mud sills and shores.

.8 Fabricate and erect formwork in accordance with CAN/CSA-S269.3 to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CSA-A23.1/A23.2.

.9 Align form joints and make watertight.

.1 Keep form joints to minimum.

.10 Use 25 mm chamfer strips on external corners and/or 25 mm fillets at interior corners, joints, unless specified otherwise.

.11 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.

.12 Construct forms for architectural concrete, and place ties as directed.

.1 Joint pattern not necessarily based on using standard size panels or maximum permissible spacing of ties.

.13 Build in anchors, sleeves, and other inserts required to accommodate Work specified in other sections.

.1 Ensure that anchors and inserts will not protrude beyond surfaces designated to receive applied finishes, including painting.

.14 Clean formwork in accordance with CSA-A23.1/A23.2, before placing concrete.

3.2 REMOVAL AND RESHORING

.1 Leave formwork in place for following minimum periods of time after placing concrete.

.1 7 days for walls and sides of beams.

.2 7 days for columns.

.3 7 days for beam soffits, slabs, decks and other structural members.

.4 3 days for footings and abutments.

.2 Remove formwork when concrete has reached 70 % of its design strength or minimum period noted above, whichever comes later, and replace immediately with adequate reshoring.

.3 Provide necessary reshoring of members where early removal of forms may be required or where members may be subjected to additional loads during construction as required.

.4 Space reshoring in each principal direction at not more than 3000 mm apart.

.5 Re-use formwork and falsework subject to requirements of CSA-A23.1/A23.2.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 03 30 00, 03 35 05, 04 05 1

1.2 REFERENCES

.1 American Concrete Institute (ACI)

.1 SP-66-04, ACI Detailing Manual 2004.

.2 ASTM International

.1 ASTM A82/A82M-07, Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.

.2 ASTM A143/A143M-07, Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.

.3 ASTM A185/A185M-07, Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.

.4 ASTM A775/A775M-07b, Standard Specification for Epoxy-Coated Reinforcing Steel Bars.

.3 CSA International

.1 CSA-A23.1-09/A23.2-09, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.

.2 CAN/CSA-A23.3-04(R2010), Design of Concrete Structures.

.3 CSA-G30.18-09, Carbon Steel Bars for Concrete Reinforcement.

.4 CSA-G40.20/G40.21-04 (R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

.5 CAN/CSA-G164-M92 (R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.

.6 CSA W186-M1990 (R2007), Welding of Reinforcing Bars in Reinforced Concrete Construction.

.4 Reinforcing Steel Institute of Canada (RSIC)

.1 RSIC-2004, Reinforcing Steel Manual of Standard Practice.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Prepare reinforcement drawings in accordance with RSIC Manual of Standard Practice SP-66.

.3 Shop Drawings:

.1 Submit drawings indicating the following:

.1 Indicate placing of reinforcement and:

.1 Bar bending details, placement plans, clear cover, marks, spacing

.2 Lists.

.3 Quantities of reinforcement and grade of steel.

.4 Sizes, spacings, locations of reinforcement and mechanical splices if approved by Consultant, with identifying code marks to permit correct placement without reference to structural drawings.

.2 Detail lap lengths and bar development lengths to CAN/CSA-A23.3, unless otherwise indicated.

1.4 QUALITY ASSURANCE

.1 Submit in accordance with Section 01 45 00 - Quality Control and as described in PART 2 - SOURCE QUALITY CONTROL.

.1 Mill Test Report: upon request, provide the Consultant with certified copy of mill test report of reinforcing steel, minimum 4 weeks prior to beginning reinforcing work.

.2 Upon request submit in writing to the Consultant proposed source of reinforcement material to be supplied.

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

.2 Replace defective or damaged materials with new.

Part 2 Products

2.1 MATERIALS

.1 Substitute different size bars only if permitted in writing by Consultant.

.2 Reinforcing steel: billet steel, grade 400, deformed bars to CSA-G30.18, unless indicated otherwise.

.3 Reinforcing steel: weldable low alloy steel deformed bars to CSA-G30.18.

.4 Cold-drawn annealed steel wire ties: to ASTM A82/A82M.

.5 Deformed steel wire for concrete reinforcement: to ASTM A82/A82M.

.6 Welded steel wire fabric: to ASTM A185/A185M.

.1 Provide in flat sheets only.

.7 Welded deformed steel wire fabric: to ASTM A82/A82M.

.1 Provide in flat sheets only.

.8 Epoxy Coating of non-prestressed reinforcement: to ASTM A775/A775M.

.9 Galvanizing of non-prestressed reinforcement: to CAN/CSA-G164, minimum zinc coating610 g/m^2.

.1 Protect galvanized reinforcing steel with chromate treatment to prevent reaction with Portland cement paste.

.2 If chromate treatment is carried out immediately after galvanizing, soak steel in aqueous solution containing minimum 0.2% by weight sodium dichromate or 0.2% chromic acid.

.1 Temperature of solution equal to or greater than 32 degrees and galvanized steels immersed for minimum 20 seconds.

.3 If galvanized steels are at ambient temperature, add sulphuric acid as bonding agent at concentration of 0.5% to 1%.

.1 In this case, no restriction applies to temperature of solution.

.4 Chromate solution sold for this purpose may replace solution described above, provided it is of equivalent effectiveness.

.1 Provide product description as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.

.10 Chairs, bolsters, bar supports, spacers: to CSA-A23.1/A23.2.

2.2 FABRICATION

.1 Fabricate reinforcing steel in accordance with CSA-A23.1/A23.2 SP-66 Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada.

.1 SP-66 unless indicated otherwise.

.2 Obtain Consultant's written approval for locations of reinforcement splices other than those shown on placing drawings.

.3 Upon approval of the Consultant, weld reinforcement in accordance with CSA W186.

.4 Ship bundles of bar reinforcement, clearly identified in accordance with bar bending details and lists.

2.3 SOURCE QUALITY CONTROL

.1 Upon request, provide Consultant with certified copy of mill test report of reinforcing steel, showing physical and chemical analysis, minimum 4 weeks prior to beginning reinforcing work.

.2 Upon request inform the Consultant of proposed source of material to be supplied.

Part 3 Execution

3.1 PREPARATION

.1 Galvanizing to include chromate treatment.

.1 Duration of treatment to be 1 hour per 25 mm of bar diameter.

.2 Conduct bending tests to verify galvanized bar fragility in accordance with ASTM A143/A143M.

3.2 FIELD BENDING

.1 Do not field bend or field weld reinforcement except where indicated or authorized by the Consultant.

.2 When field bending is authorized, bend without heat, applying slow and steady pressure.

.3 Replace bars, which develop cracks or splits.

3.3 PLACING REINFORCEMENT

.1 Place reinforcing steel as indicated on placing drawings in accordance with CSA-A23.1/A23.2.

.2 Use plain round bars as slip dowels in concrete.

.1 Paint portion of dowel intended to move within hardened concrete with one coat of asphalt paint.

.2 When paint is dry, apply thick even film of mineral lubricating grease.

.3 Prior to placing concrete, obtain the Consultant's approval of reinforcing material and placement.

.4 Ensure cover to reinforcement is maintained during concrete pour.

3.4 FIELD TOUCH-UP

.1 Touch up damaged and cut ends of epoxy coated or galvanized reinforcing steel with compatible finish to provide continuous coating.

3.5 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

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

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 03 30 00, 03 35 05, 04 05 12

1.2 REFERENCES

.1 Abbreviations and Acronyms:

.1 Portland Cement: hydraulic cement, blended hydraulic cement and Portland-limestone cement.

.1 Type GU, GUb and GUL - General use cement.

.2 Type MS and MSb - Moderate sulphate-resistant cement.

.3 Type MH, MHb and MHL - Moderate heat of hydration cement.

.4 Type HE, HEb and HEL - High early-strength cement.

.5 Type LH, LHb and LHL - Low heat of hydration cement.

.6 Type HS and HSb - High sulphate-resistant cement.

.2 Fly ash:

.1 Type F - with CaO content less than 15%.

.2 Type CI - with CaO content ranging from 15 to 20%.

.3 Type CH - with CaO greater than 20%.

.3 GGBFS - Ground, granulated blast-furnace slag.

.2 Reference Standards:

.1 ASTM International

.1 ASTM C260/C260M-10a, Standard Specification for Air-Entraining Admixtures for Concrete.

.2 ASTM C309-07, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

.3 ASTM C494/C494M-10a, Standard Specification for Chemical Admixtures for Concrete.

.4 ASTM C1017/C1017M-07, Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.

.5 ASTM D412-06ae2, Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.

.6 ASTM D624-00(2007), Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomer.

.7 ASTM D1751-04(2008), Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).

.8 ASTM D1752-04a (2008), Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.

.2 CSA International

.1 CSA A23.1/A23.2-09, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

.2 CSA A283-06, Qualification Code for Concrete Testing Laboratories.

.3 CSA A3000-08, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Provide testing and inspection results for review by Consultant and do not proceed without written approval when deviations from mix design or parameters are found.

.3 Concrete pours: provide accurate records of poured concrete items indicating date and location of pour, quality, air temperature and test samples taken as described in PART 3 - FIELD QUALITY CONTROL.

.4 Concrete hauling time: provide for review by Consultant deviations exceeding maximum allowable time of 120 minutes for concrete to be delivered to site of Work and discharged after batching.

1.4 QUALITY ASSURANCE

.1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.

.2 Provide Consultant, minimum 4 weeks prior to starting concrete work, with valid and recognized certificate from plant delivering concrete.

.1 Provide test data and certification by qualified independent inspection and testing laboratory that materials and mix designs used in concrete mixture will meet specified requirements.

.3 Minimum 4 weeks prior to starting concrete work, provide proposed quality control procedures for review by Consultant on following items:

.1 Falsework erection.

.2 Hot weather concrete.

.3 Cold weather concrete.

.4 Curing.

.5 Finishes.

.6 Formwork removal.

.7 Joints.

.4 Quality Control Plan: provide written report to Consultant verifying compliance that concrete in place meets performance requirements of concrete as established in PART 2 - PRODUCTS.

.5 Sustainability Standards Certification:

.1 Construction Waste Management: provide copy of plan.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Delivery and Acceptance Requirements:

.1 Concrete hauling time: deliver to site of Work and discharged within 120 minutes maximum after batching.

.1 Do not modify maximum time limit without receipt of prior written agreement from Consultant laboratory representative and concrete producer as described in CSA A23.1/A23.2.

.2 Deviations to be submitted for review by Consultant.

.2 Concrete delivery: ensure continuous concrete delivery from plant meets CSA A23.1/A23.2.

Part 2 Products

2.1 PERFORMANCE CRITERIA

.1 Quality Control Plan: ensure concrete supplier meets performance criteria of concrete as established by Consultant and provide verification of compliance as described in PART 1 - QUALITY ASSURANCE.

2.2 MATERIALS

.1 Portland Cement: to CSA A3001, Type GU HS.

.1 Reduction in cement from Base Mix to Actual Supplementary Cementing Materials (SCMs) Mix, as percentage.

.2 Blended hydraulic cement: Type GUb, HSb to CSA A3001.

.3 Portland-limestone cement: Type GUL to CSA A23.1.

.4 Water: to CSA A23.1.

.5 Aggregates: to CSA A23.1/A23.2.

.6 Admixtures:

.1 Air entraining admixture: to ASTM C260.

.2 Chemical admixture: to ASTM C494, ASTM C1017. Consultant to approve accelerating or set retarding admixtures during cold and hot weather placing.

.7 Shrinkage compensating grout: premixed compound consisting of metallic aggregate, Portland cement, water reducing and plasticizing agents to CSA A23.1/A23.2.

.1 Compressive strength: 35 MPa at 28 days.

.2 Net shrinkage at 28 days: maximum 1%.

.8 Non premixed dry pack grout: composition of non-metallic aggregate Portland cement with sufficient water for mixture to retain its shape when made into ball by hand and capable of developing compressive strength of 35 MPa at 28 days.

.9 Curing compound: to CSA A23.1/A23.2 white ASTM C309, Type 1-chlorinated rubber Type1-D with fugitive dye.

.10 Mechanical waterstops: extruded PVC Arctic Grade of sizes indicated

.11 Weep hole tubes: plastic.

.12 Dovetail anchor slots: minimum 0.6 mm thick galvanized steel with insulation filled slots.

.13 Dampproof membrane:

.1 Kraft/polyethylene membrane:

.1 Plain: .10 mm thick polyethylene film bonded to asphalt treated creped kraft.

.2 Reinforced: two .10 mm thick polyethylene films bonded each side of asphalt treated creped kraft paper, reinforced with 13 x 13 mm fibreglass scrim.

.3 Membrane adhesive: as recommended by membrane manufacturer.

.14 Dampproofing:

.1 Emulsified asphalt, mineral colloid type, unfilled: to CAN/CGSB-37.2, and to Section 07 11 13 - Bituminous Dampproofing.

Part 3 Execution

3.1 PREPARATION

.1 Obtain Consultant's written approval before placing concrete.

.1 Provide 72 hours minimum notice prior to placing of concrete.

.2 Place concrete reinforcing in accordance with Section 03 20 00 - Concrete Reinforcing.

.3 During concreting operations:

.1 Development of cold joints not allowed.

.2 Ensure concrete delivery and handling facilitates placing with minimum of re-handling, and without damage to existing structure or Work.

.4 Pumping of concrete is permitted only after approval of equipment and mix.

.5 Ensure reinforcement and inserts are not disturbed during concrete placement.

.6 Prior to placing of concrete obtain Consultant's approval of proposed method for protection of concrete during placing and curing in adverse weather.

.7 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.

.8 In locations where new concrete is dowelled to existing work, drill holes in existing concrete.

.1 Place steel dowels of deformed steel reinforcing bars and pack solidly with Hilti Hy 200 epoxy grout to anchor and hold dowels in positions to match steel in walls/slab beams, etc.

.9 Do not place load upon new concrete until authorized by Consultant.

3.2 INSTALLATION/APPLICATION

.1 Do cast-in-place concrete work to CSA A23.1/A23.2.

.2 Sleeves and inserts:

.1 Do not permit penetrations, sleeves, ducts, pipes or other openings to pass through joists, beams, column capitals or columns, except where indicated or approved by Consultant.

.2 Where approved by Consultant, set sleeves, ties, pipe hangers and other inserts and openings as indicated or specified elsewhere.

.3 Sleeves and openings greater than 100 x 100 mm not indicated, must be reviewed by Consultant.

.4 Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain written approval of modifications from Consultant before placing of concrete.

.5 Confirm locations and sizes of sleeves and openings shown on drawings.

.6 Set special inserts for strength testing as indicated and as required by non-destructive method of testing concrete.

.3 Anchor bolts:

.1 Set anchor bolts to templates in co-ordination with appropriate trade prior to placing concrete.

.2 Grout anchor bolts in preformed holes or holes drilled after concrete has set only after receipt of written approval from Consultant.

.3 Protect anchor bolt holes from water accumulations, snow and ice build-ups.

.4 Grout under base plates using procedures in accordance with manufacturer's recommendations which result in 100% contact over grouted area.

.5 Finishing and curing:

.1 Finish concrete to CSA A23.1/A23.2.

.2 Use procedures as reviewed by Consultant or those noted in CSA A23.1/A23.2 to remove excess bleed water. Ensure surface is not damaged.

.3 Finish concrete floor to CSA A23.1/A23.2.

.4 Provide screed finish where bonded topping terrazzo floor tile is to be applied.

.6 Waterstops:

.1 Install waterstops to provide continuous water seal.

.2 Do not distort or pierce waterstop in way as to hamper performance.

.3 Do not displace reinforcement when installing waterstops.

.4 Use equipment to manufacturer's requirements to field splice waterstops.

.5 Tie waterstops rigidly in place.

.6 Use only straight heat sealed butt joints in field.

.7 Use factory welded corners and intersections unless otherwise approved by Consultant.

.7 Joint fillers:

.1 Furnish filler for each joint in single piece for depth and width required for joint, unless otherwise authorized by Consultant.

.2 When more than one piece is required for joint, fasten abutting ends and hold securely to shape by stapling or other positive fastening.

.3 Locate and form construction joints as indicated.

.4 Install joint filler.

.5 Use 12 mm thick joint filler to separate slabs-on-grade from vertical surfaces and extend joint filler from bottom of slab to within 12 mm of finished slab surface unless indicated otherwise.

.8 Dampproof membrane:

.1 Install dampproof membrane under concrete slabs-on-grade inside building.

.2 Lap dampproof membrane minimum 150 mm at joints and seal.

.3 Seal punctures in dampproof membrane before placing concrete.

.4 Use patching material at least 150 mm larger than puncture and seal.

3.3 SURFACE TOLERANCE

.1 Concrete tolerance to CSA A23.1 Straightedge Method FF = 25: FL = 20 to tolerance schedule as indicated.

3.4 FIELD QUALITY CONTROL

.1 Site tests: conduct tests as follows in accordance with Section 01 45 00 - Quality Control and submit report as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.

.1 Concrete pours.

.2 Slump.

.3 Air content.

.4 Compressive strength at 7 and 28 days.

.5 Air and concrete temperature.

.2 Inspection and testing of concrete and concrete materials will be carried out by testing laboratory designated by Consultant for review to CSA A23.1/A23.2.

.1 Ensure testing laboratory is certified to CSA A283.

.3 Ensure test results are distributed for discussion at pre-pouring concrete meeting between testing laboratory and Consultant.

.4 General Contractor will pay for costs of tests as specified in Section 01 29 83 - Payment Procedures for Testing Laboratory Services.

.5 Consultant may request to take additional test cylinders during cold weather concreting. Cure cylinders on job site under same conditions as concrete which they represent.

.6 Non-Destructive Methods for Testing Concrete: to CSA A23.1/A23.2.

.7 Inspection or testing by Consultant will not augment or replace Contractor quality control nor relieve Contractor of his contractual responsibility.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 03 30 00, 03 35 05, 04 05 12

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for concrete hardener and curing compound and include product characteristics, performance criteria, physical size, finish and limitations.

1.3 DELIVERY, STORAGE AND HANDLING

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

.2 Replace defective or damaged materials with new.

Part 2 Products

2.1 FLOOR HARDENER

.1 Non-metallic hardener: premixed, dry shake surface hardener, cement to hardener ratio 2 to 1.

.1 Volcanic basaltic aggregate (trap rock):

.1 Quartz aggregate.

.2 Metallic floor hardener: premixed, cement to hardener ratio 2 to 1.

.3 Synthetic non-ferrous hardener.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of slab previously installed under other Sections or Contracts are acceptable for concrete hardener and curing compound application installation in accordance with manufacturer's written instructions.

.1 Inform Consultant of unacceptable conditions immediately upon discovery.

.2 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Consultant.

3.2 HARDENING

.1 Apply floor hardener aggregate at rate as recommended in accordance with manufacturer's written instructions.

.2 Apply slip resistant coating on floor surfaces.

.3 Apply in accordance with manufacturer's written instructions.

3.3 PROTECTION

.1 Protect finished installation until floor treatment has completely cured.

.2 Repair damage to adjacent materials caused by concrete floor hardener installation.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 06 10 00, 061500, 061753.

1.2 REFERENCES

.1 American Wood-Preservers' Association (AWPA)

- .1 AWPA M2-01, Standard for Inspection of Treated Wood Products.
- .2 AWPA M4-06, Standard for the Care of Preservative-Treated Wood Products.

.2 Canadian Standards Association (CSA International)

- .1 CSA O80 Series-97(R2002) - O80S2-05, Wood Preservation.
- .2 CSA O80.20-1.1-M97 (R2002), This Standard applies to the fire-retardant treatment of lumber by pressure processes.
- .3 CSA O80.27-1.1-M97 (R2002), This Standard covers the fire-retardant treatment of Douglas Fir, hardwood, softwood, and Poplar plywood by pressure processes.
- .4 CSA O80.201-M89, This Standard covers hydrocarbon solvents for preparing solutions of preservatives.
- .5 CSA O322-02, Procedure for Certification of Pressure-Treated Wood Materials for Use in Preserved Wood Foundations.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Quality assurance submittals:

- .1 Submit certificates in accordance with Section 01 33 00 - Submittal Procedures.
- .2 For products treated with preservative or fire-retardant by pressure impregnation submit following information certified by authorized signing officer of treatment plant:
  - .1 Information listed in AWPA M2 and revisions specified in CSA O80 Series, Supplementary Requirement to AWPA M2 applicable to specified treatment.
  - .2 Moisture content after drying following treatment with water-borne preservative or fire-retardant.
  - .3 Acceptable types of paint, stain, and clear finishes that may be used over treated materials to be finished after treatment.

1.4 QUALITY ASSURANCE

.1 Each piece of lumber and plywood for preserved wood foundations to be identified by CSA O322 certified stamp.

Part 2 Products

2.1 MATERIALS

.1 Preservative: to CSA-O80 Series, odourless, for clear finish.

.1 SCAQMD Rule #1113, Architectural Coatings.

.2 Preservatives: maximum VOC limit 350 g/L.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 06 10 00, 061500, 061753.

1.2 REFERENCES

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

.1 ANSI/NPA A208.1-2009, Particleboard.

.2 ASTM International

.1 ASTM A123/A123M-09, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

.2 ASTM A653/A653M-11, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanealled) by the Hot-Dip Process.

.3 ASTM C578-11a, Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.

.4 ASTM C1289-11, Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.

.5 ASTM C1396/C1396M-11, Standard Specification for Gypsum Board.

.6 ASTM D1761-06, Standard Test Methods for Mechanical Fasteners in Wood.

.7 ASTM D5055-11, Standard Specification for Establishing and Monitoring Structural Capacities of Prefabricated Wood I-Joists.

.8 ASTM D5456-11, Standard Specification for Evaluation of Structural Composite Lumber Products.

.3 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-11.3-M87, Hardboard.

.2 CAN/CGSB-51.32-M77, Sheathing, Membrane, Breather Type.

.3 CAN/CGSB-51.34-M86, Vapour Barrier, Polyethylene Sheet for Use in Building Construction and amendment.

.4 CAN/CGSB-71.26-M88, Adhesive for Field-Gluing Plywood to Lumber Framing for Floor Systems.

.4 CSA International

.1 CAN/CSA-A123.2-03(R2008), Asphalt Coated Roofing Sheets.

.2 CAN/CSA-A247-M86 (R1996), Insulating Fiberboard.

.3 CSA B111-1974(R2003), Wire Nails, Spikes and Staples.

.4 CSA O112.9-10, Evaluation of Adhesives for Structural Wood Products (Exterior Exposure).

.5 CSA O121-08, Douglas Fir Plywood.

.6 CAN/CSA O122-06(R2011), Structural Glued-Laminated Timber.

.7 CSA O141-05(R2009), Softwood Lumber.

.8 CSA O151-09, Canadian Softwood Plywood.

.9 CSA O153-M1980 (R2008), Poplar Plywood.

.10 CSA O325-07, Construction Sheathing.

.11 CSA O437 Series-93(R2011), Standards on OSB and Waferboard.

.12 CAN/CSA-Z809-08, Sustainable Forest Management.

.5 Forest Stewardship Council (FSC)

.1 FSC-STD-01-001-2004, FSC Principle and Criteria for Forest Stewardship.

.6 National Lumber Grades Authority (NLGA)

.1 Standard Grading Rules for Canadian Lumber 2010.

.7 Sustainable Forestry Initiative (SFI)

.1 SFI-2010-2014 Standard.

.8 The Truss Plate Institute of Canada

.1 Truss Design Procedures and Specifications for Light Metal Plate Connected Wood Trusses 2007.

.9 Underwriters' Laboratories of Canada (ULC)

.1 CAN/ULC-S706-09, Standard for Wood Fibre Insulating Boards for Buildings.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for wood products and accessories and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:

.1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Manitoba, Canada.

1.4 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.

.3 Sustainable Standards Certification:

.1 Certified Wood: submit listing of wood products and materials used in accordance with CAN/CSA-Z809 or FSC or SFI.

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

.2 Store and protect wood from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

Part 2 Products

2.1 FRAMING STRUCTURAL AND PANEL MATERIALS

.1 Description:

.1 Sustainability Characteristics:

.1 Lumber, Finger Jointed Lumber, Glulam, I-Joists, Trusses, SCL, CAN/CSA-Z809 or FSC or SFI certified.

.2 Plywood. Particleboard OSB urea-formaldehyde free, CAN/CSA-Z809 or FSC or SFI certified.

.2 Lumber: softwood, S4S, moisture content 19% (S-dry) or less in accordance with following standards:

.1 CSA O141.

.2 NLGA Standard Grading Rules for Canadian Lumber.

.3 Glulam in accordance with Structural Glued-Laminated Timber CAN/CSA-O122.

.4 Wood I-joists in accordance with Prefabricated Wood I-Joists ASTM D5055.

.5 Light-frame trusses in accordance with "Truss Design and Procedures for Light Metal Connected Wood Trusses", The Truss Plate Institute of Canada.

.6 Structural Composite Lumber (SCL) in accordance with ASTM D5456.

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

.8 Furring, blocking, nailing strips, grounds, rough bucks, curbs, fascia backing and sleepers:

.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.

.9 Plywood, OSB and wood based composite panels: to CSA O325.

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

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

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

.13 Interior mat-formed wood particleboard: to ANSI/NPA 208.1.

.14 Mat-formed structural panelboards (OSB wafer): to CAN O437.

.15 Insulating fiberboard sheathing: to CAN/CSA-A247 CAN/ULC-S706.

.16 Glass fibre board sheathing: non-structural, rigid, faced, fiberglass, insulating exterior sheathing board.

.17 Gypsum sheathing: to ASTM C1396/C1396M.

2.2 ACCESSORIES

.1 Exterior wall sheathing paper: to CAN/CGSB-51.32

.2 Polyethylene film: to CAN/CGSB-51.34, Type 1, 0.15 mm thick.

.3 Roll roofing: to CAN/CSA A123.2, Type S.

.4 Air seal: closed cell polyurethane or polyethylene.

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

.6 Subflooring adhesive: to CAN/CGSB-71.26, cartridge loaded.

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

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

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

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

.11 Joist hangers: minimum 1 mm thick sheet steel, galvanized ZF001 coating designation. Hangers to be sized by truss manufacturer.

.12 Roof sheathing H-Clips: formed "H" shape, thickness to suit panel material, extruded 6063-T6 aluminum alloy type approved by Consultant.

.13 Fastener Finishes:

.1 Galvanizing: to ASTM A123/A123M, ASTM A653, use galvanized fasteners for exterior work and treated lumber.

.14 Wood Preservative:

.1 Preservative Coating: in accordance with manufacturer's recommendations for surface conditions:

.1 Preservative: VOC limit 350 g/L maximum to SCAQMD Rule 1113.

.2 Coatings: VOC limit 350 g/L maximum to SCAQMD Rule 1113.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for product installation in accordance with manufacturer's written instructions.

.1 Inform Consultant of unacceptable conditions immediately upon discovery.

.2 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Consultant.

3.2 PREPARATION

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

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

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

3.3 MATERIAL USAGE

.1 Roof sheathing:

.1 Plywood, DFP or CSP sheathing grade or PP standard sheathing grade, square edge, 12.5 mm thick.

.2 Exterior wall sheathing:

.1 Plywood, DFP or CSP sheathing grade or PP standard sheathing grade, square edge, 12.5 mm thick.

.3 Subflooring:

.1 Plywood, DFP or CSP sheathing grade or PP standard sheathing grade, T and G edge, 19 mm thick.

3.4 INSTALLATION

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

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

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

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

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

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

.6 Install all wall sheathing in accordance with manufacturer's printed instructions.

.7 Install all roof sheathing in accordance with requirements of NBC.

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

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

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

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

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

.12 Install sleepers as indicated.

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

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

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

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

3.5 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

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

3.6 PROTECTION

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

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

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 06 10 00, 061500, 061753.

1.2 REFERENCES

.1 CSA International

.1 CAN/CSA O80 Series-08, Wood Preservation.

.2 CSA O86 Consolidation-09, Engineering Design in Wood.

.3 CSA O141-05(R2009), Softwood Lumber.

.4 CSA S307-M1980 (R2001), Load Test Procedure for Wood Roof Trusses for Houses and Small Buildings.

.5 CSA S347-99 (R2009), Method of Test for Evaluation of Truss Plates Used in Lumber Joints.

.6 CSA W47.1-09, Certification of Companies for Fusion Welding of Steel.

.7 CAN/CSA-Z809-08, Sustainable Forest Management.

.2 Forest Stewardship Council (FSC)

.1 FSC-STD-01-001-2004, FSC Principle and Criteria for Forest Stewardship.

.3 National Lumber Grades Authority (NLGA)

.1 Standard Grading Rules for Canadian Lumber 2010.

.4 National Research Council (NRC)/Institute for Research in Construction (IRC) - Canadian Construction Materials Centre (CCMC)

.1 CCMC-on-line edition, Registry of Product Evaluations.

.5 Truss Plate Institute of Canada (TPIC)

.1 TPIC - 2007, Truss Design Procedures and Specifications for Light Metal Plate Connected Wood Trusses (Limit States Design).

.6 Sustainable Forestry Initiative (SFI)

.1 SFI-2010-2014 Standard.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for wood trusses and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:

.1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Manitoba, Canada.

.2 Include on drawings:

.1 Each shop drawing submission showing connection details.

.2 Indicate special structural application and specification as according to local authorities having jurisdiction.

.3 Indicate TPIC Truss Design Procedure and CSA O86 Engineering Design in Wood and specific CCMC Product Registry number of the truss plates

.4 Indicate species, sizes, and stress grades of lumber used as truss members. Show pitch, span, camber, configuration and spacing of trusses. Indicate connector types, thicknesses, sizes, locations and design value. Show bearing details. Indicate design load for members.

.5 Submit stress diagram or print-out of computer design indicating design load for truss members. Indicate allowable load and stress increase.

.6 Provide certification that trusses meet requirements of CSA S307 and CSA S347.

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

.8 Show location of lateral bracing for compression members.

.9 Test reports: submit certified test reports for prefabricated wood trusses from approved independent testing laboratories, indicating compliance with specifications for specified performance characteristics and physical properties.

.10 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.11 Instructions: submit manufacturer's installation instructions.

1.4 QUALITY ASSURANCE

.1 Qualifications:

.1 Fabricator for trusses to show evidence of quality control program such as provided by regional wood truss associations, or equivalent.

.2 Fabricator for welded steel connections to be certified in accordance with CSA W47.1.

.2 Sustainable Standards Certification:

.1 Certified Wood: submit listing of wood products and materials used in accordance with CAN/CSA-Z809 or FSC or SFI.

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

.2 Store and protect wood trusses from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

.4 Provide bearing supports and bracings. Prevent bending, warping and overturning of trusses.

Part 2 Products

2.1 DESIGN REQUIREMENTS

.1 Design light metal plate connected wood trusses in accordance with TPIC truss design procedures for wood truss chords and webs in accordance with engineering properties in CSA O86.

.2 Design light metal plate connected wood trusses in accordance with TPIC truss design procedures for truss joint designs to test engineering properties in accordance with CSA S347 and listed in CCMC Registry of Product Evaluations.

.3 Design trusses, bracing in accordance with CSA O86.1 for loads indicated for building locality as ascertained by NBC, Climatic Information for Building Design in Canada and minimum uniform and minimum concentrated loadings stipulated in NBC commentary.

.4 Limit live load deflection to 1/360th of span where gypsum board ceilings are hung directly from trusses.

.5 Provide camber for trusses as indicated.

2.2 MATERIALS

.1 Materials and products in accordance with Section 01 47 15 - Sustainable Requirements: Construction.

.2 Lumber: As required by truss manufacturer and to following standards:

.1 CSA O141.

.2 NLGA (National Lumber Grading Association), Standard Grading Rules for Canadian Lumber.

.3 CAN/CSA-Z809 or FSC or SFI certified.

.3 Fastenings: to CSA O86.

.4 Preservative: creosote.

2.3 FABRICATION

.1 Fabricate wood trusses in accordance with reviewed and approved shop drawings.

.2 Provide for design camber and roof slopes when positioning truss members.

.3 Connect members using metal connector plates.

2.4 SOURCE QUALITY CONTROL

.1 Identify lumber by grade stamp of an agency certified by Canadian Lumber Standards Administration Board.

.2 Certify by agency accredited by Standards Council of Canada that preservative fire retardant treated wood in accordance with CAN/CSA O80 Series.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for product installation in accordance with manufacturer's written instructions.

.1 Inform Consultant of unacceptable conditions immediately upon discovery.

.2 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Consultant.

3.2 MANUFACTURER'S INSTRUCTIONS

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

3.3 ERECTION

.1 Erect wood trusses in accordance with reviewed and approved shop drawings.

.2 Handling, installation, erection, bracing and lifting in accordance with manufacturer’s instructions.

.3 Make adequate provisions for handling and erection stresses.

.4 Exercise care to prevent out-of-plane bending of trusses.

.5 Install temporary horizontal and cross bracing to hold trusses plumb and in safe condition until permanent bracing and decking are installed.

.6 Install permanent bracing in accordance with approved shop drawings, prior to application of loads to trusses.

.7 Do not cut or remove any truss material without approval of Consultant.

.8 Remove chemical and other surface deposits on treated wood, in preparation for applied finishes.

3.4 FIELD QUALITY CONTROL

.1 Manufacturer's Field Services:

.1 Have manufacturer of products supplied under this Section review work involved in handling, installation/application, protection and cleaning of its products, and submit written reports, in acceptable format, to verify compliance of work with Contract.

.2 Manufacturer's field services: provide manufacturer's field services, consisting of product use recommendations and periodic site visits for inspection of product installation, in accordance with manufacturer's instructions.

.3 Schedule site visits to review work at stages listed:

.1 After delivery and storage of products, and when preparatory work on which work of this Section depends is complete, but before installation begins.

.2 Twice during progress of work at 25% and 60% complete.

.2 Upon completion of work, after cleaning is carried out.

.3 Obtain reports within three days of review and submit immediately to Consultant.

3.5 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

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

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 American National Standards Institute (ANSI)

- .1 ANSI A208.1-09, Particleboard.
- .2 ANSI A208.2-09, Medium Density Fiberboard (MDF) for Interior Applications.
- .3 ANSI/HPVA HP-1-10, Standard for Hardwood and Decorative Plywood.

.2 ASTM International

- .1 ASTM E1333-10, Standard Test Method for Determining Formaldehyde Concentrations in Air and Emission Rates From Wood Products Using a Large Chamber.
- .2 ASTM D2832-92(R2011), Standard Guide for Determining Volatile and Non-volatile 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 Architectural Woodwork Manufacturers Association of Canada (AWMAC) and Architectural Woodwork Institute (AWI)

- .1 Architectural Woodwork Quality Standards Illustrated, 8th edition, Version 1.0 (2009).

.4 Canadian General Standards Board (CGSB)

- .1 CAN/CGSB-71.20-M88, Adhesive, Contact, Brushable.

.5 CSA International

- .1 CSA B111-74(R2003), Wire Nails, Spikes and Staples.
- .2 CSA O112.10-08, Evaluation of Adhesives for Structural Wood Products (Limited Moisture Exposure).
- .3 CSA O121-08, Douglas Fir Plywood.
- .4 CSA O141-05(R2009), Softwood Lumber.
- .5 CSA O151-09, Canadian Softwood Plywood.
- .6 CSA O153-M1980(R2008), Poplar Plywood.
- .7 CAN/CSA-Z809-08, Sustainable Forest Management.

.6 Forest Stewardship Council (FSC)

- .1 FSC-STD-01-001-2004, FSC Principle and Criteria for Forest Stewardship.

.7 Green Seal Environmental Standards (GS)

- .1 GS-11-11, Paints and Coatings.
- .2 GS-36-11, Commercial Adhesives.

.8 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

- .1 Material Safety Data Sheets (MSDS).

.9 International Organization for Standardization (ISO)

.1 ISO 14040-2006, Environmental Management-Life Cycle Assessment - Principles and Framework.

.2 ISO 14041-98, Environmental Management-Life Cycle Assessment - Goal and Scope Definition and Inventory Analysis.

.10 National Electrical Manufacturers Association (NEMA)

.1 ANSI/NEMA LD-3-05, High-Pressure Decorative Laminates (HPDL).

.11 National Hardwood Lumber Association (NHLA)

.1 Rules for the Measurement and Inspection of Hardwood and Cypress 2011.

.12 National Lumber Grades Authority (NLGA)

.1 Standard Grading Rules for Canadian Lumber 2010.

.13 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards

.1 SCAQMD Rule 1113-A2011, Architectural Coatings.

.2 SCAQMD Rule 1168-A2005, Adhesives and Sealants Applications.

.14 Sustainable Forestry Initiative (SFI)

.1 SFI-2010-2014 Standard.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Shop Drawings:

.1 Indicate details of construction, profiles, jointing, fastening and other related details.

.1 Scales: profiles full size, details half full size.

.2 Indicate materials, thicknesses, finishes and hardware.

.3 Indicate locations of service outlets in casework, typical and special installation conditions, and connections, attachments, anchorage and location of exposed fastenings.

.3 Samples:

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

.2 Submit duplicate sample size 300 x 300 mm or 300mm long.

.3 Submit duplicate samples of laminated plastic for colour selection.

.4 Submit duplicate samples of laminated plastic joints, edging, cutouts and postformed profiles.

.4 Certifications: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

1.3 QUALITY ASSURANCE

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

.2 Sustainable Standards Certification:

.1 Certified Wood: submit listing of wood products and materials used in accordance with CAN/CSA-Z809 or FSC or SFI.

.3 Plywood, particleboard, OSB and wood based composite panels to 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 with manufacturer's written instructions.

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

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

.2 Store millwork in ventilated areas, protected from extreme changes of temperature or humidity.

.3 Storage and Handling Requirements:

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

.2 Store and protect architectural woodwork from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove for reuse in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 MATERIALS

.1 Softwood lumber: unless specified otherwise, S4S, moisture content 15 % or less in accordance with following standards:

.1 CSA O141.

.2 CAN/CSA-Z809 or FSC or SFI certified.

.3 NLGA Standard Grading Rules for Canadian Lumber.

.4 AWMAC custom and premium grade, moisture content as specified.

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

.3 Ensure manufacturing process adheres to Lifecycle Assessment (LCA) Standards to ISO 14040/14041 LCA Standards, CSA Z760-94 Life Cycle Assessment.

.4 Hardwood lumber: moisture content 6 % or less in accordance with following standards:

.1 National Hardwood Lumber Association (NHLA).

.2 CAN/CSA-Z809 or FSC or SFI certified.

.3 AWMAC premium grade, moisture content as specified.

.5 Douglas fir plywood (DFP): to CSA O121, standard construction, CAN/CSA-Z809 or FSC or SFI certified.

.1 Plywood resin to contain no added urea-formaldehyde.

.6 Canadian softwood plywood (CSP): to CSA O151, standard construction, CAN/CSA-Z809 or FSC or SFI certified.

.1 Plywood resin to contain no added urea-formaldehyde.

.7 Hardwood plywood: to ANSI/HPVA HP-1, CAN/CSA-Z809 or FSC or SFI certified.

.1 Plywood resin to contain no added urea-formaldehyde.

.8 Poplar plywood (PP): to CSA O153, standard construction, CAN/CSA-Z809 or FSC or SFI certified.

.1 Plywood resin to contain no added urea-formaldehyde.

.9 Interior mat-formed wood particleboard: to ANSI/NPA A208.1, CAN/CSA-Z809 or FSC or SFI certified.

.1 Particleboard resin to contain no added urea-formaldehyde.

.10 Birch plywood: to AWMAC Natural, CAN/CSA-Z809 or FSC or SFI certified.

.1 Plywood resin to contain no added urea-formaldehyde.

.11 Fibreboard must contain less than 10% roundwood by weight, using weighted average over three month period at manufacturing locations.

.1 Fibreboard resin to contain no added urea-formaldehyde.

.2 CAN/CSA-Z809 or FSC or SFI certified.

.12 Hardboard:

.1 To CAN/CGSB-11.3, CAN/CSA-Z809 or FSC or SFI certified.

.2 Hardboard resin to contain no added urea-formaldehyde.

.13 MDF (medium density fibreboard) core: to ANSI A208.2, density 769 kg/m^2, CAN/CSA-Z809 or FSC or SFI certified.

.1 Medium density fibreboard performance requirements to: ANSI A208.2.

.2 MDF resin to contain no added urea-formaldehyde.

.14 Thermofused Melamine: to NEMA LD3 Grade VGL.

.1 High wear resistant thermofused melamine: equal or exceed 400 cycles (Minimum standard for HPL abrasion test).

.15 Nails and staples: to CSA B111.

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

.17 Splines: wood.

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

.1 Sealants: VOC limit 250 g/L maximum to SCAQMD Rule 1168.

.19 Laminated plastic adhesive:

.1 Adhesive: urea resin adhesive to CSA O112.10 contact adhesive to CAN/CGSB-71.20 resorcinol resin adhesive to CSA O112.10 polyvinyl adhesive to CSA O112.10 two component epoxy thermosetting adhesive.

.2 Adhesives: VOC limit 30 g/L maximum to GS-36.

.3 Clear Wood Finishes: VOC limit 350 550 g/L maximum to GS-11

2.2 Stainless Steel Cabinets/ Counter Tops

.1 General Stainless steel materials requirements (Counter and Cabinets for Rooms 136 and 138.

.1 Fabricate work square, true, straight to suit installation conditions and as indicated

.2 Fit and shop assemble equipment ready for erection where possible

.3 Debur, smooth and round off raw edges prior to forming

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

.5 Stainless sheet steel to ASTM 204/240M Type 304 with AISI No. 4 finish with 2mm thickness or as indicated

.6 Hardware and Fastenings: Stainless Steel

.7 Welding: sound, non-porous and free from imperfections

.1 Weld metal: color matched and corrosion-resistant as parent petal

.2 Spot welds. Minimum 3.0 mm in diameter with full penetration

.3 Grind exposed welds smooth and polish to match parent metal

.4 Grind other welds smooth

.5 Welding and finishing is not to impair corrosion resistance of finish article.

.6 Welds, except spot welds: continuous unless otherwise indicated

.8 Steel Section and tubing plates to CSA G40.20/G40.21

.9 Steel Pipe to ASTM A53/A53M

.10 Welding Materials to CSA W59

.11 Welding electrodes to CSA W48 Series

.12 Bolts and anchor bolts to ASTM A307

.

2.3 MANUFACTURED UNITS

.1 Casework:

.1 Fabricate caseworks to AWMAC premium quality grade.

.2 Furring, blocking, nailing strips, grounds and rough bucks and sleepers.

.1 S2S

.2 Board sizes: "standard" or better grade.

.3 Dimension sizes: "standard" light framing or better grade.

.4 Urea-formaldehyde free.

.3 Framing fir or spruce species, NLGA custom grade.

.4 Case bodies (ends, divisions and bottoms).

.1 Softwood and poplar plywood DFP or CSP or PP custom grade, square edge, 19 mm thick.

.2 Particleboard, grade R, 19 mm thick.

.3 Solid wood: fir or spruce species, custom grade, 19 mm thick.

.5 Backs:

.1 Softwood and poplar plywood DFP or CSP or PP custom grade, square edge, 19 mm thick.

.2 Particleboard, grade R, 6 mm thick.

.3 Fibreboard, Medium Density Fibreboard 19 mm thick.

.4 Solid wood: spruce species, custom grade, 19 mm thick.

.6 Shelving:

.1 Softwood and poplar plywood DFP or CSP or PP G2G grade, square edge, 16 and 19 mm thick.

.2 Particleboard, HPL grade M2, 19 - 25 mm thick.

.3 Solid wood: hard maple species, premium grade, 19 mm thick.

.4 Edge banding: provide 10 mm thick solid matching wood strip on plywood edges 10 mm or thicker, exposed in final assembly. Strips same width as plywood.

.2 Drawers:

.1 Fabricate drawers to AWMAC premium grade supplemented as follows:

.2 Sides and Backs.

.1 Softwood and poplar plywood DFP or CSP or PP G2G grade, square edge, 13 mm thick.

.2 Fibreboard: medium density fibreboard 13 mm thick.

.3 Thermofused melamine: 13 mm thick.

.3 Bottoms:

.1 Softwood and poplar plywood DFP or CSP or PP G2G grade, square edge, 13 mm thick.

.2 Hardboard: type 1, 6 mm thick.

.4 Fronts:

.1 Softwood and poplar plywood DFP or CSP or PP G2G grade, square edge, 19 mm thick.

.2 Particleboard, HPL grade 2000, 16 mm thick.

.3 Casework Doors:

.1 Fabricate doors to AWMAC premium grade supplemented as follows:

.2 Softwood and poplar plywood DFP or CSP or PP G2G grade, square edge, 19 mm thick.

.3 Particleboard, HPL grade 2000, 19 mm thick.

.4 Medium Density Fibreboard, laminated with TFM.

2.4 MANUFACTURED UNITS

.1 To AWMAC premium quality grade

.2 Standard softwood framing species (NLGA) (NHLA) for counter framing including furring, blocking, nailing strips, grounds and rough bucks and sleepers.

.3 Prepare for: electrical wiring, outlets, computer grounded outlets etc.

.4 Counter top: stainless steel on double 19mm plywood core. 180º wrap.

.5 Countertop supports: Pre-manufacture red Steel Brackets – heavy-duty.

.6 Stainless Steel, complete with pass through for cables

.7 Size: 533 x 610mm

.8 Spaced: 406mm O.C.

.9 Casework:

.10 Exposed sides, front and ends: Particleboard, with plastic laminate finish thickness as indicated on drawings.

.11 Unexposed sides, 16 mm particleboard

.12 Front side and ends of counters: Particleboard, with plastic laminate finish thicknesses as shown.

.13 Bond: Type II.

.14 Drawers: To AWMAC standards.

.15 Front: Particleboard, with plastic laminate finish 19 mm thick.

.16 Sides and Back: 13 mm melamine, commercial grade.

.17 Bottom: 6mm prefinished hardboard.

.18 Slide, bottom mounted.

.19 Drawer pulls (125mm aluminum) and locks (nickel plated) as specified.

.20 Bond: Type II.

.21 Transaction Counter: Stainless steel with 19 mm plywood core 180º wrap as shown.

.22 Counter grommets location to be determined.

.23 Base: Particleboard, with plastic laminate finish 6 mm thick.

.24 Edge Tape: finish to match laminate.

2.5 FABRICATION

.1 Set nails and countersink screws apply wood filler to indentations, sand smooth and leave ready to receive finish.

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

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

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

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

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

.7 Ensure adjacent parts of continuous laminate work match in colour and pattern.

.8 Veneer laminated plastic to core material in accordance with adhesive manufacturer's instructions. Ensure core and laminate profiles coincide to provide continuous support and bond over entire surface. Use continuous lengths up to 3000 mm. Keep joints 600 mm from sink cutouts.

.9 Form shaped profiles and bends as indicated, using postforming grade laminate to laminate manufacturer's instructions.

.10 Use straight self-edging laminate strip for flatwork to cover exposed edge of core material. Chamfer exposed edges uniformly at approximately 20 degrees. Do not mitre laminate edges.

.11 Apply laminate backing sheet to reverse side of core of plastic laminate work.

.12 Apply laminated plastic liner sheet where indicated.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for architectural woodwork installation in accordance with manufacturer's instructions.

.1 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.2 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

.1 Do architectural woodwork to Quality Standards of AWMAC.

.2 Install prefinished millwork at locations shown on drawings.

.1 Position accurately, level, plumb straight.

.3 Fasten and anchor millwork securely.

.1 Supply and install heavy duty fixture attachments for wall mounted cabinets.

.4 Use draw bolts in countertop joints.

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

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

.7 Apply water resistant building paper over wood framing members in contact with masonry or cementitious construction.

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

.9 Install at location as indicated.

.10 Site apply laminated plastic to units as indicated.

.1 Adhere laminated plastic over entire surface.

.2 Make corners with hairline joints.

.3 Use full sized laminate sheets.

.4 Make joints only where indicated approved Departmental Representative.

.5 Slightly bevel arises.

.11 For site application, offset joints in plastic laminate facing from joints in core.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

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

.1 Clean millwork and cabinet work outside surfaces inside cupboards drawers.

.2 Remove excess glue from surfaces.

3.4 PROTECTION

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

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

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

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 American National Standards Institute (ANSI)

.1 ANSI 208.1-09, Particleboard.

.2 ASTM International

.1 ASTM D2832-92(R2011), Standard Guide for Determining Volatile and Non-volatile Content of Paint and Related Coatings.

.2 ASTM D2369-10e1, Standard Test Method for Volatile Content of Coatings.

.3 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-71.20-M88, Adhesive, Contact, Brushable.

.4 CSA International

.1 CSA O112.10-08, Evaluation of Adhesives for Structural Wood Products (Limited Moisture Exposure).

.2 CSA O121-08, Douglas Fir Plywood.

.3 CSA O151-09, Canadian Softwood Plywood.

.4 CSA O153-M1980 (R2008), Poplar Plywood.

.5 CAN/CSA-Z809-08, Sustainable Forest Management.

.5 Forest Stewardship Council (FSC)

.1 FSC-STD-01-001-2004, FSC Principle and Criteria for Forest Stewardship.

.6 Green Seal Environmental Standards (GS)

.1 GS-36-11, Commercial Adhesives.

.7 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

.8 National Electrical Manufacturers Association (NEMA)

.1 ANSI/NEMA LD-3-05, High Pressure Decorative Laminates (HPDL).

.9 Scientific Equipment and Furniture Association (SEFA)

.1 SEFA 8-99, Laboratory Furniture.

.10 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards

.1 SCAQMD Rule 1113-A2011, Architectural Coatings.

.2 SCAQMD Rule 1168-A2005, Adhesives and Sealants Applications.

.11 Sustainable Forestry Initiative (SFI)

.1 SFI-2010-2014 Standard.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Samples:

.1 Submit for review and acceptance of each unit.

.2 Samples will be returned for inclusion into work.

.3 Submit duplicate samples of joints, edging, cutouts and postformed profiles.

.3 Certifications: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.1 Wood Certification: submit vendor's manufacturer's Chain-of-Custody Certificate number for CAN/CSA-Z809 or FSC or SFI certified wood.

.2 Low-Emitting Materials:

.1 Submit listing of composite wood products used in building, stating they contain no added urea-formaldehyde resins, laminate adhesives used in building, stating they contain no urea-formaldehyde.

.2 Submit listing of adhesives and sealants sealers used in building, showing compliance with VOC and chemical component limits or restrictions requirements.

1.3 CLOSEOUT SUBMITTALS

.1 Provide maintenance data for laminate work for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.4 QUALITY ASSURANCE

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

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

1.5 DELIVERY, STORAGE AND HANDLING

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

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

.3 Storage and Handling Requirements:

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

.2 Store and protect laminate, adhesive, and core materials from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

Part 2 Products

2.1 MATERIALS

.1 Laminated plastic for flatwork: to NEMA LD3.

.1 Type: general purpose.

.2 Grade: HGS.

.3 Size: 1.27 mm thick.

.4 Colour: integral colour throughout, multilayered.

.5 Pattern and Finish: Selected from manufacturers full range of available selections. Up to four different patterns / finishes will be selected.

.2 Laminated plastic for postforming work: to NEMA LD3.

.1 Type: postforming.

.2 Grade: HGP .

.3 Size: 1.016 mm thick.

.4 Pattern and Finish: Selected from manufacturers full range of available selections. Up to four different patterns / finishes will be selected.

.3 Laminated plastic for backing sheet: to NEMA LD3.

.1 Type: backer.

.2 Grade: BKM BKL.

.3 Size: not less than 0.5 mm thick or same thickness as face laminate.

.4 Colour: same colour as face laminate.

.4 Laminated plastic adhesive: Low VOC acceptable to laminate manufacturer

.1 Test for acceptable VOC emissions in accordance with ASTM D2369 and ASTM D2832.

.5 Sealer: water resistant sealer or glue acceptable to laminate manufacturer.

.1 Draw bolts and splines: as recommended by fabricator.

2.2 FABRICATION

.1 Comply with NEMA LD3, Annex A.

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

.3 Ensure adjacent parts of continuous laminate work match in colour and pattern.

.4 Veneer laminated plastic to core material in accordance with adhesive manufacturer's instructions. Ensure core and laminate profiles coincide to provide continuous support and bond over entire surface. Use continuous lengths up to 2400 3000 mm. Keep joints 600 mm from sink cutouts.

.5 Form shaped profiles and bends as indicated, using postforming grade laminate to laminate manufacturer's instructions.

.6 Use straight self-edging laminate strip for flatwork to cover exposed edge of core material. Chamfer exposed edges uniformly at approximately 20 degrees. Do not mitre laminate edges.

.7 Apply laminate backing sheet to reverse side of core of plastic laminate work.

.8 Apply laminated plastic liner sheet to interior of cabinetry.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

.1 Install work plumb, true and square, neatly scribed to adjoining surfaces.

.2 Make allowances around perimeter where fixed objects pass through or project into laminated plastic work to permit normal movement without restriction.

.3 Use draw bolts and splines in countertop joints. Maximum spacing 450 mm on centre, 75 mm from edge. Make flush hairline joints.

.4 Provide cutouts for inserts, grilles, appliances, outlet boxes and other penetrations. Round internal corners, chamfer edges and seal exposed core.

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

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

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

.1 Clean to NEMA LD3, Annex B.

.2 Remove traces of primer, caulking, epoxy and filler materials and clean doors and frames.

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

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.4 PROTECTION

.1 Cover finished laminated veneered surfaces with heavy Kraft paper or put in cartons during shipment.

.2 Protect installed laminated surfaces in accordance with manufacturer's written recommendations.

.1 Remove protection only immediately before final inspection.

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

.4 Repair damage to adjacent materials caused by laminate, adhesive, and core materials installation.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 ASTM International Inc.

.1 ASTM C726-05, Standard Specification for Mineral Fiber Roof Insulation Board.

.2 ASTM C728-05, Standard Specification for Perlite Thermal Insulation Board.

.3 ASTM D41-05, Standard Specification for Asphalt Primer Used in Roofing, Damp proofing, and Waterproofing.

.4 ASTM D448-03a, Standard Classification for Sizes of Aggregate for Road and Bridge Construction.

.5 ASTM D449-03, Standard Specification for Asphalt Used in Damp proofing and Waterproofing.

.6 ASTM D2178-04, Standard Specification for Asphalt Glass Felt Used in Roofing and Waterproofing.

.7 ASTM D6162-00a, Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using a Combination of Polyester and Glass Fibre Reinforcements.

.8 ASTM D6163-00e1, Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Glass Fibre Reinforcements.

.9 ASTM D6164-05, Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Polyester Reinforcements.

.2 Canadian General Standards Board (CGSB)

.1 CGSB 37-GP-9Ma-83, Primer, Asphalt, Unfilled, for Asphalt Roofing, Damp proofing and Waterproofing.

.2 CGSB 37-GP-56M-80b (A1985), Membrane, Modified, Bituminous, Prefabricated, and Reinforced for Roofing.

.3 Canadian Standards Association (CSA International)

.1 CSA-A123.3-05, Asphalt Saturated Organic Roofing Felt.

.2 CSA-A123.4-04, Asphalt for Constructing Built-Up Roof Coverings and Waterproofing Systems.

.3 CSA A231.1/A231.2-06, Precast Concrete Paving Slabs/Precast Concrete Pavers.

.4 Underwriters Laboratories' of Canada (ULC)

.1 CAN/ULC-S701-05, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.

.2 CAN/ULC-S702.2-03, Standard for Mineral Fibre Thermal Insulation for Buildings.

.3 CAN/ULC-S704-03, Standard for Thermal Insulation, Polyurethane and Polyisocyanurate Boards, Faced.

.4 CAN/ULC-S706-02, Standard for Wood Fibre Thermal Insulation for Buildings.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Provide two copies of most recent technical waterproofing components data sheets describing materials' physical properties and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Provide two copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements 01 35 43 - Environmental Procedures, and indicate VOC content for:

.1 Primers.

.2 Asphalt.

.3 Sealers.

.4 Filter fabric.

.3 Provide shop drawings and indicate:

.1 Flashing, control joints, details.

1.3 QUALITY ASSURANCE

.1 Sustainability Standards Certification:

1.4 FIRE PROTECTION

.1 Fire Extinguishers:

.1 Maintain one stored pressure rechargeable type with hose and shut-off nozzle,

.2 ULC labelled for A, B and C class protection.

.3 Sizes 14 kg or as indicated on roof per torch applicator, within 6 m of torch applicator.

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

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.

.1 Store membrane rolls with salvage edge up.

.3 Remove only in quantities required for same day use.

.4 Place plywood runways over completed Work to enable movement of material and other traffic.

.5 Store sealants at +5 degrees C minimum.

.6 Store insulation protected from weather and deleterious materials.

.7 Handle waterproofing materials in accordance with manufacturer's written directives, to prevent damage or loss of performance.

.8 Store and manage hazardous materials in accordance with Section 01 35 29.06 - Health and Safety Requirements 01 35 43 - Environmental Procedures.

1.6 SITE CONDITIONS

.1 Ambient Conditions

.1 Do not install waterproofing when temperature remains below -18 degrees C for torch application, or to manufacturers' recommendations for mop application.

.2 Minimum temperature for solvent-based adhesive is -5 degrees C.

.2 Install waterproofing on dry deck, free of snow and ice, use only dry materials and apply only during weather that will not introduce moisture into waterproofing system.

1.7 WARRANTY

.1 For Work of this Section 07 13 52 - Modified Bituminous Sheet Waterproofing, 12 months warranty period is extended to 60 months.

Part 2 Products

.1 Primer: For application and curing at temperatures between -12 C and 25 C: Acceptable material: Bakor Aqua Tac Primer

.2 Mastic: Acceptable Product Bakor Polybitume 507-05

.3 Self-Adhesive Waterproofing Membrane : Acceptable material: Bakor Blueskin WP2000

.4 Type 4 Insulation: Acceptable Product: Styrofoam SM, 100mm thick

.5 Prefabricated Drainage Composites: Acceptable Materials: Vertical walls Surface Bakor DBR100

Part 3 Execution

3.1 FIELD QUALITY CONTROL

.1 Inspections:

.1 Inspection and testing of waterproofing application will be carried out by testing laboratory designated by Consultant.

.2 Departmental Representative will pay for tests as specified in Section 01 45 00 - Quality Control.

.3 Inspection and testing of waterproofing application will be carried out by testing laboratory designated by Consultant.

.4 Costs of tests will be paid under cash allowance.

3.2 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

1.1 REFERENCES

.1 American Society for Testing and Materials International (ASTM)

.1 ASTM C208-95(2001), Specification for Cellulosic Fiber Insulating Board.

.2 ASTM C591-01, Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation.

.3 ASTM C612-04, Standard Specification for Mineral Fibre Block and Board Thermal Insulation.

.4 ASTM C726-05, Standard Specification for Mineral Fiber Roof Insulation Board.

.5 ASTM C728-05, Standard Specification for Perlite Thermal Insulation Board.

.6 ASTM C1126-04, Standard Specification for Faced or Unfaced Rigid Cellular Phenolic Thermal Insulation.

.7 ASTM C1289-05a, Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.

.8 ASTM E96/E96M-05, Standard Test Methods for Water Vapour Transmission of Materials.

.2 Canadian Gas Association (CGA)

.1 CAN/CGA-B149.1-05, Natural Gas and Propane Installation Code Handbook.

.2 CAN/CGA-B149.2-05, Propane Storage and Handling Code.

.3 Canadian General Standards Board (CGSB)

.1 CGSB 71-GP-24M-77(R1983), Adhesive, Flexible, for Bonding Cellular polystyrene Insulation.

.4 Underwriters Laboratories of Canada (ULC)

.1 CAN/ULC-S604-M91, Standard for Type A Chimneys.

.2 CAN/ULC-S701-05, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Coverings.

.3 CAN/ULC-S702-97, Standard for Thermal Insulation, Mineral Fibre, for Buildings.

.4 CAN/ULC-S704-03, Standard for Thermal Insulation Polyurethane and Polyisocyanurate, Boards, Faced.

.5 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

1.2 ACTION AND INFORMATIONAL 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 Manufacturer's Instructions:

.1 Submit manufacturer's installation instructions.

.3 Shop Drawings

.1 Submit shop drawings showing attachment details for Z-Girts and flashing

1.3 QUALITY ASSURANCE

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

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

.3 Convene pre-installation meeting one week prior to beginning work of this Section on-site installations in accordance with Section 01 32 16.06 - Construction Progress Schedule - Critical Path Method (CPM) Section 01 32 16.07 - Construction Progress Schedules - Bar (GANTT) Chart.

.1 Verify project requirements.

.2 Review installation and substrate conditions.

.3 Co-ordinate with other building subtrades.

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

.4 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.4 WASTE MANAGEMENT AND DISPOSAL

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

Part 2 Products

2.1 SUSTAINABLE REQUIREMENTS

2.2 INSULATION

.1 Foundations: Extruded Polystyrene Insulation.

.1 Expanded polystyrene (EPS): to CAN/ULC-S701.

.1 Acceptable Product Owens Corning or approved equivalent.

.1 Type: 4.

.2 Compressive strength: 30 psi to ASTM D1621.

.3 Thickness: as indicated.

.4 Edges: ship lapped.

.5 R Value: 5 per inch ASTM C518

.6 Water Absorption ≤0.7% to ASTM D2842

.7 Water Vapour Permeance: 0.6 perm max to ASTM E96

.8 Flexural Strength:≥ 60 PSI to ASTM C203

.2 Exterior Walls(Masonry, Wood and Steel Stud)

.1 Expanded polystyrene (EPS): to CAN/ULC-S701.

.1 Acceptable Product Owens Corning Formular C-300.

.1 Type: 3

.2 Compressive strength: 30 psi to ASTM D1621.

.3 Thickness: as indicated.

.4 Edges: shiplapped.

.5 R Value: 5 per inch ASTM C518

.6 Water Absorption ≤0.7% to ASTM D2842

.7 Water Vapour Permeance: 0.6 perm max to ASTM E96

.8 Flexural Strength:≥ 60 PSI to ASTM C203

2.3 ADHESIVES

.1 Manufacturers approved adhesive to Blueskin membrane

2.4 ACCESSORIES

.1 Z-Girts Supports @ 400 O.C. Z Girts to be thermally Broken and 16 gauge.

.1 Girts to be attached to concrete with 2-#10 Concrete anchors @ 400 O.C.

.2 Girts to be attached to stud walls with 2- ¼" x 2" Tapcon Anchors @ 600 O.C.

.2 Install with smooth face outwards

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 CAN/CGA-B149.1 and CAN/CGA-B149.2 type B 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 Departmental Representative and 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 RIGID INSULATION INSTALLATION

.1 Apply adhesive in accordance with manufacturer's recommendations.

.2 Leave insulation board joints unbonded over line of expansion and control joints. Bond a continuous 150 mm wide 0.15 mm modified bituminous membrane over expansion and control joints using compatible adhesive and primer before application of insulation.

3.5 PERIMETER FOUNDATION INSULATION

.1 Exterior application: extend board. Install on exterior face of perimeter foundation wall with adhesive.

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 ASTM C665-01e1, Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

.3 ASTM C1320-05, Standard Practice for Installation of Mineral Fiber Batt and Blanket Thermal Insulation for Light Frame Construction.

.2 Canadian Gas Association (CGA)

.1 CAN/CGA-B149.1-05, Natural Gas and Propane Installation Code Handbook.

.2 CAN/CGA-B149.2-05, Propane Storage and Handling Code.

.3 Canadian Standards Association (CSA International)

.1 CSA B111-1974(R2003), Wire Nails, Spikes and Staples.

.4 Underwriters Laboratories of Canada (ULC)

.1 CAN/ULC-S604-M1991, Type A Chimneys.

.2 CAN/ULC-S702-1997, Standard for Mineral Fibre Insulation.

1.2 ACTION AND INFORMATIONAL 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 Manufacturer's Instructions:

.1 Submit manufacturer's installation instructions.

1.3 QUALITY ASSURANCE

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

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

.3 Convene pre-installation meeting one week prior to beginning work of this Section on-site installations in accordance with Section 01 32 16.06 - Construction Progress Schedule - Critical Path Method (CPM) Section 01 32 16.07 - Construction Progress Schedules - Bar (GANTT) Chart.

.1 Verify project requirements.

.2 Review installation and substrate conditions.

.3 Co-ordinate with other building subtrades.

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

.4 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.4 WASTE MANAGEMENT AND DISPOSAL

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

Part 2 Products

2.1 INSULATION

.1 Mineral Wool Batt Insulation: Roxul or Approved Equivalent

.1 To Stud depth and spacing required

.1 89mm thickness: RSI 2.47 (R14)

.2 140mm Thickness: RSI 3.87 (R22)

.3 R50

.2 CAN/ULC-S702-97 – Mineral Fiber Thermal Insulation for Buildings Type 1

.3 Non Combustible

.4 Smoke Development less than 5

.5 Flame spread = 0

2.2 ACCESSORIES

.1 Insulation clips:

.1 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.

.2 Nails: galvanized steel, length to suit insulation plus 25 mm, to CSA B111.

.3 Staples: 12 mm minimum leg.

.4 Tape: as recommended by manufacturer.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION – INSULATION - THERMAL

.1 Install insulation to maintain continuity of thermal protection to building elements and spaces and to ASTM C1320.

.2 Install insulation with factory applied vapour barrier facing warm side of building spaces and vapour permeable membrane facing cold side. Lap ends and side flanges of membrane over framing members. Retain in position with insulation clips installed as recommended by manufacturer. Tape seal butt ends and lapped side flanges. Do not tear or cut vapour barrier.

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

.4 Do not compress insulation to fit into spaces.

.5 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 CAN/CGA-B149.1 and CAN/CGA-B149.2 Type B L vents.

.6 Do not enclose insulation until it has been inspected and approved by Departmental Representative and Consultant.

3.3 INSTALLATION – INSULATION – ACOUSTIC

.1 Install acoustic batt insulation between studs in sound rated partitions in areas indicated. Ensure batts fill space continuously from floor to ceiling, over door and window openings, below window openings and around corners.

.2 Coordinate installation of acoustic insulation with other work

.3 Ensure insulation is packed around cut openings in gypsum board, behind outlet boxes, around plumbing, heating or structural items passing through the system or abutting walls.

3.4 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 General Standards Board (CGSB)

.1 CAN/CGSB-51.33-M89, Vapour Barrier Sheet, Excluding Polyethylene, for Use in Building Construction.

.2 CAN/CGSB-51.34-M86, Vapour Barrier, Polyethylene Sheet, for Use in Building Construction.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet and include:

.1 Product characteristics.

.2 Performance criteria.

.3 Limitations.

.3 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS).

.4 Quality assurance submittals:

.1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.2 Instructions: submit manufacturer's installation instructions and comply with written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

1.3 QUALITY ASSURANCE

.1 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

.2 Mock-Ups:

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

.2 Construct mock-up of sheet vapour barrier installation including one lap joint, one inside corner and at one electrical box. Mock-up may be part of finished work.

.3 Mock-up will be used to judge workmanship, substrate preparation, and material application.

.4 Locate where directed where indicated.

.5 Allow 24 hours for inspection of mock-up by Departmental Representative and Consultant before proceeding with vapour barrier work.

.3 When accepted, mock-up will demonstrate minimum standard of quality required for this work. Approved mock-up may not remain as part of finished work. Remove mock-up and dispose of materials when no longer required and when directed by Departmental Representative and Consultant.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Waste Management and Disposal:

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

Part 2 Products

2.1 SHEET VAPOUR BARRIER

.1 Polyethylene film: to CAN/CGSB-51.34, 10 mm thick, 6mm thick.

2.2 ACCESSORIES

.1 Joint sealing tape: air resistant pressure sensitive adhesive tape, cloth fabric duct tape type recommended by vapour barrier manufacturer, 50 mm wide for lap joints and perimeter seals, 25 mm wide elsewhere.

.2 Sealant: compatible with vapour retarder materials, recommended by vapour retarder manufacturer. To Section 07 92 00 - Joint Sealants.

.3 Staples: minimum 6 mm leg.

.4 Moulded box vapour barrier: factory-moulded polyethylene box for use with recessed electric switch and outlet device boxes.

Part 3 Execution

3.1 INSTALLATION

.1 Ensure services are installed and inspected prior to installation of retarder.

.2 Install sheet vapour retarder on warm side of exterior wall ceiling and floor assemblies prior to installation of gypsum board to form continuous retarder.

.3 Use sheets of largest practical size to minimize joints.

.4 Inspect for continuity. Repair punctures and tears with sealing tape before work is concealed.

3.2 EXTERIOR SURFACE OPENINGS

.1 Cut sheet vapour retarder to form openings and ensure material is lapped and sealed to frame.

3.3 PERIMETER SEALS

.1 Seal perimeter of sheet vapour barrier as follows:

.1 Apply continuous bead of sealant to substrate at perimeter of sheets.

.2 Lap sheet over sealant and press into sealant bead.

.3 Install staples through lapped sheets at sealant bead into wood substrate.

.4 Ensure that no gaps exist in sealant bead. Smooth out folds and ripples occurring in sheet over sealant.

3.4 LAP JOINT SEALS

.1 Seal lap joints of sheet vapour barrier as follows:

.1 Attach first sheet to substrate.

.2 Apply continuous bead of sealant over solid backing at joint.

.3 Lap adjoining sheet minimum 150 mm and press into sealant bead.

.4 Install staples through lapped sheets at sealant bead into wood substrate.

.5 Ensure that no gaps exist in sealant bead. Smooth out folds and ripples occurring in sheet over sealant.

3.5 ELECTRICAL BOXES

.1 Seal electrical switch and outlet device boxes that penetrate vapour barrier as follows:

.1 Install moulded box vapour barrier.

.2 Apply sealant to seal edges of flange to main vapour barrier and seal wiring penetrations through box cover.

3.6 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 SECTION INCLUDES

.1 Fiber cement lap siding, panels, single, trim, fascia, moulding and accessories; James Hardie HZ10 Engineered for Climate Siding.

.2 Factory-finished fiber cement lap siding, panels, single, trim, fascia, moulding and accessories; James Hardie HZ10 Engineered for Climate Siding.

1.2 RELATED SECTIONS

.1 Section 06 10 00 - Rough Carpentry.

.2 Section 06 10 00 - Rough Carpentry.

.3 Section 07 21 16 - Blanket Insulation.

1.3 REFERENCES

.1 ASTM D3359 - Standard Test Method for Measuring Adhesion by Tape Test, Tool and Tape.

.2 ASTM E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 degrees C.

1.4 SUBMITTALS

.1 Submit under provisions of Section 01 30 00.

.2 Product Data: Manufacturer's data sheets on each product to be used, including:

.1 Preparation instructions and recommendations.

.2 Storage and handling requirements and recommendations.

.3 Installation methods.

.3 Shop Drawings: Provide detailed drawings of atypical non-standard applications of cementitious siding materials which are outside the scope of the standard details and specifications provided by the manufacturer.

.4 Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

.5 Verification Samples: For each finish product specified, two samples, minimum size 4 by 6 inches (100 by 150 mm), representing actual product, color, and patterns.

1.5 QUALITY ASSURANCE

.1 Installer Qualifications: Minimum of 4 years experience with installation of similar products.

.2 Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.

.1 Finish areas designated by Architect.

.2 Do not proceed with remaining work until workmanship, color, and sheen are approved by Departmental Representative and Consultant.

.3 Refinish mock-up area as required to produce acceptable work.

1.6 DELIVERY, STORAGE, AND HANDLING

.1 Store products in manufacturer's unopened packaging until ready for installation.

.2 Store siding on edge or lay flat on a smooth level surface. Protect edges and corners from chipping. Store sheets under cover and keep dry prior to installing.

.3 Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.7 PROJECT CONDITIONS

.1 Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.8 WARRANTY

.1 Product Warranty: Limited, non-pro-rated product warranty.

.1 HardiePlank HZ10 lap siding for 30 years.

.2 Finish Warranty: Limited product warranty against manufacturing finish defects.

.1 When used for its intended purpose, properly installed and maintained according to Hardie's published installation instructions, James Hardie's ColorPlus finish with ColorPlus Technology, for a period of 15 years from the date of purchase: will not peel; will not crack; and will not chip. Finish warranty includes the coverage for labor and material.

.3 Workmanship Warranty: Application limited warranty for 2 years.

Part 2 PRODUCTS

2.1 MANUFACTURERS

.1 Acceptable Manufacturer: James Hardie Building Products, Inc., which is located at: 26300 La Alameda Suite 400 ; Mission Viejo, CA 92691; Toll Free Tel: 866-274-3464; Tel: 949-367-4980; Fax: 949-367-4981; Email: request info (info@jameshardie.com); Web: www.jameshardiecommercial.com

.2 Requests for approval of equal substitutions will be considered in accordance with provisions of Section 01 60 00.

2.2 SIDING

.1 HardiePlank HZ10 lap siding, HardiPanel HZ10 vertical siding, HardieSoffit HZ10 panels and HardieShingle HZ10 siding requirement for Materials:

.1 Fiber-cement Siding - complies with ASTM C 1186 Type A Grade II.

.2 Fiber-cement Siding - complies with ASTM E 136 as a noncombustible material.

.3 Fiber-cement Siding - complies with ASTM E 84 Flame Spread Index = 0, Smoke Developed Index = 5.

.4 CAL-FIRE, Fire Engineering Division Building Materials Listing - Wildland Urban Interface (WUI) Listed Product.

.5 National Evaluation Report No. NER 405 (BOCA, ICBO, SBCCI, IBC, IRC).

.6 City of Los Angeles, Research Report No. 24862.

.7 Miami Dade County, Florida Notice of Acceptance 07-0418.04.

.8 US Department of Housing and Urban Development Materials Release 1263d

.9 California DSA PA-019.

.10 City of New York M EA 223-93-M.

.11 Florida State Product Approval FL889.

.12 Texas Department of Insurance Product Evaluation EC-23.

.2 Trim:

.1 HardieTrim HZ10 boards as manufactured by James Hardie Building Products, Inc.

.1 Product: 4/4 Boards, 3-1/2 inch (89 mm) width.

.2 Product: 4/4 Boards, 5-1/2 inch (140 mm) width.

.3 Product: 4/4 Boards, 7-1/4 inch (184 mm) width.

.4 Product: 4/4 Boards, 9-1/4 inch (235 mm) width.

.5 Product: 4/4 Boards, 11-1/4 inch (286 mm) width.

.6 Product: 4/4 NT3 Boards, 3-1/2 inch (89 mm) width.

.7 Product: 4/4 NT3 Boards, 5-1/2 inch (140 mm) width.

.8 Product: 4/4 NT3 Boards, 7-1/4 inch (184 mm) width.

.9 Product: 4/4 NT3 Boards, 9-1/4 inch (235 mm) width.

.10 Product: 4/4 NT3 Boards, 11-1/4 inch (286 mm) width.

.11 Product: 5/4 Boards, 3-1/2 inch (89 mm) width.

.12 Product: 5/4 Boards, 5-1/2 inch (140 mm) width.

.13 Product: 5/4 Boards, 7-1/4 inch (184 mm) width.

.14 Product: 5/4 Boards, 9-1/4 inch (235 mm) width.

.15 Product: 5/4 Boards, 11-1/4 inch (286 mm) width.

.16 Product: 5/4 NT3 Boards, 3-1/2 inch (89 mm) width.

.17 Product: 5/4 NT3 Boards, 4-1/2 inch (114 mm) width.

.18 Product: 5/4 NT3 Boards, 5-1/2 inch (140 mm) width.

.19 Product: 5/4 NT3 Boards, 7-1/4 inch (184 mm) width.

.20 Product: 5/4 NT3 Boards, 11-1/4 inch (286 mm) width.

.21 Texture: Smooth.

.22 Texture: Rustic.

.23 Texture: Wood Grained.

.24 Length: 12 feet (3658 mm).

.25 Thickness: 3/4 inch (19 mm).

.26 Thickness: 1 inch (24 mm).

.2 HardieTrim HZ10 Fascia boards as manufactured by James Hardie Building Products, Inc.

.3 Artisan HZ10 Accent trim as manufactured by James Hardie Building Products, Inc.

2.3 FASTENERS

.1 Wood Framing Fasteners:

.1 Wood Framing: 4d common corrosion resistant nails.

.2 Wood Framing: 6d common corrosion resistant nails.

.3 Wood Framing: 8d box ring common corrosion resistant nails.

.4 Wood Framing: 0.089 inch (2.2 mm) shank by 0.221 inch (5.6 mm) head by 2 inches (51 mm) corrosion resistant siding nails.

.5 Wood Framing: 0.093 inch (2.4 mm) shank by 0.222 inch (5.6 mm) head by 2 inches (51 mm) corrosion resistant siding nails.

.6 Wood Framing: 0.093 inch (2.4 mm) shank by 0.222 inch (5.6 mm) head by 2-1/2 inches (64 mm) corrosion resistant siding nails.

.7 Wood Framing: 0.091 inch (2.3 mm) shank by 0.221 inch (5.6 mm) head by 1-1/2 inches (38 mm) corrosion resistant siding nails.

.8 Wood Framing: 0.091 inch (2.3 mm) shank by 0.225 inch (5.7 mm) head by 1-1/2 inches (38 mm) corrosion resistant siding nails.

.9 Wood Framing: 0.121 inch (3 mm) shank by 0.371 inch (9.4 mm) head by 1-1/4 inches (32 mm) corrosion resistant roofing nails.

.10 Wood Framing: No. 11 gauge 1-1/4 inches (32 mm) corrosion resistant roofing nails.

.11 Wood Framing: No. 11 gauge 1-1/2 inches (38 mm) corrosion resistant roofing nails.

.12 Wood Framing: No. 11 gauge 1-3/4 inches (44 mm) corrosion resistant roofing nails.

.2 Metal Framing:

.1 Metal Framing: 1-1/4 inches (32 mm) No. 8-18 by 0.375 inch (9.5 mm) head self-drilling, corrosion resistant S-12 ribbed buglehead screws.

.2 Metal Framing: 1-5/8 inches (41 mm) No. 8-18 by 0.323 inch (8.2 mm) head self-drilling, corrosion resistant S-12 ribbed buglehead screws.

.3 Metal Framing: 1 inch (25 mm) No. 8-18 by 0.323 inch (8.2 mm) head self-drilling, corrosion resistant ribbed buglehead screws.

.4 Metal Framing: 1 inch (25 mm) No. 8-18 by 0.311 inch (7.9 mm) head self-drilling, corrosion resistant S-12 ribbed buglehead screws.

.5 Metal Framing: 1.5 inch (38mm) [AGS-100] .100 inches by 25 inches (2540 mm by 635 mm) ET&F Pin or equivalent pneumatic fastener.

2.4 FINISHES

.1 Factory Finish Color for Trim, Soffit and Siding Colors:

.1 Color from Manufacturers standard color set.

Part 3 EXECUTION

3.1 EXAMINATION

.1 Do not begin installation until substrates have been properly prepared.

.2 If framing preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

.1 Clean surfaces thoroughly prior to installation.

.2 Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

.3 Install a water-resistive barrier is required in accordance with local building code requirements.

.4 The water-resistive barrier must be appropriately installed with penetration and junction flashing in accordance with local building code requirements.

.5 Install Engineered for ClimateTM HardieWrapTM weather barrier in accordance with local building code requirements.

.6 Use HardieWrapTM Seam Tape and joint and laps.

.7 Install and HardieWrapTM flashing, HardieWrapTM Flex Flashing.

3.3 INSTALLATION - HARDIEPLANK HZ10 LAP SIDING AND ARTISAN HZ10 LAP SIDING

.1 Install materials in strict accordance with manufacturer's installation instructions.

.2 Starting: Install a minimum 1/4 inch (6 mm) thick lath starter strip at the bottom course of the wall. Apply planks horizontally with minimum 1-1/4 inches (32 mm) wide laps at the top. The bottom edge of the first plank overlaps the starter strip.

.3 Allow minimum vertical clearance between the edge of siding and any other material in strict accordance with the manufacturer's installation instructions.

.4 Align vertical joints of the planks over framing members.

.5 Maintain clearance between siding and adjacent finished grade.

.6 Locate splices at least one stud cavity away from window and door openings.

.7 Use off-stud metal joiner in strict accordance with manufacturer's installation instructions.

.8 Wind Resistance: Where a specified level of wind resistance is required Hardieplank lap siding is installed to framing members and secured with fasteners described in Table No. 2 in National Evaluation Service Report No. NER-405.

.9 Face nail to sheathing.

.10 Locate splices at least 12 inches (305 mm) away from window and door openings.

3.4 INSTALLATION - HARDIETRIM HZ10 BOARDS

.1 Install materials in strict accordance with manufacturer's installation instructions. Install flashing around all wall openings.

.2 Fasten through trim into structural framing or code complying sheathing. Fasteners must penetrate minimum 3/4 inch (19 mm) or full thickness of sheathing. Additional fasteners may be required to ensure adequate security.

.3 Place fasteners no closer than 3/4 inch (19 mm) and no further than 2 inches (51 mm) from side edge of trim board and no closer than 1 inch (25 mm) from end. Fasten maximum 16 inches (406 mm) on center.

.4 Maintain clearance between trim and adjacent finished grade.

.5 Trim inside corner with a single board trim both side of corner.

.6 Outside Corner Board Attach Trim on both sides of corner with 16 gage corrosion resistant finish nail 1/2 inch (13 mm) from edge spaced 16 inches (406 mm) apart, weather cut each end spaced minimum 12 inches (305 mm) apart.

.7 Allow 1/8 inch gap between trim and siding.

.8 Seal gap with high quality, paint-able caulk.

.9 Shim frieze board as required to align with corner trim..

.10 Fasten through overlapping boards. Do not nail between lap joints.

.11 Overlay siding with single board of outside corner board then align second corner board to outside edge of first corner board. Do not fasten HardieTrim boards to HardieTrim boards.

.12 Shim frieze board as required to align with corner trim.

.13 Install HardieTrim Fascia boards to rafter tails or to sub fascia.

3.5 FINISHING

.1 Finish unprimed siding with a minimum one coat high quality, alkali resistant primer and one coat of either, 100 percent acrylic or latex or oil based, exterior grade topcoats or two coats high quality alkali resistant 100 percent acrylic or latex, exterior grade topcoat within 90 days of installation. Follow paint manufacturer's written product recommendation and written application instructions.

.2 Finish factory primed siding with a minimum of one coat of high quality 100 percent acrylic or latex or oil based exterior grade paint within 180 days of installation. Follow paint manufacturer's written product recommendation and written application instructions.

3.6 PROTECTION

.1 Protect installed products until completion of project.

.2 Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Materials and installation for sheet metal roofing including mansard roofs.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 74 21 - Construction/Demolition Waste Management And Disposal.

.3 Section 01 45 00 - Quality Control.

.4 Section 07 92 00 - Joint Sealing.

1.3 REFERENCES

.1 Aluminum Association (AA).

- .1 AA DAF-45-R03, Designation System for Aluminum Finishes - 9th Edition.
- .2 AA ASM-35-October 2000, Specifications for Aluminum Sheet Metal Work in Building Construction, Section 5.

.2 American Society for Testing and Materials International, (ASTM).

- .1 ASTM A167-99, Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
- .2 ASTM A240/A240M-02a, Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
- .3 ASTM A653/A653M-02a, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .4 ASTM A792/A792M-02, Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot Dip Process.
- .5 ASTM B32-00e1, Standard Specification for Solder Metal.
- .6 ASTM B370-98, Standard Specification for Copper Sheet and Strip for Building Construction.
- .7 ASTM D523-89(1999), Standard Test Method for Specular Gloss.
- .8 ASTM D822-01, Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings.

.3 Canadian General Standards Board (CGSB).

- .1 CAN/CGSB-37.5-M89, Cutback Asphalt Plastic Cement.
- .2 CAN/CGSB-37.29-M89, Rubber-Asphalt Sealing Compound.
- .3 CAN/CGSB-51.32- M77, Sheathing, Membrane, Breather Type.

.4 CAN/CGSB-93.1-M85, Sheet Aluminum Alloy, Prefinished, Residential.

.4 Canadian Standards Association (CSA International).

.1 CAN/CSA A123.3-98, Asphalt Saturated Organic Roofing Felt.

.5 Department of Justice Canada (Jus).

.1 Canadian Environmental Protection Act (CEPA), 1999.

.6 Health Canada/Workplace Hazardous Materials Information System (WHMIS).

.1 Material Safety Data Sheets (MSDS).

.7 National Research Council Canada (NRC)/Institute for Research in Construction (IRC) - Canadian Construction Materials Centre (CCMC).

.1 CCMC-2002, Registry of Product Evaluations.

.8 Transport Canada (TC).

.1 Transportation of Dangerous Goods Act (TDGA), 1992.

1.4 SUBMITTALS

.1 Manufacturer's Instructions: Provide to indicate special handling criteria, installation sequence, cleaning procedures and .

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

.3 Submit product data sheets for bitumen roofing felts insulation. Include:

.1 Product characteristics.
.2 Performance criteria.
.3 Limitations.

.4 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.

.5 Indicate arrangements of sheets and joints, types and locations of fasteners and special shapes and relationship of panels to structural frame.

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

.7 Submit duplicate 300 x 300 mm samples of each sheet metal material.

1.1 STANDARDS

.1 Design of cladding system in accordance to the latest edition of:

.1 CSA-S136 for the design of Cold Formed Steel Structural Members
.2 Canadian Sheet Steel Building Institute Standards 10M, 20M, B11.
.3 National Building Code of Canada

1.2 QUALITY ASSURANCE

.1 Manufacturer of roof system, and installer shall demonstrate at least five years' experience in projects similar in scope.

.2 This section establishes the standard of quality required for the complete metal roof system. Proposed substitutions must meet this standard, and will be considered as follows:

.1 A written request for approval of a substitution is received at least ten (10) days prior to tender closing.
.2 The request includes a complete item-by-item description comparing the proposed substitution to the specified system, together with manufacturer's literature, samples, test data, engineering standards and performance evaluation indicating comparable standards to those specified.

1.3 DESIGN REQUIREMENTS

.1 Design roof system to resist

.1 Snow loads and snow build-up and rain load, expected in this geographical region NBCC climatic data, 50 year probability
.2 Wind loads, positive and negative, expected in this geographical region NBCC climatic data, 50 year probability
.3 Dead load of roof system.
.4 If the roof system is to be designed as a shear diaphragm, then the factored shear design loads "Q" and the flexibility factors "F" must be shown on the structural drawings.

.2 Deflection of the roof system is not to exceed $1/180^{th}$ of the span for the specified live loading.

.3 Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, overstressing of components, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime sky heat loss.

.1 Temperature Change (Range): 20 deg C, ambient; 40 deg C, material surfaces

1.4 SAMPLES

.1 Submit samples of standard coloured metal roof sheet for review by the consultant, prior to fabrication.

1.5 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Section 01 33 00.

.1 Indicate arrangement of pre-finished Roof Sheet, including joints, types and locations of supports, fasteners, flashing, gutters, mitres, and all metal components related to the roof installation. Include for, Membrane Air/Vapour Barrier, Insulation, as part of the roof system.

.2 Drawings shall be signed and sealed by a Professional Engineer, attesting to the ability of the metal panels assembly to withstand the specified loads.

1.6 MAINTENANCE DATA

.1 Provide maintenance data for cleaning and maintenance of panel finishes for incorporation into manual.

1.7 PRODUCT DELIVERY, HANDLING AND STORAGE

.1 Store components and materials in accordance with panel manufacturer's recommendations and protect from elements.

.2 Protect prefinished steel during fabrication, transportation, site storage and erection, in accordance with CSSBI Standards.

1.8 GUARANTEE

.1 For work in this section, warranty by installer against defects or deficiencies in materials or workmanship shall be for a period of one year from date of substantial completion.

1.9 WARRANTY

.1 Provide a manufacturer's written warranty: Furnish panel manufacturer's written warranty covering failure of factory-applied exterior finish within the warranty period. Warranty period for finish: 35 years after the date of Substantial Completion. The values below are based on normal environments and exclude any aggressive atmospheric conditions.

PART 2 – PRODUCTS

2.1 MATERIALS:

.1 Roof System: Tradition150-4: System 3000 by Vicwest.

.2 Clip and Sub-girt System:

.1 Thermally responsive clips to be fabricated from a minimum of 0.61 mm (0.018") steel, with minimum Z275 galvanized coating designed to accommodate expansion and contraction of the roof sheet.

.2 Continuous hat bar and zee clips made from galvanized material, thickness to suit design parameters, to accommodate depth of insulation.

.3 Roof Fasteners: As specified by manufacturer, to resist wind uplift and sliding snow forces.

.3 Prefinished Roof Sheet, exposed to exterior.

.1 Profile: Tradition 150-4, with T-style ribs at 400 mm spacing.

.2 Panel: Z275 galvanized (zinc coated) sheet steel conforming to ASTM A653M structural quality Grade 230 having a nominal core thickness 0.61mm (0.024”).

.4 Snap Cap:

.1 Seam Caps: Provide seam caps for full length of the roof panel with sealant of non-skinning, non-drying sealant on the unexposed side. Caps to be mechanically seamed onto panel side-laps. Fabricated from Z275 galvanized (zinc coated) sheet steel conforming to ASTM A653M structural quality Grade 230 having a nominal core thickness 0.61mm (0.024”). Finish and colour to match roof sheet.

2.2 PANEL FINISHES:

.1 Prefinished Roof Sheet coating Pre-painted with 10,000 Series on interior face.

2.3 COLOUR

.1 Prefinished Roof sheet colour to be selected from the manufacturer’s standard colour range.

2.4 ACCESSORIES

.1 Flashing: In accordance with Section 07 62 00. Formed from same materials as the roof sheet. Custom fabricated to suit architectural details, as required.

.2 Closures: Foam and metal closures to suit profiles selected, to manufacturer's recommendations.

.3 Sealants: In accordance with manufacturer's recommendation and Section 07 92 00.

2.5 FABRICATION

.1 Fabricate roof components to comply with dimensions, profiles, gauges and details as shown on the shop drawings, including fascia and soffit panels and all companion flashing.

.2 Fabricate all components of the system in the factory, ready for field installation.

.3 Provide roof sheet and all accessories in longest practicable length to minimize field lapping of joints.

PART 3 — EXECUTION

3.1 EXAMINATION

.1 Examine work of other Sections upon which work of this Section depends.

.2 Report all discrepancies to Departmental Representatives and Consultant before beginning work on the roof system.

3.2 INSTALLATION

.1 Thermal & Moisture Protection:

.1 Thermal Barrier: Install exterior grade gypsum board Thermal Barrier perpendicular to flutes of Structural Liner. Fasten using manufacturer's recommended fasteners, with spacing to suit wind loading conditions.

.2 Air/Vapour Barrier: Install membrane Air/Vapour Barrier to manufacturer's recommendations. Ensure all joints are properly lapped, sealed and tied in with wall air/vapour barriers to ensure airtight construction. Provide a continuous seal at all openings in the roof system.

.3 Clip and Subgirts: Attach Tradition clips, hat bar, and zee clips using fasteners as recommended by the manufacturer, to suit the substrate.

.4 Insulation: Install rigid Insulation in two layers, as shown on the drawings. Tightly butt against support clips. Insulation should be continuous.

.2 Roof Panel Installation

.1 Install exterior prefinished roof panels on panel support clips, using manufacturer's proper construction procedure. Ensure metal roofing sheet side-lap is positively retained by clips, and proper sheet coverage is maintained.

.2 Install the seam-cap at all side laps as shown on the approved shop drawings. Add sealant as required. Mitre snap-cap as required to resist water entry.

.3 Where indicated on approved shop drawings, secure the end-lap of metal roofing sheets in accordance with the manufacturers specifications and details to provide a weather-tight seal. Exposed fasteners to match colour of the roof sheet.

.4 Provide notched and formed closures, sealed against weather penetration, at changes in pitch, and at ridges and eaves, where required.

.5 Install all companion flashing gutters, ventilators as shown on the shop drawings. Use concealed fasteners when possible. Exposed fasteners to match colour of roof sheet.

3.3 CLEAN-UP

.1 Clean exposed panel surfaces in accordance with manufacturer’s instructions.

.2 Repair and touch up with colour matching high grade enamel minor surface damage, only where permitted by the Architect and only where appearance after touch-up is acceptable to Architect.

.3 Replace damaged panels and components that, in opinion of the Architect, cannot be satisfactorily repaired.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 74 21 - Construction/Demolition Waste Management And Disposal.

1.2 REFERENCES

.1 The Aluminum Association Inc. (AA)

- .1 Aluminum Sheet Metal Work in Building Construction-2000.
- .2 AA DAF45-97, Designation System for Aluminum Finishes.

.2 American Society for Testing and Materials (ASTM International)

- .1 ASTM A167-99, Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
- .2 ASTM A240/A240M-02, Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
- .3 ASTM A591/A591M-98, Standard Specification for Steel Sheet, Electrolytic Zinc-Coated, for Light Coating Mass Applications.
- .4 ASTM A606-01, Standard Specification for Steel, Sheet and Strip, High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, with Improved Atmospheric Corrosion Resistance.
- .5 ASTM A653/A653M-01a, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .6 ASTM A792/A792M-02, Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
- .7 ASTM B32-00, Standard Specification for Solder Metal.
- .8 ASTM B370-98, Standard Specification for Copper Sheet and Strip for Building Construction.
- .9 ASTM D523-89(1999), Standard Test Method for Specular Gloss.
- .10 ASTM D822-01, Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings.

.3 Canadian Roofing Contractors Association (CRCA)

- .1 Roofing Specifications Manual 1997.

.4 Canadian General Standards Board (CGSB)

- .1 CAN/CGSB-37.5-M89, Cutback Asphalt Plastic Cement.
- .2 CAN/CGSB-51.32-M77, Sheathing, Membrane, Breather Type.
- .3 CAN/CGSB-93.1-M85, Sheet Aluminum Alloy, Prefinished, Residential.

.5 Canadian Standards Association (CSA International)

.1 CSA A123.3-98, Asphalt Saturated Organic Roofing Felt.

.2 CSA-A440-00/A440.1-00 - A440-00, Windows / Special Publication A440.1-00, User Selection Guide to CSA Standard A440-00, Windows.

.3 CSA B111-1974(R1998), Wire Nails, Spikes and Staples.

1.3 SAMPLES

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

.2 Submit 50 x 50 mm samples of each type of sheet metal material, colour and finish.

Part 2 Products

2.1 PREFINISHED STEEL SHEET

.1 Zinc coated (galvanized) steel sheet similar to metal cladding / roofing: commercial quality to ASTM A 653/A 653M, with Z275 (G90) designation zinc coating and SMP finish. Sheet steel to be min 24 GA.

2.2 ACCESSORIES

.1 Isolation coating: alkali resistant bituminous paint.

.2 Plastic cement: to CAN/CGSB 37.5.

.3 Cleats: of same material, and temper as sheet metal, minimum 50 mm wide. Same as sheet metal being secured.

.4 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.

.5 Washers: of same material as sheet metal, 1 mm thick with rubber packings.

.6 Flux: rosin, cut hydrochloric acid, or commercial preparation suitable for materials to be soldered.

.7 Touch-up paint: as recommended by prefinished material manufacturer.

2.3 FABRICATION

.1 Fabricate metal flashings and other sheet metal work in accordance with applicable CRCA 'FL' series details.

.2 Fabricate aluminum flashings and other sheet aluminum work in accordance with AA-Aluminum Sheet Metal Work in Building Construction.

.3 Form pieces in 2400 mm maximum lengths. Make allowance for expansion at joints.

.4 Hem exposed edges on underside 12 mm. Mitre and seal corners with sealant.

.5 Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.

.6 Apply isolation coating to metal surfaces to be embedded in concrete or mortar.

2.4 METAL FLASHINGS

.1 Form flashings, copings and fascias to profiles indicated steel to match roof and walls.

.2 Form eaves troughs and downpipes from 24 GA steel to be chosen from manufacturers' standard color set.

2.5 EAVES TROUGHS AND DOWNPIPES

.1 Form eaves troughs and downpipes from 24 GA steel to be chosen from manufacturers' standard color set.

.2 Sizes and profiles as indicated.

.3 Provide goosenecks, outlets, strainer baskets and necessary fastenings.

Part 3 Execution

3.1 INSTALLATION

.1 Install sheet metal work in accordance with CRCA FL series details, FL

.2 Use concealed fastenings except where approved before installation.

.3 Provide underlay under sheet metal. Secure in place and lap joints 100 mm.

.4 Counterflash bituminous flashings at intersections of roof with vertical surfaces and curbs. Flash joints using S-lock forming tight fit over hook strips.

.5 Lock end joints and caulk with sealant.

.6 Install surface mounted reglets true and level, and caulk top of reglet with sealant.

.7 Turn top edge of flashing into recessed reglet or mortar joint minimum of 25 mm. Lead wedge flashing securely into joint.

.8 Caulk flashing at cap flashing with sealant.

.9 Install pans, where shown around items projecting through roof membrane.

3.2 EAVES TROUGHS AND DOWNPIPES

.1 Install eaves troughs and secure to building at 750 mm on centre as per manufacturers requirements through spacer ferrules. Slope eaves troughs to downpipes as indicated. Solder joints watertight.

.2 Install downpipes and provide goosenecks back to wall. Secure downpipes to wall with straps at 1500 mm on centre; minimum two straps per downpipe. Install splash pans as indicated.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

.2 Underwriter's Laboratories of Canada (ULC)

.1 ULC-S115-2005, Fire Tests of Fire stop Systems.

1.2 DEFINITIONS

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

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

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

.4 Tightly Fitted; (ref: NBC Part 3.1.9.1.1 and 9.10.9.6.1): penetrating items that are cast in place in buildings of non-combustible construction or have "0" annular space in buildings of combustible construction.

.1 Words "tightly fitted" should ensure that integrity of fire separation is such that it prevents passage of smoke and hot gases to unexposed side of fire separation.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Submit two copies of WHMIS MSDS - Material Safety Data Sheets in accordance with Section 02 81 01 - Hazardous Materials.

.3 Shop Drawings:

.1 Submit shop drawings sealed by an Engineer licenced to Practice in the Province of Manitoba to show location, proposed material, reinforcement, anchorage, fastenings and method of installation. Through the fire walls as shown on drawing A2.0

.2 Construction details should accurately reflect actual job conditions.

.4 Samples:

.1 Submit duplicate 300 x 300 mm samples showing actual fire stop material proposed for project.

.5 Quality assurance submittals: submit following in accordance with Section 01 45 00 - Quality Control.

.1 Test reports: in accordance with CAN-ULC-S101 for fire endurance and CAN-ULC-S102 for surface burning characteristics.

.1 Submit certified test reports from approved independent testing laboratories, indicating compliance of applied fire stopping with specifications for specified performance characteristics and physical properties.

.2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.3 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, cleaning procedures and .

.4 Manufacturer's Field Reports: submit to manufacturer's written reports within 3 days of review, verifying compliance of Work, as described in PART 3 - FIELD QUALITY CONTROL.

1.4 QUALITY ASSURANCE

.1 Qualifications:

.1 Installer: company specializing in fire stopping installations and approved by manufacturer.

.2 Pre-Installation Meetings: convene pre-installation meeting one week prior to beginning work of this Section, with contractor's representative Departmental Representative and Consultant in accordance with Section 01 32 16.06 - Construction Progress Schedule - Critical Path Method (CPM) Section 01 32 16.07 - Construction Progress Schedule - Bar (GANTT) Chart 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.

.3 Provide shop drawings of proposed ULC listed fire stopping systems for approval by Consultant

.4 Site Meetings: as part of Manufacturer's Services described in PART 3 - FIELD QUALITY CONTROL, schedule site visits, to review Work, at stages listed.

.1 After delivery and storage of products, and when preparatory Work is complete, but before installation begins.

.2 Once during progress of Work at 50% complete.

.3 Upon completion of Work, after cleaning is carried out.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Packing, shipping, handling and unloading:

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

.2 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.3 Deliver materials to the site in undamaged condition and in original unopened containers, marked to indicate brand name, manufacturer, ULC markings.

.2 Storage and Protection:

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

.2 Replace defective or damaged materials with new.

.3 Waste Management and Disposal:

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

Part 2 Products

2.1 MATERIALS

.1 Fire stopping and smoke seal systems: in accordance with CAN-ULC-S115.

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

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

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

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

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

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

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

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

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

.10 Sealants for vertical joints: non-sagging.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 COORDINATION

.1 General Contractor is to coordinate work between sub-contractors to ensure proper fire stopping coordination

- .1 Fire stopping installer is to review site prior to and during installation of work by other trades
- .2 Ensure that work by all trades is installed in such a manor to meet the requirements of ULC listed fire stopping systems approved for use.
- .3 Do not enclose shafts, walls and other spaces until completion of all fire stopping work.
- .4 Photograph completion of fire stopping in all concealed spaces prior to enclosing

3.3 PREPARATION

.1 Examine sizes and conditions of voids to be filled to establish correct thicknesses and installation of materials.

- .1 Ensure that substrates and surfaces are clean, dry and frost free.

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

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

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

3.4 INSTALLATION

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

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

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

.4 Tool or trowel exposed surfaces to neat finish.

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

3.5 SEQUENCES OF OPERATION

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

.2 Install floor fire stopping before interior partition erections.

.3 Metal deck bonding: fire stopping to precede spray applied fireproofing to ensure required bonding.

.4 Mechanical pipe insulation: certified fire stop system component.

.1 Ensure pipe insulation installation precedes fire stopping.

3.6 FIELD QUALITY CONTROL

.1 Manufacturer's Field Services:

.1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.

.2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

.3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

3.7 CLEANING

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

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

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

3.8 SCHEDULE

.1 All Penetrations through fire wall as shown on sheet A2.0

.2 Fire stop and smoke seal at:

.1 Penetrations through fire-resistance rated masonry, concrete, and gypsum board partitions and walls.

.2 Top of fire-resistance rated masonry and gypsum board partitions.

.3 Intersection of fire-resistance rated masonry and gypsum board partitions.

.4 Control and sway joints in fire-resistance rated masonry and gypsum board partitions and walls.

.5 Penetrations through fire-resistance rated floor slabs, ceilings and roofs.

.6 Openings and sleeves installed for future use through fire separations.

.7 Around mechanical and electrical assemblies penetrating fire separations.

.8 Rigid ducts: greater than 129 cm^2: fire stopping to consist of bead of fire stopping material between retaining angle and fire separation and between retaining angle and duct, on each side of fire separation.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 ASTM International

.1 ASTM C919-08, Standard Practice for Use of Sealants in Acoustical Applications.

.2 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.

.3 General Services Administration (GSA) - Federal Specifications (FS)

.1 FS-SS-S-200-E(2)1993, Sealants, Joint, Two-Component, Jet-Blast-Resistant, Cold Applied, for Portland Cement Concrete Pavement.

.4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for joint sealants and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Manufacturer's product to describe:

.1 Caulking compound.

.2 Primers.

.3 Sealing compound, each type, including compatibility when different sealants are in contact with each other.

.3 Samples:

.1 Submit samples of each type of material and colour.

.2 Cured samples of exposed sealants for each colour where required to match adjacent material.

.4 Manufacturer's Instructions:

.1 Submit instructions to include installation instructions for each product used.

1.3 CLOSEOUT SUBMITTALS

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

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

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

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

.3 Storage and Handling Requirements:

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

.2 Store and protect joint sealants from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

1.5 SITE CONDITIONS

.1 Ambient Conditions:

.1 Proceed with installation of joint sealants only when:

.1 Ambient and substrate temperature conditions are within limits permitted by joint sealant manufacturer or are above 4.4 degrees C.

.2 Joint substrates are dry.

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

.2 Joint-Width Conditions:

.1 Proceed with installation of joint sealants only where joint widths are more than those allowed by joint sealant manufacturer for applications indicated.

.3 Joint-Substrate Conditions:

.1 Proceed with installation of joint sealants only after contaminants capable of interfering with adhesion are removed from joint substrates.

1.6 ENVIRONMENTAL REQUIREMENTS

.1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labelling and provision of Material Safety Data Sheets (MSDS) acceptable to Health Canada.

.2 Conform to manufacturers recommended installation conditions for applications of sealants

.3 Ventilate area of work by use of portable supply and exhaust fans.

Part 2 Products

2.1 SEALANT MATERIALS

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

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

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

.4 All sealants to be used in accordance with manufacturers recommended applications

.5 It remains the contractors' responsibility to verify compatibility of the sealant with the substrate, primers, backer rods and weather conditions prior to installation.

.1 Bring any discrepancies with the above to the attention of the project manager.

2.2 SEALANT MATERIAL DESIGNATIONS

.1 Exterior joints in horizontal wearing (concrete) surfaces: Polyurethane, semi-self-levelling, moisture curing, non-staining, non-bleeding, colour as selected.

.1 ASTM C920
.2 Single Component
.3 Pourable
.4 Class – Cyclic Movement - 100/50
.5 CAN/CGSB – 19.13-M87
.6 Acceptable Product: Vulkem 45 SSL – Tremco Sealants, or approved equivalent.

.2 General exterior use: Silicone, neutral cure ultra-low modulus, moisture curing, nonstaining, nonbleeding, colour as selected.

.1 ASTM C920
.2 Single Component
.3 Non-Sag
.4 Class – Cyclic Movement - 100/50
.5 Class 'A'
.6 ASTM C1248, C1382, E84
.7 CAN/CGSB – 19.13-M87
.8 Acceptable Product: Spectrem 1 – Tremco Sealants, or approved equivalent.

.3 Glazing: Silicone, neutral cure, medium modulus, and colour as selected.

.1 ASTM C920
.2 Single Component
.3 Non-Sag
.4 Class – Cyclic Movement - 50
.5 Class 'A'
.6 ASTM C1248
.7 CAN/CGSB – 19.13-M87
.8 Acceptable Product: Spectrem 2 – Tremco Sealants, or approved equivalent.

.4 Air-Barrier to Window air-seal sealant: Silyl-terminated polyether polymer (STPe), moisture cure, medium modulus.

.1 Compatible with Air-Barrier system.
.2 ASTM C920
.3 Single Component
.4 Non-Sag
.5 Class – Cyclic Movement - 25
.6 Class 'A'
.7 Acceptable Product: Bakor HE925 BES, or approved equivalent.

.5 General interior use: painted gypsum, painted concrete, painted concrete block: Acrylic latex, colour as selected.

.1 Low VOC.
.2 Single Component
.3 Non-Sag
.2 Class – Cyclic Movement - 12.5
.3 Class 'A'
.4 CAN/CGSB 19-GP-14M
.5 Acceptable Product: Tremflex 834 – Tremco Sealants, or approved equivalent.

.6 Plumbing fixtures and general washroom / kitchen (wet-area) usage: sinks, tubs, urinals, water-closets, vanities: Silicone, acetoxy, moisture curing, with fungicide.

.1 ASTM C920
.2 Single Component
.3 Non-Sag
.4 Class – Cyclic Movement – 25
.5 Class 'A'
.6 CAN/CGSB – 19.13-M87
.7 Acceptable Product: Tremsil 200 – Tremco Sealants, or approved equivalent.

.7 Acoustical Sealant: to ASTM C919: Synthetic rubber, single-component, non-skinning, non-hardening.

.1 Single Component

.2 Non-Sag

.3 Class – Cyclic Movement – N/A

.4 CAN/CGSB 19.21 M87

.5 Acceptable Product: Acoustical Sealant – Tremco Sealants, or approved

.8 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/m^3 density, or neoprene foam backer, size as recommended by manufacturer.

.4 Bond breaker tape:

.1 Polyethylene bond breaker tape which will not bond to sealant.

2.3 JOINT CLEANER

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

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

Part 3 Execution

3.1 EXAMINATION

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

.1 Visually inspect substrate.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied

3.2 SURFACE PREPARATION

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

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

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

.4 Ensure joint surfaces are dry and frost free.

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

3.3 PRIMING

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

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

3.4 BACKUP MATERIAL

.1 Apply bond breaker tape where required to manufacturer's instructions.

.2 Install joint filler to achieve correct joint depth and shape, with approximately 30% compression.

3.5 MIXING

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

3.6 APPLICATION

.1 Sealant:

.1 Apply sealant in accordance with manufacturer's written instructions.

.2 Mask edges of joint where irregular surface or sensitive joint border exists to provide neat joint.

.3 Apply sealant in continuous beads.

.4 Apply sealant using gun with proper size nozzle.

.5 Use sufficient pressure to fill voids and joints solid.

.6 Form surface of sealant with full bead, smooth, free from ridges, wrinkles, sags, air pockets, embedded impurities.

.7 Tool exposed surfaces before skinning begins to give slightly concave shape.

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

.2 Curing:

.1 Cure sealants in accordance with sealant manufacturer's instructions.

.2 Do not cover up sealants until proper curing has taken place.

3.7 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Clean adjacent surfaces immediately.

.3 Remove excess and droppings, using recommended cleaners as work progresses.

.4 Remove masking tape after initial set of sealant.

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

3.8 PROTECTION

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

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

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 American Society for Testing and Materials International (ASTM)

- .1 ASTM A653/A653M-06a, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .2 ASTM B29-03, Standard Specification for Refined Lead.
- .3 ASTM B749-03, Standard Specification for Lead and Lead Alloy Strip, Sheet and Plate Products.

.2 Canadian General Standards Board (CGSB)

- .1 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.
- .2 CGSB 41-GP-19Ma-84, Rigid Vinyl Extrusions for Windows and Doors.

.3 Canadian Standards Association (CSA International)

- .1 CSA-G40.20-04/G40.21-04, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
- .2 CSA W59-03, Welded Steel Construction (Metal Arc Welding).

.4 Canadian Steel Door Manufacturers' Association (CSDMA)

- .1 CSDMA, Recommended Specifications for Commercial Steel Doors and Frames, 2000.
- .2 CSDMA, Selection and Usage Guide for Commercial Steel Doors, 1990.

.5 National Fire Protection Association (NFPA)

- .1 NFPA 80-2007, Standard for Fire Doors and Fire Windows.
- .2 NFPA 252-03, Standard Methods of Fire Tests of Door Assemblies.

.6 South Coast Air Quality Management District (SCAQMD), California State

- .1 SCAQMD Rule 1113-04, Architectural Coatings.
- .2 SCAQMD Rule 1168-05, Adhesives and Sealants Applications.

.7 Underwriters' Laboratories of Canada (ULC)

- .1 CAN/ULC-S701-01, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.
- .2 CAN/ULC-S702-97, Standard for Thermal Insulation, Mineral Fibre, for Buildings.
- .3 CAN/ULC-S704-03, Standard for Thermal Insulation, Polyurethane and Polyisocyanurate Boards, Faced.
- .4 CAN4-S104-M80, Standard Method for Fire Tests of Door Assemblies.
- .5 CAN4-S105-M85, Standard Specification for Fire Door Frames Meeting the Performance Required by CAN4-S104.

1.2 SYSTEM DESCRIPTION

.1 Design Requirements:

.1 Design exterior frame assembly to accommodate to expansion and contraction when subjected to minimum and maximum surface temperature of -35 degrees C to 35 degrees C.

.2 Maximum deflection for exterior steel entrance screens under wind load of 1.2 kPa not to exceed 1/175th of span.

.3 Steel fire rated doors and frames: labelled and listed by an organization accredited by Standards Council of Canada in conformance with CAN4-S104 NFPA 252 for ratings specified or indicated.

.4 Provide fire labelled frames for openings requiring fire protection ratings. Test products in conformance with CAN4-S104, ASTM E152 NFPA 252 and listed by nationally recognized agency having factory inspection services.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

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

.3 Provide shop drawings: in accordance with Section 01 33 00 - Submittal Procedures.

.1 Indicate each type of door, material, steel core thicknesses, mortises, reinforcements, location of exposed fasteners, openings, glazed louvred, arrangement of hardware fire rating and finishes.

.2 Indicate each type frame material, core thickness, reinforcements, glazing stops, location of anchors and exposed fastenings reinforcing fire rating finishes.

.3 Include schedule identifying each unit, with door marks and numbers relating to numbering on drawings and door schedule.

.4 Submit test and engineering data, and installation instructions.

.4 Provide samples in accordance with Section 01 33 00 - Submittal Procedures.

.5 Submit one 300 x 300 mm corner sample of each type of frame.

.1 Show butt cutout glazing stops snap-on trim with clips 300 mm long removable mullion connection.

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 recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 MATERIALS

.1 .

.2 Hot dipped galvanized steel sheet: to ASTM A653M, ZF75, minimum base steel thickness in accordance with CSDMA Table 1 - Thickness for Component Parts.

.3 Reinforcement channel: to CSA G40.20/G40.21, Type 44W, coating designation to ASTM A653M, ZF75.

.4 Composites: balance of core materials used in conjunction with lead: in accordance with manufacturers' proprietary design.

2.2 DOOR CORE MATERIALS

.1 Honeycomb construction:

.1 Structural small cell, 24.5 mm maximum kraft paper 'honeycomb', weight: 36.3 kg per ream minimum, density: 16.5 kg/m^3 minimum sanded to required thickness.

.2 Temperature rise rated (TRR): core composition to limit temperature rise on unexposed side of door to 250 degrees C at 60 minutes. Core to be tested as part of a complete door assembly, in accordance with CAN4-S104, ASTM E152 NFPA 252, covering Standard Method of Tests of Door Assemblies and listed by nationally recognized testing agency having factory inspection service.

2.3 ADHESIVES

.1 Honeycomb cores and steel components: heat resistant, spray grade, resin reinforced neoprene/rubber (polychloroprene) based, low viscosity, contact cement.

.2 Polystyrene and polyurethane cores: heat resistant, epoxy resin based, low viscosity, contact cement.

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

2.4 PRIMER

.1 Touch-up prime CAN/CGSB-1.181.

2.5 PAINT

.1 Field paint steel doors and frames in accordance with Sections 09 91 23 - Interior Painting, 09 91 13 - Exterior Painting. Protect weatherstrips from paint. Provide final finish free of scratches or other blemishes.

2.6 ACCESSORIES

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

.2 Exterior Caps: rigid polyvinylchloride extrusion conforming to CGSB 41-GP-19Ma steel.

.3 Fabricate glazing stops as formed channel, minimum 16 mm height, accurately fitted, butted at corners and fastened to frame sections with counter-sunk oval head sheet metal screws.

.4 Frame Thermal Breaks: Rigid polyvinylchloride extrusion conforming to CGSB 41-GP-19MA

.5 Metallic paste filler: to manufacturer's standard.

.6 Fire labels: metal riveted.

.7 Glazing: see Section 08 80 50 Glazing.

.8 Make provisions for glazing as indicated and provide necessary glazing stops.

.1 Provide removable stainless steel glazing beads for use with glazing tapes and compounds and secured with countersunk stainless steel screws.

.2 Design exterior glazing stops to be tamperproof.

2.7 FRAMES FABRICATION GENERAL

.1 Fabricate frames in accordance with CSDMA specifications.

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

.3 Exterior frames: as per door schedule welded construction.

.4 Interior frames: as per door schedule, welded construction.

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

.6 Protect mortised cutouts with steel guard boxes.

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

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

.9 Conceal fastenings except where exposed fastenings are indicated.

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

.11 Insulate exterior frame components with polyurethane insulation.

2.8 FRAME ANCHORAGE

.1 Provide appropriate anchorage to floor and wall construction.

.2 Locate each wall anchor immediately above or below each hinge reinforcement on hinge jamb and directly opposite on strike jamb.

.3 Provide 2 anchors for rebate opening heights up to 1520 mm and 1 additional anchor for each additional 760 mm of height or fraction thereof.

.4 Locate anchors for frames in existing openings not more than 150 mm from top and bottom of each jambs and intermediate at 660 mm on centre maximum.

2.9 FRAMES: WELDED TYPE

.1 Welding in accordance with CSA W59.

.2 Accurately mitre or mechanically joint frame product and securely weld on inside of profile.

.3 Cope accurately and securely weld butt joints of mullions, transom bars, centre rails and sills.

.4 Grind welded joints and corners to a flat plane, fill with metallic paste and sand to uniform smooth finish.

.5 Securely attach floor anchors to inside of each jamb profile.

.6 Weld in 2 temporary jamb spreaders per frame to maintain proper alignment during shipment.

.7 Securely attach lead to inside of frame profile from return to jamb soffit (inclusive) on door side of frame only.

2.10 DOOR FABRICATION GENERAL

.1 Exterior doors shall be laminated core with core type as indicated on the door schedule.

.2 Interior doors shall be laminated core with core type as indicated on the door schedule. Longitudinal edges shall be:

.1 Unless indicated otherwise on the door schedule: Mechanically interlocked.

.2 Where indicated on the door schedule: Mechanically interlocked, tack welded at top and bottom of door, above and below each edge cutout and at 150 mm (6") on center with visible edge seams.

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

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

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

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

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

.8 Provide fire labelled doors for those openings requiring fire protection ratings, as scheduled. Test such products in conformance with CAN4-S104 ASTM E152 NFPA 252 and list by nationally recognized agency having factory inspection service and construct as detailed in Follow-Up Service Procedures/Factory Inspection Manuals issued by listing agency to individual manufacturers.

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

2.11 DOORS: CORE CONSTRUCTION

.1 Laminated Core Construction

.1 Exterior Doors: Both face sheets for exterior doors shall be formed from a sheet of steel with polyisocyanurate core, laminated under pressure to face sheets.

.2 Interior Doors: Both face sheets for interior doors shall be formed from a sheet steel with honeycomb, vertical steel stiffener core or temperature rise rated core, (as specified on the

2.12 THERMALLY BROKEN DOORS AND FRAMES

.1 Fabricate thermally broken doors by using insulated core and separating exterior parts from interior parts with continuous interlocking thermal break.

.2 Thermal break: rigid polyvinylchloride extrusion conforming to CGSB 41-GP-19Ma.

.3 Fabricate thermally broken frames separating exterior parts form interior parts with continuous interlocking thermal break.

.4 Apply insulation.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION GENERAL

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

.2 Install doors and frames to CSDMA Installation Guide.

3.3 FRAME INSTALLATION

.1 Set frames plumb, square, level and at correct elevation.

.2 Secure anchorages and connections to adjacent construction.

.3 Brace frames rigidly in position while building-in. Install temporary horizontal wood spreader at third points of door opening to maintain frame width. Provide vertical support at centre of head for openings over 1200 mm wide. Remove temporary spreaders after frames are built-in.

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

.5 Caulk perimeter of frames between frame and adjacent material.

.6 Maintain continuity of air barrier.

3.4 DOOR INSTALLATION

.1 Install doors and hardware in accordance with hardware templates and manufacturer's instructions and Section 08 71 00 - Door Hardware.

.2 Provide even margins between doors and jambs and doors and finished floor and thresholds as follows.

.1 Hinge side: 1.0 mm.

.2 Latchside and head: 1.5 mm.

.3 Finished floor, top of carpet non-combustible sill and thresholds: 13 mm.

.3 Adjust operable parts for correct function.

.4 Install louvres.

3.5 FINISH REPAIRS

.1 Touch up with primer finishes damaged during installation.

.2 Fill exposed frame anchors surfaces with imperfections with metallic paste filler and sand to a uniform smooth finish.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 American National Standards Institute (ANSI) / Builders Hardware Manufacturers Association (BHMA)

.1 ANSI/BHMA A156.1-2000, American National Standard for Butts and Hinges.

.2 ANSI/BHMA A156.2-2003, Bored and Preassembled Locks and Latches.

.3 ANSI/BHMA A156.3-2001, Exit Devices.

.4 ANSI/BHMA A156.4-2000, Door Controls - Closers.

.5 ANSI/BHMA A156.5-2001, Auxiliary Locks and Associated Products.

.6 ANSI/BHMA A156.6-2005, Architectural Door Trim.

.7 ANSI/BHMA A156.8-2005, Door Controls - Overhead Stops and Holders.

.8 ANSI/BHMA A156.10-1999, Power Operated Pedestrian Doors.

.9 ANSI/BHMA A156.12-2005, Interconnected Locks and Latches.

.10 ANSI/BHMA A156.13-2002, Mortise Locks and Latches Series 1000.

.11 ANSI/BHMA A156.14-2002, Sliding and Folding Door Hardware.

.12 ANSI/BHMA A156.15-2006, Release Devices - Closer Holder, Electromagnetic and Electromechanical.

.13 ANSI/BHMA A156.16-2002, Auxiliary Hardware.

.14 ANSI/BHMA A156.17-2004, Self-closing Hinges and Pivots.

.15 ANSI/BHMA A156.18-2006, Materials and Finishes.

.16 ANSI/BHMA A156.19-2002, Power Assist and Low Energy Power - Operated Doors.

.17 ANSI/BHMA A156.20-2006, Strap and Tee Hinges and Hasps.

.2 Canadian Steel Door and Frame Manufacturers' Association (CSDMA)

.1 CSDMA Recommended Dimensional Standards for Commercial Steel Doors and Frames - 2009.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for door hardware and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Samples:

.1 Submit for review and acceptance of each unit.

.2 Samples will be returned for inclusion into work.

.3 Identify each sample by label indicating applicable specification paragraph number, brand name and number, finish and hardware package number.

.4 After approval samples will be returned for incorporation in Work.

.4 Hardware List:

.1 Submit contract hardware list.

.2 Indicate specified hardware, including make, model, material, function, size, finish and other pertinent information.

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

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

1.3 CLOSEOUT SUBMITTALS

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

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

1.4 MAINTENANCE MATERIALS SUBMITTALS

.1 Extra Stock Materials:

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

.2 Tools:

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

1.5 QUALITY ASSURANCE

.1 Regulatory Requirements:

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

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

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions.

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

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

.4 Storage and Handling Requirements:

.1 Store materials off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect door hardware from nicks, scratches, and blemishes.

.3 Protect prefinished surfaces with wrapping strippable coating.

.4 Replace defective or damaged materials with new.

Part 2 Products

2.1 HARDWARE ITEMS

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

2.2 DOOR HARDWARE

.1 Screws and Fasteners:

.1 All hardware is to be installed with the standard fasteners supplied by the manufacturer unless called for otherwise in hardware sets.

.2 Hinges

.1 All hinges shall be Ives and of the size, type, and finish as indicated in the hardware sets.

.3 Locks

.1 Locks shall be mortise type as specified in the hardware sets. All locks to ANSI Grade 1 lever or knob trim. Locks to be Schlage or as specifically approved by Project Manager. No substitute.

.4 Door Closers

.1 All door closers shall be surface mounted with full covers. Manual closers with universal spring size must be adjusted to suit specific opening requirements. Follow manufacturers' instructions. Provide LCN Closers as specified. No substitutes.

.5

.6 Kickplates

.1 To be of brass or bronze construction, .050 thick. Provide Ives series as specified. Screw mounted.

.7 Pulls

.1 To be of brass, bronze, or stainless steel construction. All pulls to be thru bolt mounted. Provide Ives as specified.

.8 Protective Plates, Push Plates

.1 All plates to be of brass or bronze construction. To be .050 thick. Provide Ives as specified. All kickplates on the push side of the door shall be 1 ½" less than the door width. If other hardware interferes with the above recommendations then the plate size shall be modified at the factory to suit the installation. Kickplates to be mounted behind vertical rod exit devices.

.9 Door Stops and Holders

.1 All floor stops to be solid brass or bronze. With rubber bumpers. Stops fastened to brick or concrete shall have wood screws and lead shields. Stops fastened to

walls or floors of wood construction shall have wood screws. Provide Ives stops as specified. Concealed overhead stops to be Glynn Johnson as specified.

.10 Thresholds and Weather-strip

.11 All weatherstrip, sweeps, automatic door bottoms, shall be anodized aluminum construction with polyurethane or neoprene gasketting as specified. All to be screw in mounting. K.N. Crowder as specified.

.12 Cylinders

.1 Install Schlage cylinders.

.2 Owner will replace Schlage lock cylinders with owner supplied and installed Abloy cylinders after construction completion.

2.3 KEYING

.1 All locks to come with temporary Schlage cylinders.

.1 2 keys per lock.

.2 Schlage cylinders will be temporary for use during construction and will be changed by owner after construction completion.

2.4 FASTENINGS

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

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

.3 Exposed fastening devices to match finish of hardware.

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

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

Part 3 Execution

3.1 INSTALLATION

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

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

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

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

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

.6 Install key control cabinet.

.7 Use only manufacturer's supplied fasteners.

.1 Use of "quick" type fasteners, unless specifically supplied by manufacturer, is unacceptable.

.8 Remove construction cores when directed by Departmental Representative Consultant.

.1 Install permanent cores and ensure locks operate correctly.

3.2 ADJUSTING

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

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

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

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Clean hardware with damp rag and approved non-abrasive cleaner, and polish hardware in accordance with manufacturer's instructions.

.3 Remove protective material from hardware items where present.

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

3.4 DEMONSTRATION

.1 Keying System Setup and Cabinet:

.1 Set up key control system with file key tags, duplicate key tags, numerical index, alphabetical index and key change index, label shields, control book and key receipt cards.

.2 Place file keys and duplicate keys in key cabinet on their respective hooks.

.3 Lock key cabinet and turn over key to Departmental Representative Consultant.

.2 Maintenance Staff Briefing:

.1 Brief maintenance staff regarding:

.1 Proper care, cleaning, and general maintenance of projects complete hardware.

.2 Description, use, handling, and storage of keys.

.3 Use, application and storage of wrenches for door closers locksets and fire exit hardware.

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

3.5 PROTECTION

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

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

Part 4 SCHEDULES

4.1 SCHEUDLE OF MATERIALS

.1 Hinge - Continuous IVES (IVES)

.2 Hinge IVES (IVES)

.3 Flush Bolt IVES (IVES)

.4 Mortise Lockset Schlage Lock Company (SCH)

.5 Mortise Passage Schlage Lock Company (SCH)

.6 Mortise Privacy Schlage Lock Company (SCH)

.7 Electric Strike Von Duprin, Inc. (VDI)

.8 Door Pull Standard Metal Mfg. (SM)

.9 Door Closer LCN Closers (LCN)

.10 Automatic Operator LCN Closers (LCN)

.11 Kick Plate IVES (IVES)

.12 Wall Bumper IVES (IVES)

.13 Overhead Holder/Stop Glynn - Johnson (GJ)

.14 Weatherstripping K. N. Crowder Mfg., Inc. (KNC)

.15 Astragal K. N. Crowder Mfg., Inc. (KNC)

.16 Sweep Strip K. N. Crowder Mfg., Inc. (KNC)

.17 Door Bottom - Auto K. N. Crowder Mfg., Inc. (KNC)

.18 Threshold K. N. Crowder Mfg., Inc. (KNC)

.19 Actuator LCN Closers (LCN)

.20 Sound Seal Furnished by others (FBO)

.21 Push Button Release Schlage Lock Company (SCH)

.22 Door Viewer Dayton (DT)

.23 Power Transfer Unit Von Duprin, Inc. (VDI)

.24 Power Supply Von Duprin, Inc. (VDI)

4.2 HARDWARE FINISHES DESCRIPTIONS

.1 626 Satin Chromium Plated

.2 627 Satin Aluminum Clear Coated

.3 628 Satin Aluminum Anodized

.4 630 Satin Stainless Steel

.5 652 Satin Chromium Plated

.6 689 Aluminum Painted

4.3 HARDWARE SETS:

Note all Lever and Handel locksets to have N escutcheon trim.

Hardware Set#: 1

Single: D2, D3

Qty	UOM	Item Type	Item Series/Description	Finish
3.0	EA	Hinge	3CB1HW 4.5 X 4 NRP	652
1.0	EA	Mortise Passage	L9010 07N	626
1.0	EA	Door Closer	4011	689
1.0	EA	Kick Plate	8400 10 X 1 1/2" Less Door Width	630
1.0	EA	Wall Bumper	WS401CVX	626

Hardware Set#: 2

Single: D1

Qty	UOM	Item Type	Item Series/Description	Finish
1.0	EA	Hinge - Continuous	700	630
1.0	EA	Mortise Lockset	L9466 42D	626
1.0	EA	Door Closer	4111 EDA	689
1.0	EA	Kick Plate	8400 10 X 1 1/2" Less Door Width	630
1.0	EA	Overhead Holder/Stop	104S	630
1.0	EA	Weatherstripping	W-20S Top Only	628
2.0	EA	Weatherstripping	W-50S Sides Only	628
1.0	EA	Sweep Strip	W-13S	628
1.0	EA	Threshold	CT-45	628
1.0	EA	Door Viewer	698B26D	26D

Part 1 General

1.1 REFERENCES

.1 Aluminum Association (AA)

.1 AA DAF 45-03(R2009), Designation System for Aluminum Finishes.

.2 ASTM International

.1 ASTM C475-02(2007), Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.

.2 ASTM C514-04(2009e1), Standard Specification for Nails for the Application of Gypsum Board.

.3 ASTM C557-03(2009)e1, Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing.

.4 ASTM C840-08, Standard Specification for Application and Finishing of Gypsum Board.

.5 ASTM C954-07, Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness.

.6 ASTM C1002-07, Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.

.7 ASTM C1047-09, Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.

.8 ASTM C1280-99, Standard Specification for Application of Gypsum Sheathing.

.9 ASTM C1177/C1177M-08, Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.

.10 ASTM C1178/C1178M-08, Standard Specification for Glass Mat Water-Resistant Gypsum Backing Board.

.11 ASTM C1396/C1396M-09a, Standard Specification for Gypsum Wallboard.

.3 Association of the Wall and Ceilings Industries International (AWCI)

.1 AWCI Levels of Gypsum Board Finish-97.

.4 Canada Green Building Council (CaGBC)

.1 LEED Canada-NC Version 1.0-2004, LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Package For New Construction and Major Renovations (including Addendum 2007).

.2 LEED Canada-CI Version 1.0-2007, LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Guide For Commercial Interiors.

.5 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-51.34-M86(R1988), Vapour Barrier, Polyethylene Sheet for Use in Building Construction.

.2 CAN/CGSB-71.25-M88, Adhesive, for Bonding Drywall to Wood Framing and Metal Studs.

.6 Green Seal Environmental Standards (GS)

.1 GS-11-2008, 2nd Edition, Paints and Coatings.

.7 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards

.1 SCAQMD Rule 1113-A2007, Architectural Coatings.

.2 SCAQMD Rule 1168-A2005, Adhesives and Sealants Applications.

.8 Underwriters' Laboratories of Canada (ULC)

.1 CAN/ULC-S102-07, Standard Method of Test of Surface Burning Characteristics of Building Materials and Assemblies.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for gypsum board assemblies and include product characteristics, performance criteria, physical size, finish and limitations.

1.3 DELIVERY, STORAGE AND HANDLING

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

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

.3 Storage and Handling Requirements:

.1 Store gypsum board assemblies materials level off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect gypsum board assemblies from nicks, scratches, and blemishes.

.3 Protect from weather, elements and damage from construction operations.

.4 Handle gypsum boards to prevent damage to edges, ends or surfaces.

.5 Protect prefinished aluminum surfaces with wrapping strippable coating. Do not use adhesive papers or sprayed coatings which bond when exposed to sunlight or weather.

.6 Replace defective or damaged materials with new.

.4 Dispose of waste in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

1.4 AMBIENT CONDITIONS

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

.2 Apply board and joint treatment to dry, frost free surfaces.

.3 Ventilation: ventilate building spaces as required to remove excess moisture that would prevent drying of joint treatment material immediately after its application.

Part 2 Products

2.1 MATERIALS

.1 Standard board: to ASTM C1396/C1396M regular, Type X, as per drawings, 1200 mm wide x maximum practical length, ends square cut, edges bevelled.

.2 Gypsum sheathing board: to ASTM C1396/C1396M, regular, Type X, mm thick, 1200 mm wide x maximum practical length.

.1 For use in washrooms, change rooms and exercise room.

.3 Metal furring runners, hangers, tie wires, inserts, anchors: to ASTM C1280.

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

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

.6 Nails: to ASTM C514.

.7 Steel drill screws: to ASTM C1002.

.8 Stud adhesive: to CAN/CGSB-71.25 ASTM C557.

.9 Laminating compound: as recommended by manufacturer, asbestos-free.

.10 Casing beads, corner beads, control joints and edge trim: to ASTM C1047, metal, zinc-coated by hot-dip process, 0.5 mm base thickness, perforated flanges, one piece length per location.

.11 Cornice cap: 12.7 mm deep x partition width, of 1.6 mm base thickness galvanized sheet steel, prime painted. Include splice plates for joints.

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

.13 Polyethylene: to CAN/CGSB-51.34, Type 2.

.14 Insulating strip: rubberized, moisture resistant, 3 mm thick cork closed cell neoprene strip, 12 mm wide, with self-sticking permanent adhesive on one face, lengths as required.

.15 Joint compound: to ASTM C475, asbestos-free.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for gypsum board assemblies installation in accordance with manufacturer's written instructions.

3.2 ERECTION

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

.2 Do application of gypsum sheathing to ASTM C1280.

.3 Erect hangers and runner channels for suspended gypsum board ceilings to ASTM C840 except where specified otherwise.

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

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

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

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

.8 Furr for gypsum board faced vertical bulkheads within and at termination of ceilings.

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

.10 Install wall furring for gypsum board wall finishes to ASTM C840, except where specified otherwise.

.11 Furr openings and around built-in equipment, cabinets, access panels, , on four sides. Extend furring into reveals. Check clearances with equipment suppliers.

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

.13 Erect drywall resilient furring transversely across studs joists between the layers of gypsum board, spaced maximum 600 mm on centre and not more than 150 mm from ceiling/wall juncture. Secure to each support with 38 mm common nail 25 mm drywall screw.

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

3.3 APPLICATION

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

.2 Apply single layer gypsum board to wood /metal furring or framing using screw fasteners for first layer, screw fasteners for second layer. Maximum spacing of screws 300 mm on centre.

.1 Single-Layer Application:

.1 Apply gypsum board on ceilings prior to application of walls to ASTM C840.

.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 Apply single layer gypsum board to concrete block surfaces, where indicated, using laminating adhesive.

.1 Comply with gypsum board manufacturer's recommendations.

.2 Brace or fasten gypsum board until fastening adhesive has set.

.3 Mechanically fasten gypsum board at top and bottom of each sheet.

.4 Exterior Soffits and Ceilings: install exterior gypsum board perpendicular to supports; stagger end joints over supports. Install with 6 mm gap where boards abut other work.

.5 Apply water-resistant gypsum board where wall tiles coating to be applied adjacent to slop sinks janitors closets. Apply water-resistant sealant to edges, ends, cut-outs which expose gypsum core and to fastener heads. Do not apply joint treatment on areas to receive tile finish.

.6 Apply 12 mm diameter bead of acoustic sealant continuously around periphery of each face of partitioning to seal gypsum board/structure junction where partitions abut fixed building components. Seal full perimeter of cut-outs around electrical boxes, ducts, , in partitions where perimeter sealed with acoustic sealant.

.7 Install ceiling boards in direction that will minimize number of end-butt joints. Stagger end joints at least 250 mm.

.8 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.

.9 Install gypsum board with face side out.

.10 Do not install damaged or damp boards.

.11 Locate edge or end joints over supports. Stagger vertical joints over different studs on opposite sides of wall.

3.4 ACCOUSTIC ASSEMBLIES

.1 Apply 12mm dia bead of acoustic sealant continuously around periphery of each face of partitioning to seal gypsum board/structure junction where partitions abut fixed building components. Seal full perimeter of cut-outs around electrical boxes and ducts and other penetrations.

.2 Acoustic rated rooms will be tested to ensure a minimum STC 46 Rating is achieved

.3 Any tests indicating the minimum STC 46 rating has not been achieved will be corrected at the contractor's expense.

.4 Retesting of acoustic rated rooms to confirm compliance with the STC rating will be at the contractors' expense.

3.5 INSTALLATION

.1 Erect accessories straight, plumb or level, rigid and at proper plane. Use full length pieces where practical. Make joints tight, accurately aligned and rigidly secured. Mitre and fit corners accurately, free from rough edges. Secure using contact adhesive for full length at 150 mm on centre.

.2 Install casing beads around perimeter of suspended ceilings.

.3 Install casing beads where gypsum board butts against surfaces having no trim concealing junction and where indicated. Seal joints with sealant.

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

.5 Install shadow mould at gypsum board/ceiling juncture as indicated. Minimize joints; use corner pieces and splicers.

.6 Construct control joints of two back-to-back casing beads set in gypsum board facing and supported independently on both sides of joint.

.7 Provide continuous polyethylene dust barrier behind and across control joints.

.8 Locate control joints at changes in substrate construction.

.9 Install control joints straight and true.

.10 Construct expansion joints as detailed, at building expansion and construction joints. Provide continuous dust barrier.

.11 Install expansion joint straight and true.

.12 Install cornice cap where gypsum board partitions do not extend to ceiling.

.13 Fit cornice cap over partition, secure to partition track with two rows of sheet metal screws staggered at 300 mm on centre.

.14 Splice corners and intersections together and secure to each member with 3 screws.

.15 Install access doors to electrical and mechanical fixtures specified in respective sections.

.1 Rigidly secure frames to furring or framing systems.

.16 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.

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

.1 Levels of finish:

.1 Level 0: no tapping, finishing or accessories required.

.2 Level 1: embed tape for joints and interior angles in joint compound. Surfaces to be free of excess joint compound; tool marks and ridges are acceptable.

.3 Level 2: embed tape for joints and interior angles in joint compound and apply one separate coat of joint compound over joints, angles, fastener heads and accessories; surfaces free of excess joint compound; tool marks and ridges are acceptable.

.4 Level 3: embed tape for joints and interior angles in joint compound and apply two separate coats of joint compound over joints, angles, fastener heads and accessories; surfaces smooth and free of tool marks and ridges.

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

.6 Level 5: embed tape for joints and interior angles in joint compound and apply three separate coats of joint compound over joints, angles, fastener heads and accessories; apply a thin skim coat of joint compound to entire surface; surfaces smooth and free of tool marks and ridges.

.18 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.

.19 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.

.20 Sand lightly to remove burred edges and other imperfections. Avoid sanding adjacent surface of board.

.21 Completed installation to be smooth, level or plumb, free from waves and other defects and ready for surface finish.

.22 Apply one coat of white primer sealer over surface to be textured. When dry apply textured finish in accordance with manufacturer's instructions.

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

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

.25 Allow skim coat to dry completely.

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

3.6 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

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

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

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.7 PROTECTION

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

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

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Environmental Protection Agency (EPA)

.1 Test Method for Measuring Total Volatile Organic Compound Content of Consumer Products, Method 24 (for Surface Coatings).

.2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

.3 The Master Painters Institute (MPI)

.1 Architectural Painting Specification Manual - February 2004.

.2 Standard GPS-1-05, MPI Green Performance Standard for Painting and Coatings.

.4 National Fire Code of Canada.

.5 Society for Protective Coatings (SSPC)

.1 Systems and Specifications, SSPC Painting Manual 2005.

1.2 QUALITY ASSURANCE

.1 Qualifications:

.1 Qualified journeypersons as defined by local jurisdiction to be engaged in painting work

.2 Apprentices: may be employed provided they work under direct supervision of qualified journeyperson in accordance with trade regulations.

.3 Conform to latest MPI requirements for exterior painting work including preparation and priming.

.4 Materials: in accordance with MPI Painting Specification Manual "Approved Product" listing and from a single manufacturer for each system used.

.5 Paint materials such as linseed oil, shellac, and turpentine to be highest quality product of an approved manufacturer listed in MPI Painting Specification Manual and to be compatible with other coating materials as required.

.6 Retain purchase orders, invoices and documents to prove conformance with noted MPI requirements when requested by Departmental Representative.

.7 Standard of Acceptance:

.1 Walls: No defects visible from a distance of 1000 mm at 90 degrees to surface.

.2 Soffits: No defects visible from floor at 45 degrees to surface when viewed using final lighting source.

.3 Final coat to exhibit uniformity of colour and uniformity of sheen across full surface area.

1.3 PERFORMANCE REQUIREMENTS

.1 Environmental Performance Requirements:

.1 Provide paint products meeting MPI "Environmentally Friendly" E1 E2 E3 ratings based on VOC (EPA Method 24) content levels.

.2 Green Performance in accordance with MPI Standard GPS-1.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Upon completion, submit records of products used. List products in relation to finish system and include the following:

.1 Product name, type and use.

.2 Manufacturer's product number.

.3 Colour numbers.

.4 MPI Environmentally Friendly classification system rating.

.5 Manufacturer's Material Safety Data Sheets (MSDS).

.4 Provide samples in accordance with Section 01 33 00 - Submittal Procedures.

.1 Submit duplicate 200 x 300 mm sample panels of each paint stain clear coating special finish with specified paint or coating in colours, gloss/sheen and textures required to MPI Painting Specification Manual standards submitted on the following substrate materials:

.1 3 mm plate steel for finishes over metal surfaces.

.2 13 mm birch plywood for finishes over wood surfaces.

.3 50 mm concrete block for finishes over concrete or concrete masonry surfaces.

.4 13 mm gypsum board for finishes over gypsum board and other smooth surfaces.

.5 10 mm cedar hardboard siding plywood for finishes over wood surfaces.

.2 When approved, samples shall become acceptable standard of quality for appropriate on-site surface with one of each sample retained on-site.

.3 Submit full range of available colours where colour availability is restricted.

1.5 QUALITY CONTROL

.1 Provide mock-up in accordance with Section 01 45 00 - Quality Control.

.2 When requested by Departmental Representative, Consultant or Paint Inspection Agency, prepare and paint designated surface, area, room or item to requirements specified herein, with specified paint or coating showing selected colours, number of coats, gloss/sheen, textures and workmanship to MPI Painting Specification Manual standards for review

and approval. When approved, surface, area, room and/or items shall become acceptable standard of finish quality and workmanship for similar on-site work.

1.6 MAINTENANCE

.1 Extra Materials:

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

.2 Submit two four litre cans of each type and colour of primer stain finish coating. Identify colour and paint type in relation to established colour schedule and finish system.

1.7 DELIVERY, STORAGE AND HANDLING

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

.1 Deliver and store materials in original containers, sealed, with labels intact.

.2 Labels: to indicate:

.1 Manufacturer's name and address.

.2 Type of paint or coating.

.3 Compliance with applicable standard.

.4 Colour number in accordance with established colour schedule.

.3 Remove damaged, opened and rejected materials from site.

.4 Provide and maintain dry, temperature controlled, secure storage.

.5 Observe manufacturer's recommendations for storage and handling.

.6 Store materials and supplies away from heat generating devices.

.7 Store materials and equipment in well-ventilated area with temperature range 7 degrees C to 30 degrees C.

.8 Store temperature sensitive products above minimum temperature as recommended by manufacturer.

.9 Remove paint materials from storage only in quantities required for same day use.

.10 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling storage, and disposal of hazardous materials.

.11 Fire Safety Requirements:

.1 Provide one 9 kg Type ABC dry chemical fire extinguisher adjacent to storage area.

.2 Store oily rags, waste products, empty containers and materials subject to spontaneous combustion in ULC approved, sealed containers and remove from site on a daily basis.

.3 Handle, store, use and dispose of flammable and combustible materials in accordance with the National Fire Code of Canada.

.2 Waste Management and Disposal:

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

.2 Paint, stain and wood preservative finishes and related materials (thinners, solvents, etc.) are regarded as hazardous products and are subject to regulations for disposal. Information on these controls can be obtained from Provincial Ministries of Environment and Regional levels of Government.

.3 Material which cannot be reused must be treated as hazardous waste and disposed of in an appropriate manner.

.4 Place materials defined as hazardous or toxic waste, including used sealant and adhesive tubes and containers, in containers or areas designated for hazardous waste.

.5 To reduce the amount of contaminants entering waterways, sanitary/storm drain systems or into the ground the following procedures shall be strictly adhered to:

.1 Retain cleaning water for water-based materials to allow sediments to be filtered out.

.2 Retain cleaners, thinners, solvents and excess paint and place in designated containers and ensure proper disposal.

.3 Return solvent and oil soaked rags used during painting operations for contaminant recovery, proper disposal, or appropriate cleaning and laundering.

.4 Dispose of contaminants in an approved legal manner in accordance with hazardous waste regulations.

.5 Empty paint cans are to be dry prior to disposal or recycling (where available).

.6 Where paint recycling is available, collect waste paint by type and provide for delivery to recycling or collection facility.

.7 Set aside and protect surplus and uncontaminated finish materials: Deliver to or arrange collection by employees, individuals, or organizations for verifiable re-use or re-manufacturing.

.8 Close and seal tightly partly used sealant and adhesive containers and store protected in well ventilated fire-safe area at moderate temperature.

1.8 AMBIENT CONDITIONS

.1 Heating, Ventilation and Lighting:

.1 Ventilate enclosed spaces.

.2 Do not perform painting work unless adequate and continuous ventilation and sufficient heating facilities are in place to maintain ambient air and substrate temperatures above 10 degrees C for 24 hours before, during and after paint application until paint has cured sufficiently.

.3 Where required, provide continuous ventilation for seven days after completion of application of paint.

.4 Provide temporary ventilating and heating equipment where permanent facilities are not available or supplemental ventilating and heating equipment

if ventilation and heating from existing system is inadequate to meet minimum requirements.

.5 Perform no painting work unless a minimum lighting level of 323 Lux is provided on surfaces to be painted. Adequate lighting facilities to be provided by General Contractor.

.2 Temperature, Humidity and Substrate Moisture Content Levels:

.1 Unless specifically pre-approved by specifying body, Paint Inspection Agency and, applied product manufacturer, perform no painting work when:

.1 Ambient air and substrate temperatures are below 10 degrees C.

.2 Substrate temperature is over 32 degrees C unless paint is specifically formulated for application at high temperatures.

.3 Substrate and ambient air temperatures are expected to fall outside MPI or paint manufacturer's prescribed limits.

.4 Relative humidity is above 85 % or when dew point is less than 3 degrees C variance between air/surface temperatures.

.5 Rain or snow are forecast to occur before paint has thoroughly cured or when it is foggy, misty, raining or snowing at site.

.2 Perform no painting work when maximum moisture content of substrate exceeds:

.1 12% for concrete and masonry (clay and concrete brick/block).

.2 15% for wood.

.3 12% for plaster and gypsum board.

.3 Conduct moisture tests using a properly calibrated electronic Moisture Meter, except test concrete floors for moisture using a simple "cover patch test".

.4 Test concrete, masonry and plaster surfaces for alkalinity as required.

.3 Surface and Environmental Conditions:

.1 Apply paint finish in areas where dust is no longer being generated by related construction operations or when wind or ventilation conditions are such that airborne particles will not affect quality of finished surface.

.2 Apply paint to adequately prepared surfaces and to surfaces within moisture limits noted herein.

.3 Apply paint when previous coat of paint is dry or adequately cured.

.4 Apply paint finishes when conditions forecast for entire period of application fall within manufacturer's recommendations.

.5 Do not apply paint when:

.1 Temperature is expected to drop below 10 degrees C before paint has thoroughly cured.

.2 Substrate and ambient air temperatures are expected to fall outside MPI or paint manufacturer's limits.

.3 Surface to be painted is wet, damp or frosted.

.6 Provide and maintain cover when paint must be applied in damp or cold weather. Heat substrates and surrounding air to comply with temperature

and humidity conditions specified by manufacturer. Protect until paint is dry or until weather conditions are suitable.

.7 Schedule painting operations such that surfaces exposed to direct, intense sunlight are scheduled for completion during early morning.

.8 Remove paint from areas which have been exposed to freezing, excess humidity, rain, snow or condensation. Prepare surface again and repaint.

.9 Paint occupied facilities in accordance with approved schedule only.

Part 2 Products

2.1 MATERIALS

.1 Paint materials listed in latest edition of MPI Approved Products List (APL) are acceptable for use on this project.

.2 Paint materials for paint systems: to be products of single manufacturer.

.3 Only qualified products with E3 "Environmentally Friendly" ratings are acceptable for use on this project.

2.2 COLOURS

.1 Departmental Representative will provide color schedule after award.

.2 Colour schedule will be based upon selection of five base colours and three accent colours. No more than eight colours will be selected for entire project and no more than three colours will be selected in each area.

.3 Selection of colours will be from manufacturers' full range of colours.

.4 Where specific products are available in restricted range of colours, selection will be based on limited range.

.5 Second coat in three coat system to be tinted slightly lighter colour than top coat to show visible difference between coats.

2.3 MIXING AND TINTING

.1 Perform colour tinting operations prior to delivery of paint to site. On-site tinting of painting materials is allowed only with Departmental Representative's written permission.

.2 Mix paste, powder or catalyzed paint mixes in accordance with manufacturer's written instructions.

.3 Add thinner to paint manufacturer's recommendations. Do not use kerosene or organic solvents to thin water-based paints.

.4 Thin paint for spraying according in accordance with paint manufacturer's instructions. If directions are not on container, obtain instructions in writing from manufacturer and provide copy of instructions to Departmental Representative and Consultant.

.5 Re-mix paint in containers prior to and during application to ensure break-up of lumps, complete dispersion of settled pigment, and colour and gloss uniformity.

2.4 GLOSS/SHEEN RATINGS

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

Gloss Level Category/	Units @ 60 Degrees/	Units @ 85 Degrees/
G1 - matte finish	0 to 5	max. 10
G2 - velvet finish	0 to 10	10 to 35
G3 - eggshell finish	10 to 25	10 to 35
G4 - satin finish	20 to 35	min. 35
G5 - semi-gloss finish	35 to 70	
G6 - gloss finish	70 to 85	
G7 - high gloss finish	85	

.2 Gloss level ratings of painted surfaces as noted on Finish Schedule.

2.5 EXTERIOR PAINTING SYSTEMS

.1 Asphalt Surfaces: zone/traffic marking for drive and parking areas, etc.

.1 EXT 2.1A - Latex zone/traffic marking finish.

.2 EXT 2.1B - Alkyd zone/traffic marking finish.

.2 Structural Steel and Metal Fabrications:

.1 EXT 5.1B - Waterborne light industrial insert gloss level coating (over inorganic zinc).

.3 Steel - High Heat: heat exchangers, breeching, pipes, flues, stacks, etc., with temperature range as noted

.1 EXT 5.2A - Heat resistant enamel finish, maximum 205 degrees C

.4 Galvanized Metal: not chromate passivated

.1 EXT 5.3B - Alkyd insert gloss level finish.

.5 Dimension Lumber: columns, beams, exposed joists, underside of decking, siding, fencing, etc.

.1 EXT 6.2E - Varnish gloss finish (over stain).

.2 EXT 6.2K - Varnish gloss semi-gloss finish.

.3 EXT 6.2L - Semi-transparent stain finish.

.6 Dressed Lumber: doors, door and window frames, casings, battens, smooth facias, etc.

.1 EXT 6.3A - Latex insert gloss level finish. do not use flat finish on doors.

.2 EXT 6.3B - Alkyd insert gloss level finish do not use flat finish on doors.

.3 EXT 6.3C - Solid colour stain finish do not use in high contact areas or on doors.

.4 EXT 6.3D - Semi-transparent stain finish do not use on doors.

.5 EXT 6.3E - Varnish gloss semi-gloss finish (over stain).

.6 EXT 6.3F - Varnish gloss semi-gloss finish.

.7 EXT 6.3G - Clear (2 component) polyurethane finish.

.8 EXT 6.3H - Pigmented polyurethane finish.

.9 EXT 6.3J - Waterborne light industrial insert gloss level coating use gloss or semi-gloss finish on doors and frames only.

.10 EXT 6.3K - Waterborne solid colour stain finish do not use flat finish on doors and frames.

.11 EXT 6.3L - Latex insert gloss level finish (over latex primer) do not use flat finish on doors.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 EXAMINATION

.1 Exterior repainting work: inspected by MPI Accredited Paint Inspection Agency (inspector) acceptable to specifying authority and local Painting Contractor's Association. Painting contractor to notify Paint Inspection Agency minimum of one week prior to commencement of work and provide copy of project repainting specification and Finish Schedule.

.2 Exterior surfaces requiring repainting: inspected by both painting contractor and Paint Inspection Agency who will notify Consultant in writing of defects or problems, prior to commencing repainting work, or after surface preparation if unseen substrate damage is discovered.

.3 Where assessed degree of surface degradation of DSD-1 to DSD-3 before preparation of surfaces for repainting is revealed to be DSD-4 after preparation, repair or replacement of such unforeseen defects discovered are to be corrected, as mutually agreed, before repainting is started.

.4 Where "special" repainting or recoating system applications (i.e. elastomeric coatings) or non-MPI listed products or systems are to be used, paint or coating manufacturer to provide as part of work, certification of surfaces and conditions for specific paint or coating system application as well as on site supervision, inspection and approval of their paint or coating system application as required at no additional cost to Departmental Representative.

3.3 PREPARATION

.1 Perform preparation and operations for exterior painting in accordance with MPI Maintenance Repainting Manual except where specified otherwise.

.2 Apply paint materials in accordance with paint manufacturer's written application instructions.

.3 Clean and prepare exterior surfaces to be repainted in accordance with MPI Maintenance Repainting Manual requirements. Refer to the MPI Manual in regard to specific requirements and as follows:

.1 Remove dust, dirt, and surface debris by vacuuming, wiping with dry, clean cloths or compressed air.

.2 Wash surfaces with a biodegradable detergent and bleach where applicable and clean warm water using a stiff bristle brush to remove dirt, oil and other surface contaminants.

.3 Rinse scrubbed surfaces with clean water until foreign matter is flushed from surface.

.4 Allow surfaces to drain completely and allow to dry thoroughly. Allow sufficient drying time and test surfaces using electronic moisture meter before commencing work.

.5 Use water-based cleaners in place of organic solvents where surfaces will be repainted using water based paints.

.6 Many water-based paints cannot be removed with water once dried. Minimize use of kerosene or such organic solvents to clean up water-based paints.

.4 Clean metal surfaces to be repainted by removing rust, dirt, oil, grease and foreign substances in accordance with MPI requirements. Remove such contaminates from surfaces, pockets and corners to be repainted by brushing with clean brushes, blowing with clean dry compressed air, or brushing/vacuum cleaning as required.

.5 Prevent contamination of cleaned surfaces by salts, acids, alkalis, other corrosive chemicals, grease, oil and solvents before priming and between applications of remaining coats. Touch-up, spot prime, and apply primer, paint, or pretreatment as soon as possible after cleaning and before deterioration occurs.

.6 Sand and dust between coats as required to provide adequate adhesion for next coat and to remove defects visible from a distance up to 1000 mm.

3.4 EXISTING CONDITIONS

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

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

.3 Maximum moisture content as follows:

.1 Stucco: 12%.

.2 Concrete: 12%.

.3 Clay and Concrete Block/Brick: 12%.

.4 Wood: 15%.

3.5 PROTECTION

.1 Protect existing building surfaces and adjacent structures from paint spatters, markings and other damage by suitable non-staining covers or masking. If damaged, clean and restore such surfaces as directed by Departmental Representative and Consultant.

.2 Protect items that are permanently attached such as Fire Labels on doors and frames.

.3 Protect factory finished products and equipment.

.4 Remove light fixtures, surface hardware on doors, and other surface mounted equipment, fittings and fastenings prior to undertaking painting operations. Store items and re-install after painting is completed.

.5 Move and cover exterior furniture and portable equipment as necessary to carry out painting operations. Replace as painting operations progress.

.6 As painting operations progress, place "WET PAINT" signs in pedestrian and vehicle traffic areas to approval of Departmental Representative and Consultant.

3.6 APPLICATION

.1 Method of application to be as approved by Departmental Representative and Consultant. Apply paint by brush roller air sprayer airless sprayer. Conform to manufacturer's application instructions unless specified otherwise.

.2 Brush and Roller Application:

- .1 Apply paint in a uniform layer using brush and/or roller of types suitable for application.
- .2 Work paint into cracks, crevices and corners.
- .3 Paint surfaces and corners not accessible to brush using spray, daubers and/or sheepskins. Paint surfaces and corners not accessible to roller using brush, daubers or sheepskins.
- .4 Brush and/or roll out runs and sags, and over-lap marks. Rolled surfaces shall be free of roller tracking and heavy stipple unless approved by Departmental Representative and Consultant.
- .5 Remove runs, sags and brush marks from finished work and repaint.

.3 Spray Application:

- .1 Provide and maintain equipment that is suitable for intended purpose, capable of properly atomizing paint to be applied, and equipped with suitable pressure regulators and gauges.
- .2 Keep paint ingredients properly mixed in containers during paint application either by continuous mechanical agitation or by intermittent agitation as frequently as necessary.
- .3 Apply paint in a uniform layer, with overlapping at edges of spray pattern.
- .4 Brush out immediately runs and sags.
- .5 Use brushes to work paint into cracks, crevices and places which are not adequately painted by spray.

.4 Use dipping, sheepskins or daubers when no other method is practical in places of difficult access and when specifically authorized by Departmental Representative and Consultant.

.5 Apply coats of paint as continuous film of uniform thickness. Repaint thin spots or bare areas before next coat of paint is applied.

.6 Allow surfaces to dry and properly cure after cleaning and between subsequent coats for minimum time period as recommended by manufacturer.

.7 Sand and dust between coats to remove visible defects.

.8 Finish surfaces both above and below sight lines as specified for surrounding surfaces, including such surfaces as projecting ledges.

.9 Finish top, bottom, edges and cutouts of doors after fitting as specified for door surfaces.

3.7 MECHANICAL/ELECTRICAL EQUIPMENT

.1 Unless otherwise specified, paint exterior exposed conduits, piping, hangers, duct work and other mechanical and electrical equipment with colour and finish to match adjacent surfaces, except as noted otherwise.

.2 Touch up scratches and marks on factory painted finishes and equipment with paint as supplied by manufacturer of equipment.

.3 Do not paint over nameplates.

.4 Paint fire protection piping red.

.5 Paint steel electrical light standards. Do not paint outdoor transformers and substation equipment.

3.8 FIELD QUALITY CONTROL

.1 Inspection:

.1 Field inspection of exterior painting operations to be carried out be independent inspection firm as designated by Departmental Representative and paid for by the cash allowance.

.2 Advise Departmental Representative when each surface and applied coating is ready for inspection. Do not proceed with subsequent coats until previous coat has been approved.

.3 Co-operate with inspection firm and provide access to areas of work.

.2 Manufacturer's Field Services:

.1 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

3.9 CLEANING

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

.1 Remove paint where spilled, splashed, splattered or sprayed as work progresses using means and materials that are not detrimental to affected surfaces.

3.10 RESTORATION

.1 Clean and re-install hardware items removed before undertaken painting operations.

.2 Remove protective coverings and warning signs as soon as practical after operations cease.

.3 Remove paint splashings on exposed surfaces that were not painted. Remove smears and spatter immediately as operations progress, using compatible solvent.

.4 Protect freshly completed surfaces from paint droppings and dust to approval of Consultant. Avoid scuffing newly applied paint.

.5 Restore areas used for storage, cleaning, mixing and handling of paint to clean condition as approved by Consultant.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section Includes:

.1 Material and installation of site applied paint finishes to new interior surfaces, including site painting of shop primed surfaces.

1.2 REFERENCES

.1 Department of Justice Canada (Jus)

.1 Canadian Environmental Protection Act (CEPA), 1999, c. 33

.2 Environmental Protection Agency (EPA)

.1 EPA Test Method for Measuring Total Volatile Organic Compound Content of Consumer Products, Method 24 - 1995, (for Surface Coatings).

.3 Health Canada / Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

.4 Master Painters Institute (MPI)

.1 MPI Architectural Painting Specifications Manual, 2004.

.5 National Fire Code of Canada - 1995

.6 Society for Protective Coatings (SSPC)

.1 SSPC Painting Manual, Volume Two, 8th Edition, Systems and Specifications Manual.

.7 Transport Canada (TC)

.1 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34 .

1.3 QUALITY ASSURANCE

.1 Qualifications:

.1 Journeymen: qualified journeymen who have "Tradesman Qualification Certificate of Proficiency" engaged in painting work.

.2 Apprentices: working under direct supervision of qualified trades person in accordance with trade regulations.

.2 Pre-Installation Meeting:

.1 Convene pre-installation meeting one week prior to beginning work of this Section on-site installations in accordance with Section 01 32 16.07 - Construction Progress Schedules - Bar (GANTT) Chart.

.1 Verify project requirements.

.2 Review installation and substrate conditions.

.3 Coordination with other building subtrades.

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

.3 Health and Safety:

.1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.4 SCHEDULING

.1 Submit work schedule for various stages of painting to Departmental Representative for review. Submit schedule minimum of 48 hours in advance of proposed operations.

.2 Obtain written authorization from Departmental Representative for changes in work schedule.

.3 Schedule painting operations to prevent disruption of occupants.

.4 The mechanical Rooms and other rooms where a significant amount mechanical and electrical equipment are to be painted prior to the installation of the electrical and mechanical work.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit product data and instructions for each paint and coating product to be used.

.2 Submit product data for the use and application of paint thinner.

.3 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00 - Submittal Procedures. Indicate VOCs during application and curing.

.3 Samples:

.1 Submit full range colour sample chips to indicate where colour availability is restricted.

.2 Submit duplicate 200 x 300 mm sample panels of each paint stain clear coating special finish with specified paint or coating in colours, gloss/sheen and textures required to MPI Architectural Painting Specification Manual standards submitted on following substrate materials:

.1 3 mm plate steel for finishes over metal surfaces.

.2 13 mm birch plywood for finishes over wood surfaces.

.3 50 mm concrete block for finishes over concrete or concrete masonry surfaces.

.4 13 mm gypsum board for finishes over gypsum board and other smooth surfaces.

.5 10 mm cedar hardboard siding plywood for finishes over wood surfaces.

.3 Retain reviewed samples on-site to demonstrate acceptable standard of quality for appropriate on-site surface.

.4 Test reports: submit certified test reports for paint from approved independent testing laboratories, indicating compliance with specifications for specified performance characteristics and physical properties.

.1 Lead, cadmium and chromium: presence of and amounts.

.2 Mercury: presence of and amounts.

.3 Organochlorines and PCBs: presence of and amounts.

.5 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.6 Manufacturer's Instructions:

.1 Submit manufacturer's installation application instructions.

.7 Closeout Submittals: submit maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals include following:

.1 Product name, type and use.

.2 Manufacturer's product number.

.3 Colour numbers.

.4 MPI Environmentally Friendly classification system rating.

1.6 MAINTENANCE

.1 Extra Materials:

.1 Deliver to extra materials from same production run as products installed. Package products with protective covering and identify with descriptive labels. Comply with Section 01 78 00 - Closeout Submittals.

.2 Quantity: provide one - four litre can of each type and colour of primer stain finish coating. Identify colour and paint type in relation to established colour schedule and finish system.

.3 Delivery, storage and protection: comply Departmental Representative requirements for delivery and storage of extra materials.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Packing, Shipping, Handling and Unloading:

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

.2 Acceptance at Site:

.1 Identify products and materials with labels indicating:

.1 Manufacturer's name and address.

.2 Type of paint or coating.

.3 Compliance with applicable standard.

.4 Colour number in accordance with established colour schedule.

.3 Remove damaged, opened and rejected materials from site.

.4 Storage and Protection:

.1 Provide and maintain dry, temperature controlled, secure storage.

.2 Store materials and supplies away from heat generating devices.

.3 Store materials and equipment in well-ventilated area with temperature range 7 degrees C to 30 degrees C.

.5 Store temperature sensitive products above minimum temperature as recommended by manufacturer.

.6 Keep areas used for storage, cleaning and preparation clean and orderly. After completion of operations, return areas to clean condition.

.7 Remove paint materials from storage only in quantities required for same day use.

.8 Fire Safety Requirements:

.1 Provide one 9 kg Type ABC dry chemical fire extinguisher adjacent to storage area.

.2 Store oily rags, waste products, empty containers and materials subject to spontaneous combustion in ULC approved, sealed containers and remove from site on a daily basis.

.3 Handle, store, use and dispose of flammable and combustible materials in accordance with National Fire Code of Canada requirements.

.9 Waste Management and Disposal:

.1 Separate waste materials for reuse recycling in accordance with Section01 74 21 - Construction/Demolition Waste Management and Disposal.

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

.3 Handle and dispose of hazardous materials in accordance with Regional and Municipal, regulations.

.4 Ensure emptied containers are sealed and stored safely.

.5 Unused paint coating materials must be disposed of at official hazardous material collections site as approved by Departmental Representative.

.6 Paint, stain and wood preservative finishes and related materials (thinners, and solvents) are regarded as hazardous products and are subject to regulations for disposal. Information on these controls can be obtained from Provincial Ministries of Environment and Regional levels of Government.

.7 Material which cannot be reused must be treated as hazardous waste and disposed of in an appropriate manner.

.8 Place materials defined as hazardous or toxic waste, including used sealant and adhesive tubes and containers, in containers or areas designated for hazardous waste.

.9 To reduce the amount of contaminants entering waterways, sanitary/storm drain systems or into ground follow these procedures:

.1 Retain cleaning water for water-based materials to allow sediments to be filtered out.

.2 Retain cleaners, thinners, solvents and excess paint and place in designated containers and ensure proper disposal.

.3 Return solvent and oil soaked rags used during painting operations for contaminant recovery, proper disposal, or appropriate cleaning and laundering.

.4 Dispose of contaminants in approved legal manner in accordance with hazardous waste regulations.

.5 Empty paint cans are to be dry prior to disposal or recycling (where available).

.10 Where paint recycling is available, collect waste paint by type and provide for delivery to recycling or collection facility.

.11 Set aside and protect surplus and uncontaminated finish materials: . Deliver to or arrange collection by employees, individuals, or organizations for verifiable re-use or re-manufacturing.

1.8 SITE CONDITIONS

.1 Heating, Ventilation and Lighting:

.1 Ventilate enclosed spaces.

.2 Provide heating facilities to maintain ambient air and substrate temperatures above 10 degrees C for 24 hours before, during and after paint application until paint has cured sufficiently.

.3 Provide continuous ventilation for seven days after completion of application of paint.

.4 Coordinate use of existing ventilation system with Departmental Representative and Consultant and ensure its operation during and after application of paint as required.

.5 Provide temporary ventilating and heating equipment where permanent facilities are not available or supplemental ventilating and heating equipment if ventilation and heating from existing system is inadequate to meet minimum requirements.

.6 Provide minimum lighting level of 323 Lux on surfaces to be painted.

.2 Temperature, Humidity and Substrate Moisture Content Levels:

.1 Unless pre-approved written approval by Paint Inspection Agency Authority and product manufacturer, perform no painting when:

.1 Ambient air and substrate temperatures are below 10 degrees C.

.2 Substrate temperature is above 32 degrees C unless paint is specifically formulated for application at high temperatures.

.3 Substrate and ambient air temperatures are not expected to fall within MPI or paint manufacturer's prescribed limits.

.4 The relative humidity is under 85% or when the dew point is more than 3 degrees C variance between the air/surface temperatures. Paint should not be applied if the dew point is less than 3 degrees C below the ambient or surface temperature. Use sling psychrometer to establish the relative humidity before beginning paint work.

.5 Rain or snow are forecast to occur before paint has thoroughly cured or when it is foggy, misty, raining or snowing at site.

.6 Ensure that conditions are within specified limits during drying or curing process, until newly applied coating can itself withstand 'normal' adverse environmental factors.

.2 Perform painting work when maximum moisture content of the substrate is below:

.1 Allow new concrete and masonry to cure minimum of 28 days.

.2 15% for wood.

.3 12% for plaster and gypsum board.

.3 Test for moisture using calibrated electronic Moisture Meter. Test concrete floors for moisture using "cover patch test".

.4 Test concrete, masonry and plaster surfaces for alkalinity as required.

.3 Surface and Environmental Conditions:

.1 Apply paint finish in areas where dust is no longer being generated by related construction operations or when wind or ventilation conditions are such that airborne particles will not affect quality of finished surface.

.2 Apply paint to adequately prepared surfaces and to surfaces within moisture limits.

.3 Apply paint when previous coat of paint is dry or adequately cured.

.4 Additional interior application requirements:

.1 Apply paint finishes when temperature at location of installation can be satisfactorily maintained within manufacturer's recommendations.

Part 2 Products

2.1 MATERIALS

.1 Materials and resources in accordance with Section 01 47 15 - Sustainable Requirements: Construction.

.2 Paint materials listed in the MPI Approved Products List (APL) are acceptable for use on this project.

.3 Provide paint materials for paint systems from single manufacturer.

.4 Only qualified products with E3 "Environmentally Friendly" rating are acceptable for use on this project.

.5 Conform to latest MPI requirements for interior painting work including preparation and priming.

.6 Materials (primers, paints, coatings, varnishes, stains, lacquers, fillers, thinners, solvents, etc.) in accordance with MPI Architectural Painting Specification Manual "Approved Product" listing.

.7 Linseed oil, shellac, and turpentine: highest quality product from approved manufacturer listed in MPI Architectural Painting Specification Manual, compatible with other coating materials as required.

.8 Water-borne paints and stains, recycled water-borne surface coatings and water borne varnishes to meet minimum "Environmentally Friendly" E2 rating.

2.2 COLOURS

.1 Departmental Representative will provide color schedule after contract award

.2 Colour schedule will be based upon selection of seven base colours and five accent colours. No more than twelve colours will be selected for entire project and no more than five colours will be selected in each area.

.3 Selection of colours from manufacturers' full range of colours.

.4 Where specific products are available in restricted range of colours, selection based on limited range.

.5 Second coat in three coat system to be tinted slightly lighter colour than top coat to show visible difference between coats.

2.3 MIXING AND TINTING

.1 Perform colour tinting operations prior to delivery of paint to site.

.2 Mix paste, powder or catalyzed paint mixes in accordance with manufacturer's written instructions.

.3 Use and add thinner in accordance with paint manufacturer's recommendations. Do not use kerosene or similar organic solvents to thin water-based paints.

.4 Thin paint for spraying in accordance with paint manufacturer's instructions.

.5 Re-mix paint in containers prior to and during application to ensure break-up of lumps, complete dispersion of settled pigment, and colour and gloss uniformity.

2.4 GLOSS/SHEEN RATINGS

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

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

.2 Gloss level ratings of painted surfaces as indicated as noted on Finish Schedule.

2.5 INTERIOR PAINTING SYSTEMS

.1 Concrete horizontal surfaces: floors and stairs:

.1 INT 3.2F - Concrete floor sealer.

.2 Concrete masonry units: smooth and split face block and brick:

.1 INT 4.2D - High performance architectural G5 latex finish.

.3 Structural steel and metal fabrications: columns, beams, joists:

.1 INT 5.1B - Waterborne light industrial G5 coating.

.4 Galvanized metal: doors, frames, railings, misc. steel, pipes, overhead decking, and ducts.

.1 INT 5.3B - Waterborne light industrial G5 coating.

.5 Dressed lumber: including doors, door and window frames, casings, mouldings:

.1 INT 6.3E - Polyurethane varnish G5 finish (over stain).

.6 Wood paneling and casework: partitions, panels, shelving, millwork:

.1 INT 6.4E - Polyurethane varnish G5 finish (over stain).

.7 Plaster and gypsum board: gypsum wallboard, drywall, "sheet rock type material", and textured finishes:

.1 INT 9.2A - Latex G3 finish (over latex sealer).

.8 Canvas and cotton coverings.

.1 INT 10.1A - Latex G3 finish.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 GENERAL

.1 Perform preparation and operations for interior painting in accordance with MPI Architectural Painting Specifications Manual except where specified otherwise.

.2 Apply paint materials in accordance with paint manufacturer's written application instructions.

3.3 EXAMINATION

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

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

.3 Maximum moisture content as follows:

.1 Stucco, plaster and gypsum board: 12%.

.2 Concrete: 12%.

.3 Clay and Concrete Block/Brick: 12%.

.4 Wood: 15%.

3.4 PREPARATION

.1 Protection:

.1 Protect existing building surfaces and adjacent structures from paint spatters, markings and other damage by suitable non-staining covers or masking. If damaged, clean and restore surfaces as directed by Departmental Representative.

.2 Protect items that are permanently attached such as Fire Labels on doors and frames.

.3 Protect factory finished products and equipment.

.4 Protect passing pedestrians, building occupants and general public in and about the building.

.2 Surface Preparation:

.1 Remove electrical cover plates, light fixtures, surface hardware on doors, bath accessories and other surface mounted equipment, fittings and fastenings prior to undertaking painting operations. Identify and store items in secure location and re-installed after painting is completed.

.2 Move and cover furniture and portable equipment as necessary to carry out painting operations. Replace as painting operations progress.

.3 Place "WET PAINT" signs in occupied areas as painting operations progress. Signs to approval of Departmental Representative.

.3 Clean and prepare surfaces in accordance with MPI Architectural Painting Specification Manual requirements. Refer to MPI Manual in regard to specific requirements and as follows:

.1 Remove dust, dirt, and other surface debris by vacuuming, wiping with dry, clean cloths or compressed air.

.2 Wash surfaces with a biodegradable detergent and bleach where applicable and clean warm water using a stiff bristle brush to remove dirt, oil and other surface contaminants.

.3 Rinse scrubbed surfaces with clean water until foreign matter is flushed from surface.

.4 Allow surfaces to drain completely and allow to dry thoroughly.

.5 Prepare surfaces for water-based painting, water-based cleaners should be used in place of organic solvents.

.6 Use trigger operated spray nozzles for water hoses.

.7 Many water-based paints cannot be removed with water once dried. Minimize use of mineral spirits or organic solvents to clean up water-based paints.

.4 Prevent contamination of cleaned surfaces by salts, acids, alkalis, other corrosive chemicals, grease, oil and solvents before prime coat is applied and between applications of remaining coats. Apply primer, paint, or pretreatment as soon as possible after cleaning and before deterioration occurs.

.5 Where possible, prime non-exposed surfaces of new wood surfaces before installation. Use same primers as specified for exposed surfaces.

.1 Apply vinyl sealer to MPI #36 over knots, pitch, sap and resinous areas.

.2 Apply wood filler to nail holes and cracks.

.3 Tint filler to match stains for stained woodwork.

.6 Sand and dust between coats as required to provide adequate adhesion for next coat and to remove defects visible from a distance up to 1000 mm.

.7 Clean metal surfaces to be painted by removing rust, loose mill scale, welding slag, dirt, oil, grease and other foreign substances in accordance with MPI requirements. Remove traces of blast products from surfaces, pockets and corners to be painted by brushing with clean brushes blowing with clean dry compressed air vacuum cleaning.

.8 Touch up of shop primers with primer as specified.

.9 Do not apply paint until prepared surfaces have been accepted Departmental Representative

3.5 APPLICATION

.1 Method of application to be as approved by Departmental Representative. Apply paint by brush roller air sprayer airless sprayer. Conform to manufacturer's application instructions unless specified otherwise.

.2 Brush and Roller Application:

.1 Apply paint in uniform layer using brush and/or roller type suitable for application.

.2 Work paint into cracks, crevices and corners.

.3 Paint surfaces and corners not accessible to brush using spray, daubers and/or sheepskins. Paint surfaces and corners not accessible to roller using brush, daubers or sheepskins.

.4 Brush and/or roll out runs and sags, and over-lap marks. Rolled surfaces free of roller tracking and heavy stipple.

.5 Remove runs, sags and brush marks from finished work and repaint.

.3 Spray application:

.1 Provide and maintain equipment that is suitable for intended purpose, capable of atomizing paint to be applied, and equipped with suitable pressure regulators and gauges.

.2 Keep paint ingredients properly mixed in containers during paint application either by continuous mechanical agitation or by intermittent agitation as frequently as necessary.

.3 Apply paint in uniform layer, with overlapping at edges of spray pattern. Back roll first coat application.

.4 Brush out immediately all runs and sags.

.5 Use brushes and rollers to work paint into cracks, crevices and places which are not adequately painted by spray.

.4 Use dipping, sheepskins or daubers only when no other method is practical in places of difficult access.

.5 Apply coats of paint continuous film of uniform thickness. Repaint thin spots or bare areas before next coat of paint is applied.

.6 Allow surfaces to dry and properly cure after cleaning and between subsequent coats for minimum time period as recommended by manufacturer.

.7 Sand and dust between coats to remove visible defects.

.8 Finish surfaces both above and below sight lines as specified for surrounding surfaces, including such surfaces as tops of interior cupboards and cabinets and projecting ledges.

.9 Finish inside of cupboards and cabinets as specified for outside surfaces.

.10 Finish closets and alcoves as specified for adjoining rooms.

.11 Finish top, bottom, edges and cutouts of doors after fitting as specified for door surfaces.

3.6 MECHANICAL/ELECTRICAL EQUIPMENT

.1 Paint finished area exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment with colour and finish to match adjacent surfaces, except as indicated.

.2 Boiler room, mechanical and electrical rooms: paint exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment.

.3 Other unfinished areas: leave exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment in original finish and touch up scratches and marks.

.4 Touch up scratches and marks on factory painted finishes and equipment with paint as supplied by manufacturer of equipment.

.5 Do not paint over nameplates.

.6 Keep sprinkler heads free of paint.

.7 Paint inside of ductwork where visible behind grilles, registers and diffusers with primer and one coat of matt black paint.

.8 Paint fire protection piping red.

.9 Paint disconnect switches for fire alarm system and exit light systems in red enamel.

.10 Paint natural gas piping yellow.

.11 Paint both sides and edges of backboards for telephone and electrical equipment before installation. Leave equipment in original finish except for touch-up as required, and paint conduits, mounting accessories and other unfinished items.

.12 Do not paint interior transformers and substation equipment.

3.7 SITE TOLERANCES

.1 Walls: no defects visible from a distance of 1000 mm at 90 degrees to surface.

.2 Ceilings: no defects visible from floor at 45 degrees to surface when viewed using final lighting source.

.3 Final coat to exhibit uniformity of colour and uniformity of sheen across full surface area.

3.8 FIELD QUALITY CONTROL

.1 Interior painting and decorating work shall be inspected by a Paint Inspection Agency (inspector) acceptable to the specifying authority and local Painting Contractor's Association. Painting contractor shall notify Paint Inspection Agency a minimum of one week prior to commencement of work and provide a copy of project painting specification, plans and elevation drawings (including pertinent details) as well as a Finish Schedule.

.2 Interior surfaces requiring painting shall be inspected by Paint Inspection Agency who shall notify Departmental Representative and General Contractor in writing of defects or problems, prior to commencing painting work, or after prime coat shows defects in substrate.

.3 Where "special" painting, coating or decorating system applications (i.e. elastomeric coatings) or non-MPI listed products or systems are to be used, paint or coating manufacturer shall provide as part of this work, certification of surfaces and conditions for specific paint or coating system application as well as on site supervision, inspection and approval of their paint or coating system application as required at no additional cost to Departmental Representative.

.4 Standard of Acceptance:

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

.5 Field inspection of painting operations to be carried out by independent inspection firm as designated by Departmental Representative and paid for by Section 01 21 00 Allowances.

.6 Advise Departmental Representative when surfaces and applied coating is ready for inspection. Do not proceed with subsequent coats until previous coat has been approved.

.7 Cooperate with inspection firm and provide access to areas of work.

.8 Retain purchase orders, invoices and other documents to prove conformance with noted MPI requirements when requested by Departmental Representative.

3.9 RESTORATION

.1 Clean and re-install hardware items removed before undertaken painting operations.

.2 Remove protective coverings and warning signs as soon as practical after operations cease.

.3 Remove paint splashings on exposed surfaces that were not painted. Remove smears and spatter immediately as operations progress, using compatible solvent.

.4 Protect freshly completed surfaces from paint droppings and dust to approval of Departmental Representative. Avoid scuffing newly applied paint.

.5 Restore areas used for storage, cleaning, mixing and handling of paint to clean condition as approved by Departmental Representative.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

.2 National Fire Protection Association (NFPA)

.1 NFPA 10-2006, Standard for Portable Fire Extinguishers.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's printed product literature and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Submit two copies WHMIS MSDS - Material Safety Data Sheets in accordance with Section 02 81 01 - Hazardous Materials.

.3 Provide shop drawings.

.4 Closeout Submittals:

.1 Provide operation and maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Packing, shipping, handling and unloading:

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

.2 Waste Management and Disposal:

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

Part 2 Products

2.1 MULTI-PURPOSE DRY CHEMICAL EXTINGUISHERS

.1 Stored pressure rechargeable type with hose and shut-off nozzle, ULC labelled for A, B and C class protection.

.1 Sizes 9 kg or as indicated.

2.2 EXTINGUISHER BRACKETS

.1 Type recommended by extinguisher manufacturer.

2.3 IDENTIFICATION

.1 Identify extinguishers in accordance with recommendations of ANSI/NFPA 10 CAN/ULC-S508.

.2 Attach tag or label to extinguishers, indicating month and year of installation. Provide space for service dates.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

.1 Install or mount extinguishers in cabinets or on brackets as indicated.

.2 Install fire safety blankets as indicated.

END OF SECTION

Part 1 General

1.1 SUBMITTALS

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

.2 Shop drawings to show:

- .1 Mounting arrangements.
- .2 Operating and maintenance clearances.

.3 Shop drawings and product data accompanied by:

- .1 Detailed drawings of bases, supports, and anchor bolts.
- .2 Acoustical sound power data, where applicable.
- .3 Points of operation on performance curves.
- .4 Manufacturer to certify current model production.
- .5 Certification of compliance to applicable codes.

.4 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.

.5 Closeout Submittals:

- .1 Provide operation and maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.
- .2 Operation and maintenance manual approved by, and final copies deposited with, Project Manager before final inspection.
- .3 Operation data to include:
  - .1 Control schematics for systems including environmental controls.
  - .2 Description of systems and their controls.
  - .3 Description of operation of systems at various loads together with reset schedules and seasonal variances.
  - .4 Operation instruction for systems and component.
  - .5 Description of actions to be taken in event of equipment failure.
  - .6 Valves schedule and flow diagram.
  - .7 Colour coding chart.
- .4 Maintenance data to include:
  - .1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
  - .2 Data to include schedules of tasks, frequency, tools required and task time.
- .5 Performance data to include:
  - .1 Equipment manufacturer's performance datasheets with point of operation as left after commissioning is complete.
  - .2 Equipment performance verification test results.
  - .3 Special performance data as specified.

.4 Testing, adjusting and balancing reports as specified in Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.

.6 Approvals:

.1 Submit 2 copies of draft Operation and Maintenance Manual to Project Manager for approval. Submission of individual data will not be accepted unless directed by Project Manager.

.2 Make changes as required and re-submit as directed by Project Manager.

.7 Additional data:

.1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.

.8 Site records:

.1 Project Manager will provide 1 set of reproducible mechanical drawings. Provide sets of white prints as required for each phase of work. Mark changes as work progresses and as changes occur. Include changes to existing mechanical systems, control systems and low voltage control wiring.

.2 Transfer information weekly to reproducibles, revising reproducibles to show work as actually installed.

.3 Use different colour waterproof ink for each service.

.4 Make available for reference purposes and inspection.

.9 As-built drawings:

.1 Prior to start of Testing, Adjusting and Balancing for HVAC, finalize production of as-built drawings.

.2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: - "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (Date).

.3 Submit to Project Manager for approval and make corrections as directed.

.4 Perform testing, adjusting and balancing for HVAC using as-built drawings.

.5 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.

.10 Submit copies of as-built drawings for inclusion in final TAB report.

1.2 QUALITY ASSURANCE

.1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.

.2 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.3 MAINTENANCE

.1 Furnish spare parts in accordance with Section 01 78 00 - Closeout Submittals as follows:

.1 One set of packing for each pump.

.2 One casing joint gasket for each size pump.

.3 One head gasket set for each heat exchanger.

.4 One glass for each gauge glass.

.5 One filter cartridge or set of filter media for each filter or filter bank in addition to final operating set.

.2 Provide one set of special tools required to service equipment as recommended by manufacturers and in accordance with Section 01 78 00 - Closeout Submittals.

.3 Furnish one commercial quality grease gun, grease and adapters to suit different types of grease and grease fittings.

1.4 DELIVERY, STORAGE, AND HANDLING

.1 Waste Management and Disposal:

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

Part 2 Execution

2.1 PAINTING REPAIRS AND RESTORATION

.1 Do painting in accordance with Section 09 91 23 - Interior Painting.

.2 Prime and touch up marred finished paintwork to match original.

.3 Restore to new condition, finishes which have been damaged.

2.2 CLEANING

.1 Clean interior and exterior of all systems including strainers. Vacuum interior of ductwork and air handling units.

2.3 FIELD QUALITY CONTROL

.1 Site Tests: conduct following tests in accordance with Section 01 45 00 - Quality Control and submit report as described in PART 1 - SUBMITTALS.

.2 Manufacturer's Field Services:

.1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.

.2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

.3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

2.4 DEMONSTRATION

.1 Project Manager will use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.

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

.3 Use operation and maintenance manual, as-built drawings, and audio visual aids as part of instruction materials.

.4 Instruction duration time requirements as specified in appropriate sections.

.5 Project Manager will record these demonstrations on video tape for future reference.

2.5 PROTECTION

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

END OF SECTION

Part 1 General

1.1 SUBMITTALS

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

.2 Shop drawings to show:

- .1 Mounting arrangements.
- .2 Operating and maintenance clearances.

.3 Shop drawings and product data accompanied by:

- .1 Detailed drawings of bases, supports, and anchor bolts.
- .2 Acoustical sound power data, where applicable.
- .3 Points of operation on performance curves.
- .4 Manufacturer to certify current model production.
- .5 Certification of compliance to applicable codes.

.4 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.

.5 Closeout Submittals:

- .1 Provide operation and maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals..
- .2 Operation and maintenance manual approved by, and final copies deposited with, Consultant before final inspection.
- .3 Operation data to include:
  - .1 Control schematics for systems including environmental controls.
  - .2 Description of systems and their controls.
  - .3 Description of operation of systems at various loads together with reset schedules and seasonal variances.
  - .4 Operation instruction for systems and component.
  - .5 Description of actions to be taken in event of equipment failure.
  - .6 Valves schedule and flow diagram.
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  - .1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
  - .2 Data to include schedules of tasks, frequency, tools required and task time.
- .5 Performance data to include:
  - .1 Equipment manufacturer's performance datasheets with point of operation as left after commissioning is complete.
  - .2 Equipment performance verification test results.
  - .3 Special performance data as specified.

.4 Testing, adjusting and balancing reports as specified in Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.

.6 Approvals:

.1 Submit 2 copies of draft Operation and Maintenance Manual to Consultant for approval. Submission of individual data will not be accepted unless directed by Consultant.

.2 Make changes as required and re-submit as directed by Consultant.

.7 Additional data:

.1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.

.8 Site records:

.1 Consultant will provide 1 set of reproducible mechanical drawings. Provide sets of white prints as required for each phase of work. Mark changes as work progresses and as changes occur. Include changes to existing mechanical systems, control systems and low voltage control wiring.

.2 Transfer information weekly to reproducibles, revising reproducibles to show work as actually installed.

.3 Use different colour waterproof ink for each service.

.4 Make available for reference purposes and inspection.

.9 As-built drawings:

.1 Prior to start of Testing, Adjusting and Balancing for HVAC, finalize production of as-built drawings.

.2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: - "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (Date).

.3 Submit to Consultant for approval and make corrections as directed.

.4 Perform testing, adjusting and balancing for HVAC using as-built drawings.

.5 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.

.10 Submit copies of as-built drawings for inclusion in final TAB report.

1.2 QUALITY ASSURANCE

.1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.

1.3 MAINTENANCE

.1 Furnish spare parts in accordance with Section 01 78 00 - Closeout Submittals as follows:

.1 One set of packing for each pump.

.2 One casing joint gasket for each size pump.

.3 One glass for each gauge glass.

.2 Provide one set of special tools required to service equipment as recommended by manufacturers and in accordance with Section 01 78 00 - Closeout Submittals.

.3 Furnish one commercial quality grease gun, grease and adapters to suit different types of grease and grease fittings.

1.4 DELIVERY, STORAGE, AND HANDLING

.1 Waste Management and Disposal:

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

Part 2 Execution

2.1 PAINTING REPAIRS AND RESTORATION

.1 Prime and touch up marred finished paintwork to match original.

.2 Restore to new condition, finishes which have been damaged.

2.2 CLEANING

.1 Clean interior and exterior of all systems including strainers. Vacuum interior of ductwork and air handling units.

2.3 DEMONSTRATION

.1 Consultant will use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.

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

.3 Use operation and maintenance manual, as-built drawings, and audio visual aids as part of instruction materials.

.4 Instruction duration time requirements as specified in appropriate sections.

.5 Consultant will record these demonstrations on video tape for future reference.

2.4 PROTECTION

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

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Disinfection of potable water distribution system.

.2 Testing and reporting results.

1.2 RELATED SECTIONS

.1 Section 01 20 13 - Price and Payment Procedures.

.2 Section 01 33 00 - Administrative Requirements.

.3 Section 01 44 00 - Quality Assurance.

.4 Section 01 61 00 - Common Product Requirements.

.5 Section 01 78 10 - Execution Requirements.

.6 Section 33 11 16 - Site Water Utility Distribution Piping.

.7 Section 33 21 13 - Public Water Supply Well.

.8 Section 22 10 00 - Plumbing Piping: Disinfection of building domestic water piping system.

1.3 UNIT PRICE - MEASUREMENT AND PAYMENT

.1 Section 01 20 13: Unit prices.

.2 Disinfection: By the linear metre. Includes preparing, disinfecting, testing, and reporting.

1.4 REFERENCES

.1 AWWA B300 - Standard for Hypochlorites.

.2 AWWA B301 - Standard for Liquid Chlorine.

.3 AWWA B302 - Standard for Ammonium Sulfate.

.4 AWWA B303 - Standard for Sodium Chlorite.

.5 AWWA C651 - Standards for Disinfecting Water Mains.

1.5 SUBMITTALS FOR INFORMATION

.1 Test Reports: Indicate results comparative to specified requirements.

.2 Certificate: Certify that cleanliness of water distribution system meets or exceeds specified requirements.

1.6 PROJECT RECORD DOCUMENTS

.1 Section 01 78 10: Submission procedures.

.2 Disinfection report:

.1 Type and form of disinfectant used.
.2 Date and time of disinfectant injection start and time of completion.
.3 Test locations.
.4 Initial and 24 hour disinfectant residuals (quantity in treated water) in ppm for each outlet tested.
.5 Date and time of flushing start and completion.
.6 Disinfectant residual after flushing in ppm for each outlet tested.

.3 Bacteriological report:

.1 Date issued, project name, and testing laboratory name, address, and telephone number.
.2 Time and date of water sample collection.
.3 Name of person collecting samples.
.4 Test locations.
.5 Initial and 24 hour disinfectant residuals in ppm for each outlet tested.
.6 Coliform bacteria test results for each outlet tested.
.7 Certification that water conforms, or fails to conform, to bacterial standards of Province of Manitoba.

1.7 QUALITY ASSURANCE

.1 Perform Work in accordance with AWWA C651.

.2 Water Treatment Firm: Company specializing in disinfecting potable water systems specified in this Section with minimum three years documented experience.

.3 Testing Firm: Company specializing in testing potable water systems, certified/approved by the Province of Manitoba.

.4 Submit bacteriologist's signature and authority associated with testing.

1.8 REGULATORY REQUIREMENTS

.1 Conform to applicable code or regulation for performing the work of this Section.

.2 Provide certificate of compliance from authority having jurisdiction indicating approval of water system.

Part 2 Products

2.1 DISINFECTION CHEMICALS

.1 Chemicals: AWWA B300, Hypochlorite, AWWA B301, Liquid Chlorine, AWWA B302, Ammonium Sulfate, and AWWA B303, Sodium Chlorite.

Part 3 Execution

3.1 EXAMINATION

.1 Verify that piping system and water well has been cleaned, inspected, and pressure tested.

.2 Perform scheduling and disinfecting activity with start-up, testing, adjusting and balancing, demonstration procedures, including coordination with related systems.

3.2 EXECUTION

.1 Provide and attach required equipment to perform the work of this Section.

.2 Inject treatment disinfectant into piping system.

.3 Maintain disinfectant in system for 24 hours.

.4 Flush, circulate, and clean until required cleanliness is achieved; use domestic water.

.5 Replace permanent system devices removed for disinfection.

.6 Pressure test system to 400 kPa. Repair leaks and re-test.

3.3 FIELD QUALITY CONTROL

.1 Section 01 44 00: Field inspection and testing.

.2 Test samples in accordance with AWWA C651.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Pipe, pipe fittings, valves, and connections for piping systems.

.1 Sanitary sewer.

.2 Domestic water.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Administrative Requirements.

.2 Section 01 44 00 - Quality Assurance: Requirements for references and standards.

.3 Section 01 44 00 - Quality Assurance.

.4 Section 01 61 00 - Common Product Requirements.

.5 Section 01 78 10 - Execution Requirements.

.6 Section 08 31 13 - Access Doors And Frames.

.7 Section 09 91 10 - Painting.

.8 Section 23 05 48 - Vibration Isolation.

.9 Section 23 05 53 - Mechanical Identification.

.10 Section 23 07 19 - Piping Insulation.

.11 Section 26 05 80 - Equipment Wiring: Electrical characteristics and wiring connections.

1.3 REFERENCES

.1 AGA Z21.22 - Relief Valves and Automatic Gas Shutoff Devices for Hot Water Supply Systems.

.2 ASME B16.1 - Cast Iron Pipe Flanges and Flanged Fittings.

.3 ASME B16.3 - Malleable Iron Threaded Fittings.

.4 ASME B16.4 - Grey Iron Threaded Fittings.

.5 ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.

.6 ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.

.7 ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings - DWV.

.8 ASME B16.26 - Copper Alloy Bronze Fittings for Flared Copper Tubes.

.9 ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV.

.10 ASME B16.32 - Cast Copper Alloy Solder Joint Fittings for Sovent Drainage Systems.

.11 ASME B31.1 - Power Piping.

.12 ASME B31.2 - Fuel Gas Piping.

.13 ASME B31.9 - Building Services Piping.

.14 ASME SEC IV - Construction of Heating Boilers.

.15 ASME SEC IX - Welding and Brazing Qualifications.

.16 ASTM A47/A47M - Ferritic Malleable Iron Castings.

.17 ASTM A53/A53M - Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

.18 ASTM A74 - Cast Iron Soil Pipe and Fittings.

.19 ASTM A234/A234M - Piping Fittings of Wrought-Carbon Steel and Alloy Steel for Moderate and High Temperature Service.

.20 ASTM B32 - Solder Metal.

.21 ASTM B42 - Seamless Copper Pipe, Standard Sizes.

.22 ASTM B43 - Seamless Red Brass Pipe, Standard Sizes.

.23 ASTM B68 - Seamless Copper Tube, Bright Annealed.

.24 ASTM B75 - Seamless Copper Tube.

.25 ASTM B88 - Seamless Copper Water Tube.

.26 ASTM B251 - General Requirements for Wrought Seamless Copper and Copper-Alloy Tube.

.27 ASTM B280 - Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.

.28 ASTM B302 - Threadless Copper Pipe, Standard Sizes.

.29 ASTM B306 - Copper Drainage Tube (DWV).

.30 ASTM C4 - Clay Drain Tile and Perforated Clay Drain Tile.

.31 ASTM C14/C14M - Concrete Sewer, Storm Drain, and Culvert Pipe.

.32 ASTM C425 - Compression Joints for Vitrified Clay Pipe and Fittings.

.33 ASTM C443 - Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.

.34 ASTM C564 - Rubber Gaskets for Cast Iron Soil Pipe and Fittings.

.35 ASTM C700 - Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated.

.36 ASTM C1053 - Borosilicate Glass Pipe and Fittings for Drain, Waste, and Vent (DWV) Applications.

.37 ASTM D1785 - Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.

.38 ASTM D2235 - Solvent Cement for Acrylonitrile - Butadiene - Styrene (ABS) Plastic Pipe and Fittings.

.39 ASTM D2239 - Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter.

.40 ASTM D2241 - Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).

.41 ASTM D2447 - Polyethylene (PE) Plastic Pipe, Schedules 40 and 80, Based on Outside Diameter.

.42 ASTM D2466 - Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.

.43 ASTM D2513 - Thermoplastic Gas Pressure Pipe, Tubing, and Fittings.

.44 ASTM D2564 - Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems.

.45 ASTM D2609 - Plastic Insert Fittings for Polyethylene (PE) Plastic Pipe.

.46 ASTM D2661 - Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe and Fittings.

.47 ASTM D2662 - Polybutylene (PB) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter.

.48 ASTM D2665 - Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings.

.49 ASTM D2666 - Polybutylene (PB) Plastic Tubing.

.50 ASTM D2683 - Socket-Type Polyethylene Fillings for Outside Diameter-Controlled Polyethylene Pipe and Tubing.

.51 ASTM D2729 - Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

.52 ASTM D2751 - Acrylonitrile-Butadiene-Styrene (ABS) Sewer, Pipe, and Fittings.

.53 ASTM D2846 - Chlorinated Polyvinyl Chloride (CPVC) Pipe, Fittings, Solvent Cements and Adhesives for Potable Hot Water Systems.

.54 ASTM D2855 - Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings.

.55 ASTM D2996 - Filament-Wound 'Fibreglass' (Glass-Fibre-Reinforced Thermosetting-Resin) Pipe.

.56 ASTM D2997 - Centrifugally-Cast 'Fibreglass' (Glass-Fibre-Reinforced Thermosetting-Resin) Pipe.

.57 ASTM D3000 - Polybutylene (PB) Plastic Pipe (SDR-PR) Based on Outside Diameter.

.58 ASTM D3034 - Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

.59 ASTM D3262 - 'Fibreglass' (Glass-Fibre-Reinforced Thermosetting-Resin) Sewer Pipe.

.60 ASTM D3309 - Polybutylene (PB) Plastic Hot- and Cold-Water Distribution System.

.61 ASTM D3517 - 'Fibreglass' (Glass-Fibre-Reinforced Thermosetting-Resin) Pressure Pipe.

.62 ASTM D3754 - 'Fibreglass' (Glass-Fibre-Reinforced Thermosetting-Resin) Sewer and Industrial Pressure Pipe.

.63 ASTM D3840 - 'Fibreglass' (Glass-Fibre-Reinforced Thermosetting-Resin) Pipe Fittings for Non-Pressure Applications.

.64 ASTM E814 - Fire Tests of Through-Penetration Fire Stops.

.65 ASTM F437 - Threaded Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80.

.66 ASTM F438 - Socket-Type Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 40.

.67 ASTM F439 - Socket-Type Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80.

.68 ASTM F441 - Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80.

.69 ASTM F442 - Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe(SDR-PR).

.70 ASTM F477 - Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

.71 ASTM F493 - Solvent Cements for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe and Fittings.

.72 ASTM F628 - Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe with a Cellular Core.

.73 ASTM F679 - Poly(Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings.

.74 ASTM F708 - Design and Installation of Rigid Pipe Hangers.

.75 ASTM F1281 - Crosslinked Polyethylene/Aluminum/Crosslinked Polyethylene (PEX-AL-PEX) Pressure Pipe.

.76 ASTM F1282 - Polyethylene/Aluminum/Polyethylene (PE-AL-PE) Composite Pressure Pipe.

.77 AWS A5.8 - Filler Metals for Brazing and Braze Welding.

.78 AWWA C105 - Polyethylene Encasement for Ductile-Iron Piping Systems.

.79 AWWA C110 - Ductile - Iron and Gray - Iron Fittings, 3 In. - 48 In. (76 mm - 1219 mm), for Water.

.80 AWWA C111 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

.81 AWWA C151 - Ductile-Iron Pipe, Centrifugally Cast, for Water.

.82 AWWA C651 - Disinfecting Water Mains.

.83 AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe (and Fabricated Fittings), 4 inch - 12 inch (100 mm - 300 mm), for Water Distribution.

.84 AWWA C901 - Polyethylene (PE) Pressure Pipe and Tubing, 1/2 inch - 3 inch (13 mm - 76 mm) for Water Service.

.85 AWWA C902 - Polybutylene (PB) Pressure Pipe and Tubing, 1/2 inch - 3 inch (13 mm - 76 mm) for Water.

.86 AWWA C905 - Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14 inch - 48 inch (350 mm - 1200mm).

.87 AWWA C950 - Fibreglass Pressure Pipe.

.88 CAN-3 B281 - Aluminum Drain, Waste, and Vent Pipe and Components.

.89 CISPI 301 - Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications.

.90 CISPI 310 - Joints with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applictions.

.91 MSS SP58 - Pipe Hangers and Supports - Materials, Design and Manufacturer.

.92 MSS SP-67 - Butterfly Valves.

.93 MSS SP69 - Pipe Hangers and Supports - Selection and Application.

.94 MSS SP-70 - Cast Iron Gate Valves, Flanged and Threaded Ends.

.95 MSS SP-71 - Cast Iron Swing Check Valves, Flanged and Threaded Ends.

.96 MSS SP-78 - Cast Iron Plug Valves, Flanged and Threaded Ends.

.97 MSS SP-80 - Bronze Gate, Globe, Angle and Check Valves.

.98 MSS SP-85 - Cast Iron Globe & Angle Valves, Flanged and Threaded Ends.

.99 MSS SP89 - Pipe Hangers and Supports - Fabrication and Installation Practices.

.100 MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

.101 NCPWB - Procedure Specifications for Pipe Welding.

.102 UL 1479 - Fire Tests of Through-Penetration Firestops.

1.4 SUBMITTALS FOR REVIEW

.1 Section 01 33 00: Procedures for submittals.

.2 Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalogue information. Indicate valve data and ratings.

1.5 SUBMITTALS AT PROJECT CLOSEOUT

.1 Section 01 78 10: Procedures for submittals.

.2 Project Record Documents: Record actual locations of valves.

1.6 QUALITY ASSURANCE

.1 Perform Work to Province of Manitoba standards. Maintain one copy on site.

.2 Valves: Manufacturer's name and pressure rating marked on valve body.

.3 Welding Materials and Procedures: Conform to ASME SEC IX and applicable provincial labour regulations.

.4 Welders Certification: To ASME SEC IX and NCPWB Standard Procedure Specifications.

.5 Identify pipe with marking including size, ASTM material classification, ASTM specification, potable water certification, water pressure rating.

1.7 REGULATORY REQUIREMENTS

.1 Perform Work to Province of Manitoba plumbing code.

.2 Conform to applicable code for installation of backflow prevention devices.

1.8 DELIVERY, STORAGE, AND PROTECTION

.1 Section 01 61 00: Transport, handle, store, and protect products.

.2 Accept valves on site in shipping containers with labelling in place. Inspect for damage.

.3 Provide temporary protective coating on cast iron and steel valves.

.4 Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

.5 Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.9 ENVIRONMENTAL REQUIREMENTS

.1 Section 01 61 00: Environmental conditions affecting products on site.

.2 Do not install underground piping when bedding is wet or frozen.

1.10 EXTRA MATERIALS

.1 Section 01 78 10: Operation and maintenance data.

.2 Provide two repacking kits for each size valve.

Part 2 Products

2.1 SANITARY SEWER PIPING, ABOVE GRADE

.1 PVC Pipe: ASTM D2729.

.1 Fittings: PVC.

.2 Joints: ASTM D2855, solvent weld with ASTM D2564 solvent cement.

.2 PVC Pipe: ASTM D2665.

.1 Fittings: PVC.

.2 Joints: ASTM D2855, solvent weld with ASTM D2564 solvent cement.

2.2 WATER PIPING, ABOVE GRADE

.1 Copper Tubing: ASTM B88M, Type L, hard drawn.

.1 Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.

.2 Joints: ASTM B32, solder, Grade 95TA.

2.3 FLANGES, UNIONS, AND COUPLINGS

.1 Pipe Size 80 mm and Under:

.1 Ferrous pipe: Class 150 malleable iron threaded unions.

.2 Copper tube and pipe: Class 150 bronze unions with soldered joints.

.2 Pipe Size Over 25 mm:

.1 Ferrous pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.

.2 Copper tube and pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.

.3 Grooved and Shouldered Pipe End Couplings:

.1 Housing: Malleable iron clamps to engage and lock, designed to permit some angular deflection, contraction, and expansion; steel bolts, nuts, and washers; galvanized for galvanized pipe.

.2 Sealing gasket: "C" shape composition sealing gasket.

.4 Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.4 PIPE HANGERS AND SUPPORTS

.1 Plumbing Piping - Drain, Waste, and Vent:

.1 Conform to ASME B31.9 ASTM F708 MSS SP58 MSS SP69 MSS SP89.

.2 Hangers for Pipe Sizes 15 to 40 mm: Carbon steel, adjustable swivel, split ring.

.3 Hangers for Pipe Sizes 50 mm and Over: Carbon steel, adjustable, clevis.

.4 Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

.5 Wall Support for Pipe Sizes to 80 mm: Cast iron hook.

.6 Wall Support for Pipe Sizes 100 mm and Over: Welded steel bracket and wrought steel clamp.

.7 Vertical Support: Steel riser clamp.

.8 Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

.9 Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

.2 Plumbing Piping - Water:

.1 Conform to ASME B31.9 ASTM F708 MSS SP58 MSS SP69 MSS SP89.

.2 Hangers for Pipe Sizes 15 to 40 mm: Malleable iron Carbon steel, adjustable swivel, split ring.

.3 Hangers for Cold Pipe Sizes 50 mm and Over: Carbon steel, adjustable, clevis.

.4 Hangers for Hot Pipe Sizes 50 to 100 mm: Carbon steel, adjustable, clevis.

.5 Hangers for Hot Pipe Sizes 150 mm and Over: Adjustable steel yoke, cast iron pipe roll, double hanger.

.6 Multiple or Trapeze Hangers: Steel channels with welded supports or spacers and hanger rods.

.7 Multiple or Trapeze Hangers for Hot Pipe Sizes 150 mm and Over: Steel channels with welded supports or spacers and hanger rods, cast iron roll.

.8 Wall Support for Pipe Sizes to 80 mm: Cast iron hook.

.9 Wall Support for Pipe Sizes 100 mm and Over: Welded steel bracket and wrought steel clamp.

.10 Wall Support for Hot Pipe Sizes 150 mm and Over: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast iron pipe roll.

.11 Vertical Support: Steel riser clamp.

.12 Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

.13 Floor Support for Hot Pipe Sizes to 100 mm: Cast iron adjustable pipe saddle, locknut, nipple, floor flange, and concrete pier or steel support.

.14 Floor Support for Hot Pipe Sizes 150 mm and Over: Adjustable cast iron pipe roll and stand, steel screws, and concrete pier or steel support.

.15 Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

2.5 GATE VALVES

.1 Up To and Including 80 mm:

.1 MSS SP-80, Class 125 , bronze body, bronze trim, rising stem, handwheel, inside screw, solid wedge disc, solder or threaded ends.

.2 50 mm and Larger:

.1 MSS SP-70, Class 125 , iron body, bronze trim, outside screw and yoke, handwheel, solid wedge disc, flanged ends. Provide chain-wheel operators for valves 150 mm and larger mounted over 2400 mm above floor.

2.6 GLOBE VALVES

.1 Up To and Including 80 mm:

.1 MSS SP-80, Class 125 , bronze body, bronze trim, handwheel, teflon disc, solder or threaded ends.

.2 50 mm and Larger:

.1 MSS SP-85, Class 125 , iron body, bronze trim, handwheel, outside screw and yoke, renewable bronze plug-type disc, renewable seat, flanged ends. Provide chain-wheel operators for valves 150 mm and larger mounted over 2400 mm above floor.

2.7 BALL VALVES

.1 Construction, 100 mm and Smaller: MSS SP-110, Class 150, 2760 kPa CWP , bronze, two piece body, chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle with balancing stops, solder or threaded ends with union.

2.8 PLUG VALVES

.1 Construction 65 mm and Larger: MSS SP-78, 1200 kPa CWP , cast iron body and plug, pressure lubricated, teflon or Buna N packing, flanged or grooved ends. Provide lever operator with set screw.

2.9 FLOW CONTROLS

.1 Construction: Class 150 , Brass or bronze body with union on inlet and outlet, temperature and pressure test plug on inlet and outlet , blowdown/backflush drain.

.2 Calibration: Control flow within 5 percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, maximum minimum pressure 24 kPa.

2.10 SWING CHECK VALVES

.1 Up To and Including 80 mm:

.1 MSS SP-80, Class 125 , bronze body and cap, bronze swing disc with rubber seat, solder or threaded ends.

.2 50 mm and Larger:

.1 MSS SP-71, Class 125 , iron body, bronze swing disc, renewable disc seal and seat, flanged or grooved ends.

2.11 SPRING LOADED CHECK VALVES

.1 Class 125 , iron body, bronze trim, stainless steel springs, bronze disc, Buna N seals, wafer style ends.

2.12 WATER PRESSURE REDUCING VALVES

.1 MSS SP-80, bronze body, stainless steel and thermoplastic internal parts, fabric reinforced diaphragm, strainer, threaded double union ends.

.2 Over 50 mm:

.1 MSS SP-85, cast iron body, bronze fitted, elastomeric diaphragm and seat disc, flanged.

2.13 RELIEF VALVES

.1 Pressure Relief:

.1 AGA Z21.22 certified, bronze body, teflon seat, steel stem and springs, automatic, direct pressure actuated.

.2 Temperature and Pressure Relief:

.1 AGA Z21.22 certified, bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, temperature relief maximum 98.9 degrees C, capacity ASME SEC IV certified and labelled.

2.14 STRAINERS

.1 Size 50 mm and Under:

.1 Class 150, threaded bronze body 2070 kPa CWP, Y pattern with 0.8 mm1/32 inch stainless steel perforated screen.

.2 Size 40 mm to 100 mm:

.1 Class 125, flanged iron body, Y pattern with 1.6 mm stainless steel perforated screen.

.3 Size 125 mm and Larger:

.1 Class 125, flanged iron body, basket pattern with 3.2 mm stainless steel perforated screen.

2.15 FIRE STOP SYSTEMS

.1 General Purpose Fire Stopping Sealant:

.1 Water based, nonslumping, premixed sealant with intumescent properties, rated for 3 hours per ASTM E814 and UL 1479.

.2 General Purpose Vibration Resistant Fire Stopping Sealant:

.1 Silicone based, nonslumping, premixed sealant with intumescent properties, vibration and moisture resistant, rated for 3 hours per ASTM E814 and UL 1479.

.3 DWV Plastic Pipe Systems Fire Stopping Sealant:

.1 Silicone based, premixed sealant with intumescent properties, vibration and moisture resistant, rated for 3 hours per ASTM E814 and UL 1479 with metal collars.

Part 3 Execution

3.1 EXAMINATION

.1 Section 01100- Coordination and Meetings: Verification of existing conditions before starting work.

.2 Verify that excavations are to required grade, dry, and not over-excavated.

3.2 PREPARATION

.1 Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

.2 Remove scale and dirt, on inside and outside, before assembly.

.3 Prepare piping connections to equipment with flanges or unions.

3.3 INSTALLATION

.1 Install to manufacturer's instructions.

.2 Provide non-conducting dielectric connections wherever jointing dissimilar metals.

.3 Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

.4 Install piping to maintain headroom, conserve space, and not interfere with use of space.

.5 Group piping whenever practical at common elevations.

.6 Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. Refer to Section 23 05 16.

.7 Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. Refer to Section 23 07 19.

.8 Provide access where valves and fittings are not exposed. Coordinate size and location of access doors with Section 08 31 13.

.9 Establish elevations of buried piping outside the building to ensure not less than 1.0 m of cover.

.10 Install vent piping penetrating roofed areas to maintain integrity of roof assembly

.11 Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.

.12 Provide support for utility meters to requirements of utility companies.

.13 Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting. Refer to Section 09 91 10.

.14 Excavate to Sections 31 23 18 and 31 23 23 for work of this Section.

.15 Backfill to Sections 31 23 16 and 31 23 23 for work of this Section.

.16 Install bell and spigot pipe with bell end upstream.

.17 Install valves with stems upright or horizontal, not inverted.

.18 Pipe vents from gas pressure reducing valves to outdoors and terminate in weather proof hood.

.19 Install water piping to ASME B31.9.

.20 Sleeve pipes passing through partitions, walls and floors.

.21 Inserts:

.1 Provide inserts for placement in concrete formwork.

.2 Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

.3 Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 100 mm.

.4 Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

.5 Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above flush with top of recessed into and grouted flush with slab.

.22 Pipe Hangers and Supports:

.1 Install to ASTM B31.9 ASTM F708 and MSS SP89.

.2 Support horizontal piping as scheduled.

.3 Install hangers to provide minimum 15 mm space between finished covering and adjacent work.

.4 Place hangers within 300 mm of each horizontal elbow.

.5 Use hangers with 40 mm minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.

.6 Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.

.7 Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

.8 Provide copper plated hangers and supports for copper piping sheet lead packing between hanger or support and piping.

.9 Prime coat exposed steel hangers and supports. Refer to Section 09 91 10. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

.10 Provide hangers adjacent to motor driven equipment with vibration isolation; refer to Section 23 05 48.

.11 Support cast iron drainage piping at every joint.

3.4 APPLICATION

.1 Use grooved mechanical couplings and fasteners only in accessible locations.

.2 Install unions downstream of valves and at equipment or apparatus connections.

.3 Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.

.4 Install gate ball or butterfly valves for shut-off and to isolate equipment, part of systems, or vertical risers.

.5 Install globe ball or butterfly valves for throttling, bypass, or manual flow control services.

.6 Provide lug end butterfly valves adjacent to equipment when provided to isolate equipment.

.7 Provide spring loaded check valves on discharge of water pumps.

.8 Provide flow controls in water recirculating systems where indicated.

3.5 ERECTION TOLERANCES

.1 Section 01 44 00: Tolerances.

.2 Establish invert elevations, slopes for drainage to 2 one percent minimum. Maintain gradients.

.3 Slope water piping minimum 0.25 percent and arrange to drain at low points.

3.6 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

.1 Disinfect water distribution system to Section 22 05 81.

3.7 SERVICE CONNECTIONS

.1 Provide new sanitary sewer services. Before commencing work check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover to avoid freezing.

.2 Provide new water service complete with approved double check backflow preventer and water meter with by-pass valves pressure reducing valve,.

.1 Provide sleeve in wall for service main and support at wall with reinforced concrete bridge. Caulk enlarged sleeve and make watertight with pliable material. Anchor service main inside to concrete wall.

3.8 SCHEDULES

.1 Pipe Hanger Schedule:

.1 Metal Piping:

.1 Pipe size: 15 to 32 mm:

.1 Maximum hanger spacing: 2 m.

.2 Hanger rod diameter: 9 mm.

.2 Pipe size: 40 to 50 mm:

.1 Maximum hanger spacing: 3 m.

.2 Hanger rod diameter: 9 mm.

.3 Pipe size: 65 to 75 mm:

.1 Maximum hanger spacing: 3 m.

.2 Hanger rod diameter: 13 mm.

.4 Pipe size: 100 to 150 mm:

.1 Maximum hanger spacing: 3 m.

.2 Hanger rod diameter: 15 mm.

.5 Pipe size: 200 to 300 mm:

.1 Maximum hanger spacing: 4.25 m.

.2 Hanger rod diameter: 22 mm.

.6 Pipe size: 350 mm and Over:

.1 Maximum hanger spacing: 6 m.

.2 Hanger rod diameter: 25 mm.

.2 Plastic Piping:

.1 All Sizes:

.1 Maximum hanger spacing: 1.8 m.

.2 Hanger rod diameter: 9 mm.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Floor drains.

.2 Cleanouts.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Administrative Requirements.

.2 Section 01 61 00 - Common Product Requirements.

.3 Section 01 78 10 - Execution Requirements.

.4 Section 22 10 00 - Plumbing Piping.

.5 Section 22 42 02 - Plumbing Fixtures.

.6 Section 22 47 00 - Plumbing Equipment.

.7 Section 26 05 80 - Equipment Wiring: Electrical characteristics and wiring connections.

.8 Section 33 05 13 - Manholes And Catch Basins.

1.3 REFERENCES

.1 ASME A112.21.1 - Floor Drains.

.2 ASME A112.21.2 - Roof Drains.

.3 ASME A112.26.1 - Water Hammer Arrestors.

.4 ASSE 1011 - Hose Connection Vacuum Breakers.

.5 ASSE 1012 - Backflow Preventers with Immediate Atmospheric Vent.

.6 ASSE 1013 - Backflow Preventers, Reduced Pressure Principle.

.7 ASSE 1019 - Wall Hydrants, Frost Proof Automatic Draining Anti-Backflow Types.

.8 ASTM C478 - Precast Reinforced Concrete Manhole Sections.

.9 AWWA C506 - Backflow Prevention Devices - Reduced Pressure Principle and Double Check Valve Types.

.10 PDI G-101 - Testing and Rating Procedure for Grease Interceptors with Appendix of Sizing and Installation Data.

.11 PDI WH-201 - Water Hammer Arrestors.

1.4 SUBMITTALS FOR REVIEW

.1 Section 01 33 00: Procedures for submittals.

.2 Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.

.3 Shop Drawings: Indicate dimensions, weights, and placement of openings and holes.

1.5 SUBMITTALS FOR INFORMATION

.1 Section 01 33 00: Procedures for submittals.

.2 Manufacturer's Instructions: Indicate Manufacturer's Installation Instructions: Indicate assembly and support requirements.

1.6 SUBMITTALS AT PROJECT CLOSEOUT

.1 Section 01 78 10: Procedures for submittals.

.2 Project Record Documents: Record actual locations of equipment, cleanouts, backflow preventers, water hammer arrestors.

.3 Operation Data: Indicate frequency of treatment required for interceptors.

.4 Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

1.7 QUALITY ASSURANCE

.1 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

1.8 DELIVERY, STORAGE, AND PROTECTION

.1 Section 01 61 00: Transport, handle, store, and protect products.

.2 Accept specialties on site in original factory packaging. Inspect for damage.

1.9 EXTRA MATERIALS

.1 Section 01 78 10.

.2 Supply two loose keys for outside hose bibs, hose end vacuum breakers for hose bibs, service kits for .

Part 2 Products

2.1 FLOOR DRAINS

.1 Floor Drain (FD-1):

.1 Watts #FD-100-C-A5-1-7 Floor Drain - epoxy coated cast iron body, reversible flashing clamp with primary and secondary weepholes, trap primer connection with plug, no hub outlet Watts -A5-1 5" (127 mm) diameter, nickel bronze, adjustable round strainer. With Trap Guard primer.

.2 Funnel Floor Drain (FD-1):

.1 Watts #FD-100-C-EG Floor Drain with oval funnel - epoxy coated cast iron body, reversible flashing clamp with primary and secondary weepholes, trap primer connection with plug, no hub outlet Watts -A5-1 5" (127 mm) diameter, oval cast iron (standard) funnel, nickel bronze, adjustable round strainer. With Trap guard primer.

2.2 CLEANOUTS

.1 Interior Finished Floor Areas (CO):

.1 Manufacturers:

.1 Zurn Model ZN-1400-HD-BP-NH

.2 Substitutions: Refer to Section 01 62 00.

.2 Galvanized cast iron body with anchor flange, reversible clamping collar, threaded top assembly, and round gasketed scored cover in service areas and round gasketed depressed cover to accept floor finish in finished floor areas.

.2 Interior Finished Wall Areas (CO):

.1 Manufacturers:

.1 Zurn Model ZANB-1460

.2 Substitutions: Refer to Section 01 62 00.

.2 Line type with lacquered cast iron body and round epoxy coated gasketed cover, and round stainless steel access cover secured with machine screw.

.3 Interior Unfinished Accessible Areas (CO-5): Caulked or threaded type. Provide bolted stack cleanouts on vertical rainwater leaders.

Part 3 Execution

3.1 INSTALLATION

.1 Install to manufacturer's instructions.

.2 Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.

.3 Encase exterior cleanouts in concrete flush with grade.

.4 Install floor cleanouts at elevation to accommodate finished floor.

.5 Install approved potable water protection devices on plumbing lines where contamination of domestic water may occur; on boiler feed water lines, janitor rooms, fire sprinkler

systems, premise isolation, irrigation systems, flush valves, interior and exterior hose bibs.

.6 Pipe relief from backflow preventer to nearest drain.

.7 Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to lavatories sinks washing machine outlets.

.8 Install air chambers on hot and cold water supply piping to each fixture or group of fixtures (each washroom). Fabricate same size as supply pipe or20 mm minimum, and minimum450 mm long.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Sink.

.2 Eye wash.

.3 Mop sink.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Administrative Requirements.

.2 Section 01 44 00 - Quality Assurance.

.3 Section 01 61 00 - Common Product Requirements.

.4 Section 01 78 10 - Execution Requirements.

.5 Section 07 92 00 - Joint Sealants: Seal fixtures to walls and floors.

.6 Section 23 05 29 - Supports And Anchors.

.7 Section 22 10 00 - Plumbing Piping.

.8 Section 22 42 01 - Plumbing Specialties.

.9 Section 22 47 00 - Plumbing Equipment.

.10 Section 26 05 80 - Equipment Wiring: Electrical characteristics and wiring connections.

1.3 REFERENCES

.1 ASME A112.6.1 - (Floor Affixed) Supports for Off-the-Floor Plumbing Fixtures for Public Use.

.2 ASME A112.18.1 - Plumbing Fixture Fittings.

.3 ASME A112.19.1 - Enamelled Cast Iron Plumbing Fixtures.

.4 ASME A112.19.2 - Vitreous China Plumbing Fixtures.

.5 ASME A112.19.3 - Stainless Steel Plumbing Fixtures (Designed for Residential Use).

.6 ASME A112.19.4 - Porcelain Enamelled Formed Steel Plumbing Fixtures.

.7 ASME A112.19.5 - Trim for Water-Closet Bowls, Tanks, and Urinals.

.8 NFPA 70 - National Electrical Code.

1.4 SUBMITTALS FOR REVIEW

.1 Section 01 33 00: Procedures for submittals.

.2 Product Data: Provide catalogue illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.

.3 Samples: Submit two lavatory supply fittings fixtures for colour matching sets of colour chips for each standard colour .

1.5 SUBMITTALS FOR INFORMATION

.1 Section 01 33 00: Procedures for submittals.

.2 Manufacturer's Instructions: Indicate installation methods and procedures.

1.6 SUBMITTALS AT PROJECT CLOSEOUT

.1 Section 01 78 10: Procedures for submittals.

.2 Maintenance Data: Include fixture trim exploded view and replacement parts lists.

.3 Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.7 QUALITY ASSURANCE

.1 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

1.8 REGULATORY REQUIREMENTS

.1 Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

1.9 DELIVERY, STORAGE, AND PROTECTION

.1 Section 01 61 00: Transport, handle, store, and protect products.

.2 Accept fixtures on site in factory packaging. Inspect for damage.

.3 Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

1.10 WARRANTY

.1 Section 01 78 10.

1.11 EXTRA MATERIALS

.1 Section 01 78 10.

.2 Supply two sets of faucet washers, Flush valve service kits, lavatory supply fittings, shower heads, toilet seats..

Part 2 Products

2.1 SINKS

.1 DOUBLE COMPARTMENT BOWL: S-1

.2 Franke Commercial #LBS6808-1/3 Single Bowl Countertop Mount Sink, 3 holes, 8" (203 mm) center, 508 mm (20") wide x 521 mm (20-1/2") long x 203 mm (8") high deep, counter mounted, backledge, grade 18-10 20 GA. (0.9 mm) type 302 stainless steel, self-rimming, satin finish rim and bowls, mounting kit provided, fully undercoated to reduce condensation and resonance, factory applied rim seal, 3-1/2" (89 mm) crumb cup waste assembly with 1-1/2" (38 mm) tailpiece. Chicago Faucets #786-GN2FCABCP two handles Faucet, chrome plated finish, 3 hole, 133 mm (5-1/4") projection flow control rigid/swing gooseneck spout, 102 mm (4") metal vandal proof wristblade handles with blue and red index buttons. REMOVE AERATOR. McGuire #LFH170BV Faucet Supplies, chrome plated finish polished brass, commercial duty 1/4 turn ball valve angle stops, 13 mm (1/2") I.D. Inlet x 127 mm (5") horizontal extension tubes, combination V.P. Loose key handles, escutcheon and flexible copper risers. PVC P-trap with slip nut, 38 mm (1-1/2") size, box flange and seamless tubular wall bend.

2.2 MOP SINK, MS-1

.1 Stern Williams #MTB-2424 square Service / Mop Sink, 610 mm (24") wide x 610 mm (24") long x 254 mm (10") high deep, floor mounted, terrazzo composed of pearl gray marble chips and Portland cement ground smooth, sealed to resist stain finish, cast brass drain with stainless steel strainer, 3"(75 mm) outlet. Chicago Faucets #540-LD897SWXFABCP Wall Mounted two handles Faucet, chrome plated finish, 2 hole, solid brass exposed body, Quaturn compression operating cartridge, unrestricted hose end outlet, 146 mm (5-3/4") projection rigid vacuum breaker spout with pail hook, 60 mm (2-3/8") metal vandal proof lever handles with blue and red index buttons. Stern Williams T-35 Hose and Wall Hook 36" (914 mm) long hose with 3/4" (19 mm) chrome coupling, stainless steel wall bracket. Stern Williams #T-40 Mop Hanger, stainless steel #4 finish, 24" (610 mm) long with 3 rubber spring loaded clips. Stern Williams BP Back Splash Panel 20 GA. (0.9 mm) type 304 stainless steel. Provide P-Trap, same material as the connecting pipe drain.

2.3 EMERGENCY EYE AND FACE WASH EW-1

.1 Manufacturer:

.1 Manufacturer: Haws model 7500 poratble 15 Gallon wall mount eyewash unit

.1 Substitutions: Refer to Section 01 62 00.

.2 Gravity operated eyewash high-density green polyethylene 16 gallon (60.6 L) tank, ABS plastic eyewash heads with .4 gpm (1.5 L) flow rate over 15 minutes, yellow pull-down activation arm, integral handles on top and sides, wide-fill threaded cap, label-mounted operation and maintenance instructions, and a stainless steel wall bracket. With Additives as required.

Part 3 Execution

3.1 EXAMINATION AND PREPARATION

.1 Section 01 70 00: Verification of existing conditions before starting work.

.2 Verify that walls and floor finishes are prepared and ready for installation of fixtures.

.3 Verify that electric power is available and of the correct characteristics.

.4 Confirm that millwork is constructed with adequate provision for the installation of counter top lavatories and sinks.

3.2 PREPARATION

.1 Rough-in fixture piping connections to minimum sizes indicated in fixture rough-in schedule for particular fixtures.

3.3 INSTALLATION

.1 Install each fixture with trap, easily removable for servicing and cleaning.

.2 Provide chrome plated rigid or flexible supplies to fixtures with loose key screwdriver stops, reducers, and escutcheons.

.3 Install components level and plumb.

.4 Install and secure fixtures in place with wall supports wall carriers and bolts.

.5 Seal fixtures to wall and floor surfaces with sealant as specified in Section 07 92 00, colour to match fixture.

.6 Solidly attach water closets to floor with lag screws. Lead flashing is not intended hold fixture in place.

3.4 INTERFACE WITH OTHER PRODUCTS

.1 Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

3.5 ADJUSTING

.1 Section 01 78 10 - Execution Requirements: Adjusting installed work.

.2 Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

3.6 CLEANING

.1 Section 01 78 10 - Execution Requirements: Cleaning installed work.

.2 Clean plumbing fixtures and equipment.

3.7 PROTECTION OF FINISHED WORK

.1 Section 01 78 10 - Execution Requirements: Protecting installed work.

.2 Do not permit use of fixtures.

3.8 SCHEDULES

.1 Fixture Heights: Install fixtures to heights above finished floor as indicated.

- .1 Water Closet:
  - .1 Standard: 380 mm mm to top of bowl rim.
  - .2 Accessible: 455 mm mm to top of seat.
- .2 Water Closet Flush Valves:
  - .1 Standard: 280 mm mm min. above bowl rim.
  - .2 Recessed: 255 mm mm min. above bowl rim.
- .3 Urinal:
  - .1 Standard: 560 mm mm to top of bowl rim.
  - .2 Accessible: 430 mm mm to top of bowl rim.
- .4 Lavatory:
  - .1 Standard: 785 mm mm to top of basin rim.
  - .2 Accessible: 865 mm mm to top of basin rim.
- .5 Drinking Fountain:
  - .1 Child: 760 mm mm to top of basin rim.
  - .2 Standard Adult: 1015 mm mm to top of basin rim.
  - .3 Accessible: 915 mm mm to top of spout.
- .6 Shower Heads:
  - .1 Adult Male: 1765 mm mm to bottom of head.
  - .2 Adult Female: 1640 mm mm to bottom of head.
  - .3 Child: 1490 mm mm to bottom of head.
- .7 Emergency Eye And Face Wash:
  - .1 Standard: 965 mm mm to receptor rim.
- .8 Emergency Shower:
  - .1 Standard: 2130 mm mm to bottom of head.

.2 Fixture Rough-In

Water Closet: (Flush Valve)	25 mm	100 mm	50 mm	
Water Closet: (Tank Type)	15 mm	100 mm	50 mm	
Bidet:	15 mm	15 mm	40 mm	32 mm
Urinal: (Flush Valve)	20 mm	50 mm	40 mm	
Urinal: (Tank Type)	15 mm	50 mm	40 mm	

	Lavatory:	15 mm	15 mm	40 mm	32 mm
	Sink:	15 mm	15 mm	40 mm	32 mm
	Service Sink:	15 mm	15 mm	50 mm	40 mm
	Service Sink:	15 mm	15 mm	80 mm	40 mm
	Drinking Fountain:	15 mm	32 mm	32 mm	
	Bathtub:	15 mm	15 mm	40 mm	32 mm
	Shower:	15 mm	15 mm	40 mm	32 mm

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Water Heaters.

.2 Sump Pumps.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Administrative Requirements.

.2 Section 01 61 00 - Common Product Requirements.

.3 Section 01 78 10 - Execution Requirements.

.4 Section 23 05 48 - Vibration Isolation.

.5 Section 26 05 80 - Equipment Wiring: Electrical characteristics and wiring connections.

1.3 REFERENCES

.1 ASHRAE 90A - Energy Conservation in New Building Design.

.2 ASME Section 8D - Boilers and Pressure Vessel Codes - Rules for Construction of Pressure Vessels.

.3 UL 1453 - Electric Booster and Commercial Storage Tank Water Heaters.

.4 UL 174 - Household Electric Storage Tank Water Heaters.

.5 CAN/CSA C22.2 No.110, Construction and Test of Electric Storage Tank Water Heaters.

.6 CAN/CSA-C191, Performance of Electric Storage Tank Water Heaters for Household Service.

.1 CAN/CSA-C309, Performance Requirements for Glass-Lined Storage Tanks for Household Hot Water Service.

1.4 SUBMITTALS FOR REVIEW

.1 Section 01 33 00: Procedures for submittals.

.2 Product Data:

.1 Provide dimension drawings of water heaters indicating components and connections to other equipment and piping.

.2 Indicate pump type, capacity, power requirements.

.3 Provide certified pump curves showing pump performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable.

.4 Provide electrical characteristics and connection requirements.

.3 Shop Drawings:

.1 Indicate heat exchanger dimensions, size of tappings, and performance data.

.2 Indicate dimensions of tanks, tank lining methods, anchors, attachments, lifting points, tappings, and drains.

1.5 SUBMITTALS AT PROJECT CLOSEOUT

.1 Section 01 78 10: Procedures for submittals.

.2 Project Record Documents: Record actual locations of components.

.3 Operation and Maintenance Data: Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.

.4 Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.6 QUALITY ASSURANCE

.1 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

.2 Provide pumps with manufacturer's name, model number, and rating/capacity identified.

.3 Ensure products and installation of specified products are to recommendations and requirements of the following organizations:

.1 Canadian Standards Association (CSA).

.2 National Sanitation Foundation (NSF).

.3 American Society of Mechanical Engineers (ASME).

.4 National Board of Boiler and Pressure Vessel Inspectors (NBBPVI).

.5 National Electrical Manufacturers' Association (NEMA).

.6 Underwriters Laboratories of Canada (ULC).

.4 Ensure pumps operate at specified system fluid temperatures without vapour binding and cavitation, are non-overloading in parallel or individual operation, operate within 25 percent of midpoint of published maximum efficiency curve.

1.7 DELIVERY, STORAGE, AND PROTECTION

.1 Section 01 61 00: Transport, handle, store, and protect products.

.2 Provide temporary inlet and outlet caps. Maintain caps in place until installation.

1.8 WARRANTY

.1 Provide five year manufacturer warranty for domestic water heaters, in-line circulator, submersible sump pumps, sewage ejectors.

Part 2 Products

2.1 COMMERCIAL ELECTRIC WATER HEATERS HWT-1

.1 Manufacturer: Rheem: PRO50 2 RH95MH

.2 Other acceptable manufacturers offering equivalent products.

.1 Substitutions: Refer to Section 01 62 00.

.3 Type: Factory-assembled and wired, electric, vertical storage.

.4 Performance:

.1 Storage capacity: 40 gal.
.2 Heating element size: 4.5 kW.
.3 Minimum recovery rate: 21 GPH 56 degrees C temperature rise.
.4 Maximum working pressure: 865 kPa

.5 Electrical Characteristics:

.1 240 volts, Single phase, 60 Hz.

.6 Tank: Welded steel pressure vessel, glass lined; thermally insulated with minimum 50 mm glass fibre encased in corrosion-resistant steel jacket; baked-on enamel finish.

.7 Controls: Automatic immersion water thermostat; externally adjustable temperature range from 16 to 82 degrees C, flanged or screw-in nichrome elements, high temperature limit thermostat.

.8 Controls: Ventilated control cabinet, factory-wired with solid state progressive sequencing step controller, fuses, magnetic contactors, control transformer, pilot lights indicating main power and heating steps, control circuit toggle switch, electronic low-water (probe-type) cut-off, high temperature limit thermostat, flush-mounted temperature and pressure gauges.

.9 Heating Elements: Flange-mounted immersion elements; individual elements sheathed with Incoloy corrosion-resistant metal alloy, rated less than 480 W/sq cm.

.10 CSA c191 compliant.

2.2 LIFT PUMP

.1 Manufacturer: Liberty FL30

.2 Other acceptable manufacturers offering equivalent products.

.1 Substitutions: Refer to Section 01 62 00.

.3 Type: Factory-assembled and wired, electric, vertical storage.

.4 Performance:

.1 The pump(s) shall have a capacity of 30 GPM at a total dynamic head of 14 feet. Motor size shall be 1/3 horsepower, single phase, 60 hz. And volt operation (115V or 208-230V).

.5 Motor

.1 The pump motor shall be of the submersible type, oil filled, hermetically sealed and shall be thermally protected. The overload element shall automatically reset when motor cools. Motor windings shall be of the class A insulation rating. The rotor shaft shall be made of 416 stainless steel and shall be supported by upper and lower ball bearings.

.6 Impeller

.1 The pump shall have a VORTEX style impeller made of high temperature engineering polymer, capable of passing a minimum 3/4" spherical solid.

.7 Seal

.1 The shaft seal shall be of the carbon/ceramic unitized design, with BUNA N elastomers and stainless housings.

.8 External construction

.1 The pump volute, legs and motor housing shall be gray iron castings, class 25 or better. All castings shall be epoxy powder coated before assembly. All fasteners shall be of 300-series stainless steel or brass.

.9 Level control

.1 The pump shall be controlled by an adjustable mercury-free switch sealed in PVC float, and shall have a series plug for manual bypass operation.

Part 3 Execution

3.1 INSTALLATION

.1 Install water heaters to manufacturer's instructions.

.2 Coordinate with plumbing piping and related electrical work to achieve operating system.

.3 Domestic Hot Water Storage Tanks:

.1 Provide steel pipe support, independent of building structural framing members.

.2 Clean and flush after installation. Seal until pipe connections are made.

.4 Pumps:

.1 Ensure shaft length allows sump pumps to be located minimum 600 mm below lowest invert into sump pit and minimum 150 mm clearance from bottom of sump pit.

.2 Provide air cock and drain connection on horizontal pump casings.

.3 Provide line sized isolating valve and strainer on suction and line sized soft seated check valve and balancing valve on discharge.

.4 Decrease from line size with long radius reducing elbows or reducers. Support piping adjacent to pump such that no weight is carried on pump casings. Provide supports under elbows on pump suction and discharge line sizes 100 mm and over.

.5 Ensure pumps operate at specified system fluid temperatures without vapour binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

.6 Align and verify alignment of base mounted pumps prior to start-up.

END OF SECTION

Approved: 2006-03-31

Part 1 General

1.1 RELATED SECTIONS

.1 Common Work Results for Mechanical.

1.2 SUBMITTALS

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

.2 Shop drawings to show:

- .1 Mounting arrangements.
- .2 Operating and maintenance clearances.

.3 Shop drawings and product data accompanied by:

- .1 Detailed drawings of bases, supports, and anchor bolts.
- .2 Acoustical sound power data, where applicable.
- .3 Points of operation on performance curves.
- .4 Manufacturer to certify current model production.
- .5 Certification of compliance to applicable codes.

.4 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.

.5 Closeout Submittals:

- .1 Provide operation and maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.
- .2 Operation and maintenance manual approved by, and final copies deposited with, Project Manager before final inspection.
- .3 Operation data to include:
  - .1 Control schematics for systems including environmental controls.
  - .2 Description of systems and their controls.
  - .3 Description of operation of systems at various loads together with reset schedules and seasonal variances.
  - .4 Operation instruction for systems and component.
  - .5 Description of actions to be taken in event of equipment failure.
  - .6 Valves schedule and flow diagram.
  - .7 Colour coding chart.
- .4 Maintenance data to include:
  - .1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
  - .2 Data to include schedules of tasks, frequency, tools required and task time.
- .5 Performance data to include:

.1 Equipment manufacturer's performance datasheets with point of operation as left after commissioning is complete.

.2 Equipment performance verification test results.

.3 Special performance data as specified.

.4 Testing, adjusting and balancing reports as specified in Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.

.6 Approvals:

.1 Submit 2 copies of draft Operation and Maintenance Manual to Project Manager for approval. Submission of individual data will not be accepted unless directed by Project Manager.

.2 Make changes as required and re-submit as directed by Project Manager.

.7 Additional data:

.1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.

.8 Site records:

.1 Project Manager will provide 1 set of reproducible mechanical drawings. Provide sets of white prints as required for each phase of work. Mark changes as work progresses and as changes occur. Include changes to existing mechanical systems, control systems and low voltage control wiring.

.2 Transfer information weekly to reproducibles, revising reproducibles to show work as actually installed.

.3 Use different colour waterproof ink for each service.

.4 Make available for reference purposes and inspection.

.9 As-built drawings:

.1 Prior to start of Testing, Adjusting and Balancing for HVAC, finalize production of as-built drawings.

.2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: - "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (Date).

.3 Submit to Project Manager for approval and make corrections as directed.

.4 Perform testing, adjusting and balancing for HVAC using as-built drawings.

.5 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.

.10 Submit copies of as-built drawings for inclusion in final TAB report.

1.3 QUALITY ASSURANCE

.1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.

.2 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.4 MAINTENANCE

.1 Furnish spare parts in accordance with Section 01 78 00 - Closeout Submittals as follows:

.1 One set of packing for each pump.

.2 One casing joint gasket for each size pump.

.3 One head gasket set for each heat exchanger.

.4 One glass for each gauge glass.

.5 One filter cartridge or set of filter media for each filter or filter bank in addition to final operating set.

.2 Provide one set of special tools required to service equipment as recommended by manufacturers and in accordance with Section 01 78 00 - Closeout Submittals.

.3 Furnish one commercial quality grease gun, grease and adapters to suit different types of grease and grease fittings.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Waste Management and Disposal:

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

Part 2 Execution

2.1 PAINTING REPAIRS AND RESTORATION

.1 Do painting in accordance with Section 09 91 23 - Interior Painting.

.2 Prime and touch up marred finished paintwork to match original.

.3 Restore to new condition, finishes which have been damaged.

2.2 CLEANING

.1 Clean interior and exterior of all systems including strainers. Vacuum interior of ductwork and air handling units.

2.3 DEMONSTRATION

.1 Departmental Representative and Project Manager will use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.

.2 Trial usage to apply to following equipment and systems:

.1 Exhaust fans and dampers, hot water tank, sink, sump pump, dehumidifier, unit heaters, thermostats and humidistats.

.3 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.

.4 Use operation and maintenance manual, as-built drawings, and audio visual aids as part of instruction materials.

.5 Instruction duration time requirements as specified in appropriate sections.

2.4 PROTECTION

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

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Nameplates.

.2 Tags.

.3 Stencils.

.4 Pipe Markers.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Administrative Requirements.

.2 Section 01 61 00 - Common Product Requirements.

1.3 REFERENCES

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

1.4 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.

.5 Samples: Submit two label samples.

.6 Manufacturer's Installation Instructions: Indicate special procedures, and installation.

1.5 PROJECT RECORD DOCUMENTS

.1 Section 01 78 10: Submittals for project closeout.

.2 Record actual locations of tagged valves.

Part 2 Products

2.1 NAMEPLATES

.1 Manufacturers:

.1 Lamacoid.

.2 Substitutions: Refer to Section 01 62 00.

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

2.2 TAGS

.1 Manufacturers:

.1 Lamacoid

.2 Substitutions: Refer to Section 01 62 00.

.2 Chart: Typewritten letter size list in anodized aluminum frame.

2.3 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 99.

2.4 PIPE MARKERS

.1 Manufacturers:

.1 Brady Canada

.2 Substitutions: Refer to Section 01 62 00.

.2 Colour: Conform to ASME A13.1.

.3 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.

.4 Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

.5 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.

Part 3 Execution

3.1 PREPARATION

.1 Degrease and clean surfaces to receive adhesive for identification materials.

.2 Prepare surfaces to Section 09 91 99 for stencil painting.

3.2 INSTALLATION

.1 Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

.2 Install tags with corrosion resistant chain.

.3 Apply stencil painting to Section 09 91 99.

.4 Install plastic pipe markers to manufacturer's instructions.

.5 Install plastic tape pipe markers complete around pipe to manufacturer's instructions.

.6 Install underground plastic pipe markers 150 to 200 mm below finished grade, directly above buried pipe.

.7 Identify air handling units, pumps, heat transfer equipment, tanks, and water treatment devices with plastic nameplates. Small devices, such as in-line pumps, may be identified with tags.

.8 Identify control panels and major control components outside panels with plastic nameplates.

.9 Identify thermostats relating to terminal boxes or valves with nameplates.

.10 Identify valves in main and branch piping with tags.

.11 Identify air terminal units and radiator valves with numbered tags.

.12 Tag automatic controls, instruments, and relays. Key to control schematic.

.13 Identify piping, concealed or exposed, with plastic tape pipe markers. stencilled painting. Use tags on piping 20 mm diameter and smaller. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 6 m on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.

.14 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.

.15 Provide ceiling tacks to locate valves or dampers above T-bar type panel ceilings. Locate in corner of panel closest to equipment.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Testing, adjustment, and balancing of air systems.

1.2 RELATED SECTIONS

.1 Section 01 20 13 - Price and Payment Procedures.

.2 Section 01 33 00 - Administrative Requirements.

.3 Section 01 44 00 - Quality Assurance:

.1 Testing laboratory services.
.2 Employment of testing agency and payment for services.
.3 Inspection and testing allowances.

.4 Section 01 61 00 - Common Product Requirements.

.5 Section 01 78 10 - Execution Requirements:

.1 Starting of Systems.
.2 Testing, Adjusting, and Balancing of Systems.

1.3 ALLOWANCES

.1 Cash Allowance: Section 01 20 13 for the Cash Allowance Sum applicable to this section.

.2 Allowance includes testing, adjusting, and balancing of mechanical systems.

.3 Work is included in this section and is part of the Contract Sum/Price.

1.4 REFERENCES

.1 AABC - National Standards for Total System Balance.

.2 ADC - Test Code for Grilles, Registers, and Diffusers.

.3 ASHRAE 111 - Practices for Measurement, Testing, Adjusting, and Balancing of Building Heating, Ventilation, Air-conditioning, and Refrigeration Systems.

.4 NEBB - Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems.

.5 SMACNA - HVAC Systems Testing, Adjusting, and Balancing.

1.5 SUBMITTALS

.1 Section 01 33 00: Procedures for submittals.

.2 Submit name of adjusting and balancing agency for approval within 30 days after award of Contract.

.3 Section 01 44 00: Procedures for submitting Field Reports.

.4 Field Reports: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.

.5 Prior to commencing work, submit report forms or outlines indicating adjusting, balancing, and equipment data required.

.6 Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Consultant and for inclusion in operating and maintenance manuals.

.7 Provide reports in soft cover, letter size, 3-ring binder manuals, complete with index page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.

.8 Include detailed procedures, agenda, sample report forms and copy of AABC National Project Performance Guaranty prior to commencing system balance.

.9 Test Reports: Indicate data on AABC National Standards for Total System Balance forms. Submit data in S.I. Metric units.

1.6 PROJECT RECORD DOCUMENTS

.1 Section 01 78 10: Submittals for project closeout.

.2 Record actual locations of flow measuring stations and balancing valves and rough setting.

1.7 QUALITY ASSURANCE

.1 Perform total system balance to AABC National Standards for Field Measurement and Instrumentation, Total System Balance.

.2 Maintain one copy of each document on site.

1.8 QUALIFICATIONS

.1 Agency: Company specializing in the testing, adjusting, and balancing of systems specified in this Section with minimum three years documented experience certified by AABC/CAABC.

.2 Perform Work under supervision of CAABC Certified Test and Balance Engineer.

1.9 PRE-BALANCING CONFERENCE

.1 Convene one week prior to commencing work of this section, to Section 01 33 00.

1.10 SEQUENCING

.1 Sequence work to Section 01 10 13.

.2 Sequence work to commence after completion of systems and schedule completion of work before Substantial Completion of Project.

1.11 SCHEDULING

.1 Schedule work to Section 01 33 00.

.2 Schedule and provide assistance in final adjustment and test of life safety and smoke control system with Fire Authority.

Part 2 Products

.1 Not used

Part 3 Execution

3.1 AGENCIES

.1 Air Movement Services, Winnipeg.

.2 Airdronics, Winnipeg.

.3 Other AABC/CAABC certified balancing companies.

3.2 EXAMINATION

.1 Verify that systems are complete and operable before commencing work. Ensure the following conditions:

.1 Systems are started and operating in a safe and normal condition.
.2 Temperature control systems are installed complete and operable.
.3 Proper thermal overload protection is in place for electrical equipment.
.4 Final filters are clean and in place. If required, install temporary media in addition to final filters.
.5 Duct systems are clean of debris.
.6 Fans are rotating correctly.
.7 Fire and volume dampers are in place and open.
.8 Air coil fins are cleaned and combed.
.9 Access doors are closed and duct end caps are in place.
.10 Air outlets are installed and connected.
.11 Duct system leakage is minimized.
.12 Hydronic systems are flushed, filled, and vented.
.13 Pumps are rotating correctly.

.14 Proper strainer baskets are clean and in place.

.15 Service and balance valves are open.

.2 Submit field reports. Report defects and deficiencies noted during performance of services which prevent system balance.

.3 Beginning of work means acceptance of existing conditions.

3.3 PREPARATION

.1 Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Consultant to facilitate spot checks during testing.

.2 Provide additional balancing devices as required.

3.4 INSTALLATION TOLERANCES

.1 Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.

.2 Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

.3 Hydronic Systems: Adjust to within plus or minus 10 percent of design.

3.5 ADJUSTING

.1 Ensure recorded data represents actual measured or observed conditions.

.2 Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

.3 After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

.4 Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

.5 At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the Owner.

.6 Check and adjust systems approximately six months after final acceptance and submit report.

3.6 AIR SYSTEM PROCEDURE

.1 Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities at site altitude.

.2 Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.

.3 Measure air quantities at air inlets and outlets.

.4 Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.

.5 Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.

.6 Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.

.7 Provide system schematic with required and actual air quantities recorded at each outlet or inlet.

.8 Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.

.9 Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.

.10 Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.

.11 Where modulating dampers are provided, take measurements and balance at extreme conditions. Balance variable volume systems at maximum air flow rate, full cooling, and at minimum air flow rate, full heating.

.12 Measure building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximately 12.5 Pa positive static pressure near the building entries.

.13 Check multi-zone units for motorized damper leakage. Adjust air quantities with mixing dampers set first for cooling, then heating, then modulating.

.14 For variable air volume system powered units set volume controller to air flow setting indicated. Confirm connections properly made and confirm proper operation for automatic variable air volume temperature control.

.15 On fan powered VAV boxes, adjust air flow switches for proper operation.

3.7 WATER SYSTEM PROCEDURE

.1 Adjust water systems to provide required or design quantities.

.2 Use calibrated Venturi tubes, orifices, or other metered fittings and pressure gauges to determine flow rates for system balance. Where flow metering devices are not installed, base flow balance on temperature difference across various heat transfer elements in the system.

.3 Adjust systems to provide specified pressure drops and flows through heat transfer elements prior to thermal testing. Perform balancing by measurement of temperature differential in conjunction with air balancing.

.4 Effect system balance with automatic control valves fully open to heat transfer elements.

.5 Effect adjustment of water distribution systems by means of balancing cocks, valves, and fittings. Do not use service or shut-off valves for balancing unless indexed for balance point.

.6 Where available pump capacity is less than total flow requirements or individual system parts, full flow in one part may be simulated by temporary restriction of flow to other parts.

3.8 SCHEDULES

.1 Equipment requiring testing, adjusting and balancing:

.1 Fans

.2 Report Forms

.1 Title Page:

.1 Name of Testing, Adjusting, and Balancing Agency
.2 Address of Testing, Adjusting, and Balancing Agency
.3 Telephone number of Testing, Adjusting, and Balancing Agency
.4 Project name
.5 Project location
.6 Project Architect
.7 Project Engineer
.8 Project Contractor
.9 Project altitude
.10 Report date

.2 Summary Comments:

.1 Design versus final performance
.2 Notable characteristics of system
.3 Description of systems operation sequence
.4 Summary of outdoor and exhaust flows to indicate amount of building pressurization
.5 Nomenclature used throughout report
.6 Test conditions

.3 Instrument List:

.1 Instrument
.2 Manufacturer
.3 Model number
.4 Serial number
.5 Range

.6 Calibration date

.4 Electric Motors:

.1 Manufacturer
.2 Model/Frame
.3 HP/BHP
.4 Phase, voltage, amperage; nameplate, actual, no load
.5 RPM
.6 Service factor
.7 Starter size, rating, heater elements
.8 Sheave Make/Size/Bore

.5 V-Belt Drive:

.1 Identification/location
.2 Required driven RPM
.3 Driven sheave, diameter and RPM
.4 Belt, size and quantity
.5 Motor sheave diameter and RPM
.6 Centre to centre distance, maximum, minimum, and actual

.6 Pump Data:

.1 Identification/number
.2 Manufacturer
.3 Size/model
.4 Impeller
.5 Service
.6 Design flow rate, pressure drop, BHP
.7 Actual flow rate, pressure drop, BHP
.8 Discharge pressure
.9 Suction pressure
.10 Total operating head pressure
.11 Shut off, discharge and suction pressures
.12 Shut off, total head pressure

.7 Air Cooled Condenser:

.1 Identification/number
.2 Location
.3 Manufacturer
.4 Model number
.5 Serial number
.6 Entering DB air temperature, design and actual
.7 Leaving DB air temperature, design and actual
.8 Number of compressors

.8 Cooling Coil Data:

.1 Identification/number

.2 Location
.3 Service
.4 Manufacturer
.5 Air flow, design and actual
.6 Entering air DB temperature, design and actual
.7 Entering air WB temperature, design and actual
.8 Leaving air DB temperature, design and actual
.9 Leaving air WB temperature, design and actual
.10 Water flow, design and actual
.11 Water pressure drop, design and actual
.12 Entering water temperature, design and actual
.13 Leaving water temperature, design and actual
.14 Saturated suction temperature, design and actual
.15 Air pressure drop, design and actual

.9 Heating Coil Data:
.1 Identification/number
.2 Location
.3 Service
.4 Manufacturer
.5 Air flow, design and actual
.6 Water flow, design and actual
.7 Water pressure drop, design and actual
.8 Entering water temperature, design and actual
.9 Leaving water temperature, design and actual
.10 Entering air temperature, design and actual
.11 Leaving air temperature, design and actual
.12 Air pressure drop, design and actual

.10 Electric Duct Heater:
.1 Manufacturer
.2 Identification/number
.3 Location
.4 Model number
.5 Design kW
.6 Number of stages
.7 Phase, voltage, amperage
.8 Test voltage (each phase)
.9 Test amperage (each phase)
.10 Air flow, specified and actual
.11 Temperature rise, specified and actual

.11 Air Moving Equipment
.1 Location

.2 Manufacturer
.3 Model number
.4 Serial number
.5 Arrangement/Class/Discharge
.6 Air flow, specified and actual
.7 Return air flow, specified and actual
.8 Outside air flow, specified and actual
.9 Total static pressure (total external), specified and actual
.10 Inlet pressure
.11 Discharge pressure
.12 Sheave Make/Size/Bore
.13 Number of Belts/Make/Size
.14 Fan RPM

.12 Return Air/Outside Air Data:
.1 Identification/location
.2 Design air flow
.3 Actual air flow
.4 Design return air flow
.5 Actual return air flow
.6 Design outside air flow
.7 Actual outside air flow
.8 Return air temperature
.9 Outside air temperature
.10 Required mixed air temperature
.11 Actual mixed air temperature
.12 Design outside/return air ratio
.13 Actual outside/return air ratio

.13 Exhaust Fan Data:
.1 Location
.2 Manufacturer
.3 Model number
.4 Serial number
.5 Air flow, specified and actual
.6 Total static pressure (total external), specified and actual
.7 Inlet pressure
.8 Discharge pressure
.9 Sheave Make/Size/Bore
.10 Number of Belts/Make/Size
.11 Fan RPM

.14 Duct Traverse:
.1 System zone/branch

.2 Duct size
.3 Area
.4 Design velocity
.5 Design air flow
.6 Test velocity
.7 Test air flow
.8 Duct static pressure
.9 Air temperature
.10 Air correction factor

.15 Duct Leak Test:
.1 Description of ductwork under test
.2 Duct design operating pressure
.3 Duct design test static pressure
.4 Duct capacity, air flow
.5 Maximum allowable leakage duct capacity times leak factor
.6 Test apparatus
.1 Blower
.2 Orifice, tube size
.3 Orifice size
.4 Calibrated
.7 Test static pressure
.8 Test orifice differential pressure
.9 Leakage

.16 Air Monitoring Station Data:
.1 Identification/location
.2 System
.3 Size
.4 Area
.5 Design velocity
.6 Design air flow
.7 Test velocity
.8 Test air flow

.17 Flow Measuring Station:
.1 Identification/number
.2 Location
.3 Size
.4 Manufacturer
.5 Model number
.6 Serial number
.7 Design Flow rate
.8 Design pressure drop

.9 Actual/final pressure drop
.10 Actual/final flow rate
.11 Station calibrated setting

.18 Air Distribution Test Sheet:
.1 Air terminal number
.2 Room number/location
.3 Terminal type
.4 Terminal size
.5 Area factor
.6 Design velocity
.7 Design air flow
.8 Test (final) velocity
.9 Test (final) air flow
.10 Percent of design air flow

.19 Sound Level Report:
.1 Location
.2 Octave bands - equipment off
.3 Octave bands - equipment on

.20 Vibration Test:
.1 Location of points:
.1 Fan bearing, drive end
.2 Fan bearing, opposite end
.3 Motor bearing, centre (if applicable)
.4 Motor bearing, drive end
.5 Motor bearing, opposite end
.6 Casing (bottom or top)
.7 Casing (side)
.8 Duct after flexible connection (discharge)
.9 Duct after flexible connection (suction)
.2 Test readings:
.1 Horizontal, velocity and displacement
.2 Vertical, velocity and displacement
.3 Axial, velocity and displacement
.3 Normally acceptable readings, velocity and acceleration
.4 Unusual conditions at time of test
.5 Vibration source (if non-complying)

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Duct work insulation.

.2 Duct Liner.

.3 Insulation jackets.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Administrative Requirements.

.2 Section 01 44 00 - Quality Assurance.

.3 Section 01 61 00 - Common Product Requirements.

.4 Section 09 91 10 - Painting: Painting insulation jackets.

.5 Section 23 05 53 - Mechanical Identification.

.6 Section 23 31 00 - Duct Work: Glass fibre duct work.

.7 Section 23 31 00 - Duct Work: Duct liner.

1.3 REFERENCES

.1 Section 01 44 00: Requirements for references and standards.

.2 ASTM B209 - Aluminum and Aluminum-Alloy Sheet and Plate.

.3 ASTM C518 - Steady-State Thermal Transmission Properties by Means of the Heat Flow Metre Apparatus.

.4 ASTM C553 - Standard Specification for Mineral Fibre Blanket Thermal Insulation for Commercial and Industrial Applications.

.5 ASTM C612 - Standard Specification for Mineral Fibre Block and Board Thermal Insulation.

.6 ASTM C921 - Properties of Jacketing Materials for Thermal Insulation.

.7 ASTM C1071 - Fibrous Glass Duct Lining Insulation(Thermal Sound Absorbing Material).

.8 ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

.9 ASTM E96 - Water Vapour Transmission of Materials.

.10 ASTM E162 - Standard Test Method for Surface Flammability of Materials Using a Radiant Heat Energy Source.

.11 ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

.12 NAIMA National Insulation Standards.

.13 NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.

.14 SMACNA - HVAC Duct Construction Standards - Metal and Flexible.

.15 UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials.

1.4 SUBMITTALS FOR REVIEW

.1 Section 01 33 00: Procedures for submittals.

.2 Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

1.5 SUBMITTALS FOR INFORMATION

.1 Section 01 33 00: Procedures for submittals.

.2 Manufacturer's Instructions: Indicate installation procedures which ensure acceptable workmanship and installation standards will be achieved.

1.6 QUALITY ASSURANCE

.1 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

.2 Applicator Qualifications: Company specializing in performing the work of this section with minimum three years documented experience.

1.7 REGULATORY REQUIREMENTS

.1 Materials: Flame spread/smoke developed rating of 25/50 to ASTM E84 NFPA 255 UL 723.

1.8 DELIVERY, STORAGE, AND PROTECTION

.1 Section 01 61 00: Transport, handle, store, and protect products.

.2 Accept materials on site in original factory packaging, labelled with manufacturer's identification, including product density and thickness.

.3 Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.9 ENVIRONMENTAL REQUIREMENTS

.1 Section 01 61 00: Environmental conditions affecting products on site.

.2 Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.

.3 Maintain temperature during and after installation for minimum period of 24 hours.

Part 2 Products

2.1 INSULATION

.1 Mineral fibre: as specified includes glass fibre, rock wool, slag wool.

.2 Thermal conductivity ("k" factor) not to exceed specified values at 24 deg C mean temperature when tested in accordance with ASTM C 335

.3 TIAC Code C-1; Rigid mineral fibre board to ASTM C 612, with or without factory applied vapour retarder jacket to CBSB 51-GP-52Ma

.4 TIAC Code C-2: Mineral fibre blanket to ASTM C 553 faced with or without factory applied vapour retarder jacket to CGSB 51-GP-52Ma

.1 Mineral Fibre to ASTM c 553

.2 Jacket: to CGSB 51-gp-52MA

.3 Maximum "k" Factor to ASTM C 553

2.2 JACKETS

.1 Canvas:

.1 220 gm/m2 cotton. Plain weave, treated with dilute fire retardant lagging adhesive to ASTM C921

2.3 ACCESSORIES

.1 Vapour retarder lap adhesive

.1 Water based, fire retardant type, compatible with insulation

.2 Indoor Vapour Retarder Finish

.1 Vinyl emulsion type acrylic, compatible with insulation

.3 Insulating Cement: hydraulic setting on mineral wool, to ASTM C 449

.4 ULC Listed Canvas Jacket

.5 Tape self-adhesive, aluminum reifinroced 75mm wide

.6 Contact adhesive: quick setting

.7 Canvas adhesive: washable

.8 Tie wire: 1.5mm stainless stel

.9 Banding: 12mm wide, 0.5mm thick stainless steel

.10 Facing: 25mm galvanized steel hexagonal wire mesh stitched on one face of insulation

.11 Fasteners: 4mm dia pins with 35mm dia clips, length to suit insulation thickness.

Part 3 Execution

3.1 EXAMINATION

.1 Section 01 70 00 - Examination and Preparation: Verification of existing conditions before starting work.

.2 Verify that duct work has been tested before applying insulation materials.

.3 Verify that surfaces are clean, foreign material removed, and dry.

3.2 INSTALLATION

.1 Section 01 44 00 - Quality Assurance: Manufacturer's instructions.

.2 Install to NAIMA National Insulation Standards.

.3 Insulated duct work conveying air below ambient temperature:

.1 Provide insulation with vapour barrier jackets.
.2 Finish with tape and vapour barrier jacket.
.3 Continue insulation through walls, sleeves, hangers, and other duct penetrations.
.4 Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.

.4 Insulated duct work conveying air above ambient temperature:

.1 Provide with or without standard vapour barrier jacket.
.2 Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.

.5 Duct Work Exposed in Mechanical Equipment Rooms or Finished Spaces below 3 metres above finished floor: Finish with canvas jacket sized for finish painting or aluminum jacket.

.6 Exterior Applications: Provide insulation with vapour barrier jacket. Cover with caulked aluminum jacket with seams located on bottom side of horizontal duct section.

.7 External Duct Insulation Application:

.1 Secure insulation with vapour barrier with wires and seal jacket joints with vapour barrier adhesive or tape to match jacket.

.2 Secure insulation without vapour barrier with staples, tape, or wires.

.3 Install without sag on underside of duct work. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift duct work off trapeze hangers and insert spacers.

.4 Seal vapour barrier penetrations by mechanical fasteners with vapour barrier adhesive.

.5 Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.

.8 Duct and Plenum Liner Application:

.1 Adhere insulation with adhesive for 90 percent coverage.

.2 Secure insulation with mechanical liner fasteners. Refer to SMACNA Standards for spacing.

.3 Seal and smooth joints. Seal and coat transverse joints.

.4 Seal liner surface penetrations with adhesive.

.5 Duct dimensions indicated are net inside dimensions required for air flow. Increase duct size to allow for insulation thickness.

3.3 SCHEDULES

Ducts	**Insulation**
Exhaust Ducts Within 3 m of Exterior Openings	3” foil-faced insulation
Outside Air Intake Ducts and Plenum	3” foil-faced insulation
Supply and Return Ducts and Plenums in Basement	1” foil-faced insulation or to match existing
Supply and Return Ducts and Plenums in Crawlspace	2” foil-faced insulation or to match existing
Supply and Return Ducts and Plenums in Attic space	2” foil-faced insulation
Supply and Return Ducts in Ceiling Space above General offices	Acoustic insulation
Vertical supply and return shafts supplying General offices	Acoustic insulation

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Metal duct work.

.2 Casing and plenums.

.3 Duct cleaning.

1.2 RELATED SECTIONS

.1 Section 01 10 00 - Summary of Work: Owner provided kitchen range hoods.

.2 Section 01 33 00 - Administrative Requirements.

.3 Section 01 61 00 - Common Product Requirements.

.4 Section 01 78 10 - Execution Requirements.

.5 Section 03 30 00 - Cast-in-place Concrete.

.6 Section 09 91 10 - Painting: Weld priming, weather resistant, paint or coating.

.7 Section 11 40 00 - Food Service Equipment: Supply of kitchen range hoods for placement by this Section.

.8 Section 23 05 29 - Supports And Anchors: Sleeves.

.9 Section 23 07 13 - Duct Insulation: External insulation and duct liner.

.10 Section 23 33 00 - Duct Work Accessories.

.11 Section 23 36 00 - Air Terminal Units.

.12 Section 23 37 00 - Air Outlets And Inlets.

.13 Section 23 05 93 - Testing, Adjusting, And Balancing.

1.3 REFERENCES

.1 ASTM A36/A36M - Carbon Structural Steel.

.2 ASTM A90/A90M - Weight (Mass) of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings.

.3 ASTM A167 - Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.

.4 ASTM A480/A480M - General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip.

.5 ASTM A568/A568M - General Requirements for Steel Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled.

.6 ASTM A653/A653M - Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.7 ASTM A1008/A1008M - Steel, Sheet, Cold-Rolled Carbon, Structural, High-Strength Low-Alloy and High Strength Low-Alloy with Improved Formability.

.8 ASTM A1011/A1011M - Standard Specification for Steel, Sheet, and Strip Hot-Rolled, Carbon, Structural, High-Strength, Low-Alloy with Improved Formability.

.9 ASTM B209 - Aluminum and Aluminum-Alloy Sheet and Plate.

.10 ASTM C14/C14M - Concrete Sewer, Storm Drain, and Culvert Pipe.

.11 ASTM C443 - Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.

.12 AWS D9.1 - Sheet Metal Welding Code.

.13 NBS PS 15 - Voluntary Product Standard for Custom Contact-Moulded Reinforced-Polyestor Chemical Resistant Process Equipment.

.14 NFPA 90A - Installation of Air Conditioning and Ventilating Systems.

.15 NFPA 90B - Installation of Warm Air Heating and Air-Conditioning Systems.

.16 NFPA 91 - Exhaust Systems for Air Conveying of Vapours, Gases, Mists, and Noncombustible Particulate Solids.

.17 NFPA 96 - Ventilation Control and Fire Protection of Commercial Cooking Operations.

.18 SMACNA - HVAC Air Duct Leakage Test Manual.

.19 SMACNA - HVAC Duct Construction Standards - Metal and Flexible.

.20 SMACNA - Fibrous Glass Duct Construction Standards.

.21 UL 181 - Factory-Made Air Ducts and Connectors.

1.4 PERFORMANCE REQUIREMENTS

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

1.5 SUBMITTALS

.1 Section 01 33 00: Procedures for submittals.

.2 Shop Drawings: Indicate duct fittings, particulars such as gauges, sizes, welds, and configuration prior to start of work for 1000 kPa pressure class and higher glass fibre duct systems.

.3 Product Data: Provide data for duct materials duct liner duct connectors .

1.6 PROJECT RECORD DOCUMENTS

.1 Section 01 78 10: Submittals for project closeout.

.2 Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

1.7 QUALITY ASSURANCE

.1 Perform Work to SMACNA - HVAC Duct Construction Standards - Metal and Flexible.

.2 Maintain one copy of document on site.

1.8 QUALIFICATIONS

.1 Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

.2 Installer: Company specializing in performing the work of this section with minimum 3 years documented experience.

1.9 REGULATORY REQUIREMENTS

.1 Construct duct work to NFPA 90B standards.

1.10 ENVIRONMENTAL REQUIREMENTS

.1 Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.

.2 Maintain temperatures during and after installation of duct sealants.

Part 2 Products

2.1 MATERIALS

.1 Galvanized Steel Ducts: ASTM A653 galvanized steel sheet, lock-forming quality, having G90 zinc coating of to ASTM A90.

.2 Fasteners: Rivets, bolts, or sheet metal screws.

.3 Sealant:

.1 Manufacturers:

.1 Duro Dyne S-2.

.2 Foster

.3 Substitutions: Refer to Section 01 62 00. Not permitted.

.2 Non-hardening, water resistant, fire resistive, compatible with mating materials; liquid used alone or with tape, or heavy mastic.

.4 Hanger Rod: ASTM A36; steel , galvanized; threaded both ends, threaded one end, or continuously threaded.

2.2 DUCT WORK FABRICATION

.1 Fabricate and support to SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated. Provide duct material, gauges, reinforcing, and sealing for operating pressures indicated.

.2 Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centreline. Where not possible and where rectangular elbows are used, provide air foil turning vanes. Where acoustical lining is indicated, provide turning vanes of perforated metal with glass fibre insulation.

.3 Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.

.4 Provide standard 45 degree lateral wye takeoffs unless otherwise indicated where 90 degree conical tee connections may be used.

2.3 MANUFACTURED DUCT WORK AND FITTINGS

.1 Manufacture to SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated. Provide duct material, gauges, reinforcing, and sealing for operating pressures indicated.

2.4 CASINGS

.1 Fabricate casings to SMACNA HVAC Duct Construction Standards - Metal and Flexible and construct for operating pressures indicated.

.2 Mount floor mounted casings on 100 mm high concrete curbs. At floor, rivet panels on 200 mm centres to angles. Where floors are acoustically insulated, provide liner of 1.20 mm galvanized expanded metal mesh supported at 300 mm centres, turned up 300 mm at sides with sheet metal shields.

.3 Reinforce door frames with steel angles tied to horizontal and vertical plenum supporting angles. Install hinged access doors where indicated or required for access to equipment for cleaning and inspection. Provide clear wire glass observation ports, minimum 150 X 150 mm size.

.4 Fabricate acoustic casings with reinforcing turned inward. Provide 1.50 mm back facing and 0.80 mm perforated front facing with 2.4 mm diameter holes on 4 mm centres. Construct panels 75 mm thick packed with 72 kg/cu m minimum glass fibre media, on inverted channels of 1.50 mm.

Part 3 Execution

3.1 INSTALLATION

.1 Install to manufacturer's instructions.

.2 Install and seal ducts to SMACNA HVAC Duct Construction Standards - Metal and Flexible.

.3 Duct Sizes are inside clear dimensions. For lined ducts, maintain sizes inside lining.

.4 Provide openings in duct work where required to accommodate thermometers and controllers. Provide pilot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated duct work, install insulation material inside a metal ring.

.5 Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

.6 Use crimp joints with or without bead for joining round duct sizes 200 mm and smaller with crimp in direction of air flow.

.7 Use double nuts and lock washers on threaded rod supports.

.8 Connect diffusers or light troffer boots to low pressure ducts directly or with 1.5 m maximum length of flexible duct held in place with strap or clamp.

.9 Connect flexible ducts to metal ducts with adhesive plus sheet metal screws.

.10 Set plenum doors 150 to 300 mm above floor. Arrange door swings so that fan static pressure holds door in closed position.

.11 During construction provide temporary closures of metal or taped polyethylene on open duct work to prevent construction dust from entering duct work system.

3.2 CLEANING

.1 Clean work to 01 78 10.

.2 Clean duct system and force air at high velocity through duct to remove accumulated dust. To obtain sufficient air, clean half the system at a time. Protect equipment which may be harmed by excessive dirt with temporary filters, or bypass during cleaning.

.3 Clean duct systems with high power vacuum machines. Protect equipment which may be harmed by excessive dirt with filters, or bypass during cleaning. Provide adequate access into duct work for cleaning purposes.

3.3 SCHEDULES

3.4 DUCT WORK MATERIAL SCHEDULE

	AIR SYSTEM	MATERIAL

	AIR SYSTEM	**MATERIAL**
	Low Pressure Supply (Heating Systems)	Steel
	Low Pressure Supply (System with Cooling Coils)	Steel
	Return and Relief	Steel,
	General Exhaust	Steel
	Outside Air Intake	Steel
	Evaporative Condenser Intake and Exhaust	Steel

3.5 DUCT WORK PRESSURE CLASS SCHEDULE

	AIR SYSTEM	**PRESSURE CLASS**
	Supply (Heating Systems)	125 Pa 250 Pa
	Supply (System with Cooling Coils)	125 Pa 250 Pa 500 Pa
	Return and Relief	125 Pa 250 Pa
	General Exhaust	125 Pa 250 Pa
	Outside Air Intake	125 Pa 250 Pa 500 Pa
	Evaporative Condenser	125 Pa
	Intake and Exhaust	250 Pa 500 Pa

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Volume control dampers.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Administrative Requirements.

.2 Section 01 61 00 - Common Product Requirements.

.3 Section 01 78 10 - Execution Requirements.

.4 Section 23 05 48 - Vibration Isolation.

.5 Section 23 31 00 - Duct Work.

.6 Section 23 36 00 - Air Terminal Units: Pressure regulating damper assemblies.

.7 Section 26 05 80 - Equipment Wiring: Electrical characteristics and wiring connections.

1.3 REFERENCES

.1 NFPA 90A - Installation of Air Conditioning and Ventilating Systems.

.2 SMACNA - HVAC Duct Construction Standards - Metal and Flexible.

1.4 SUBMITTALS

.1 Section 01 33 00: Procedures for submittals.

.2 Shop Drawings: Indicate for shop fabricated assemblies including volume control dampers duct access doors and duct test holes.

.3 Product Data: Provide for shop fabricated assemblies including volume control dampers duct access doors duct test holes and hardware used. Include electrical characteristics and connection requirements.

.4 Manufacturer's Installation Instructions: Indicate for fire dampers and combination fire and smoke dampers.

1.5 PROJECT RECORD DOCUMENTS

.1 Section 01 78 10: Submittals for project closeout.

.2 Record actual locations of access doors and test holes.

1.6 QUALIFICATIONS

.1 Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

1.7 REGULATORY REQUIREMENTS

.1 Products Requiring Electrical Connection: Listed and classified by CSA as suitable for the purpose specified and indicated.

1.8 DELIVERY, STORAGE, AND HANDLING

.1 Section 01 61 00: Transport, handle, store, and protect products.

.2 Protect dampers from damage to operating linkages and blades.

1.9 EXTRA MATERIALS

.1 Section 01 78 10: Submittals for project closeout.

.2 Provide two of each size and type of fusible link.

Part 2 Products

2.1 VOLUME CONTROL DAMPERS.

.1 Manufacturers:

.1 TAMCO Model Series 9000.

.2 Substitutions: Refer to Section 01 62 00.

.2 Extruded aluminum (6063-T5) damper frame shall not be less than 0.080” (2.03 mm) in thickness. Damper frame shall be 4” (101.6 mm) deep x 1" (25.4 mm), with duct mounting flanges on both sides of frame. Damper frame shall have a 2" (50.8 mm) mounting flange on the rear of the damper, when installed as Extended Rear Flange install type. Frame to be assembled using zinc-plated steel mounting fasteners. Welded frames shall not be acceptable.

.3 Blades shall be maximum 6.4" (162.6 mm) deep extruded aluminum (6063-T5) air-foil profiles with a minimum wall thickness of 0.06” (1.52mm). Blades shall be internally insulated with expanded polyurethane foam and shall be thermally broken. Complete blade shall have an insulating factor of R-2.29 and a temperature index of 55 *(tested to AAMA 1502.7 Test Method).* All blades shall be symmetrically pivoted.

.4 Blade seals shall be extruded EPDM, secured in an integral slot within the aluminum blade extrusions and shall be mechanically fastened to prevent shrinkage and movement over the life of the damper. Adhesive or clip-on type blade seals will not be approved.

.5 Linkage hardware shall be aluminum and corrosion-resistant zinc-plated steel, installed in the frame side, out of the airstream, and accessible after installation. Linkage hardware shall be complete with cup-point trunnion screws to prevent linkage slippage and a

Celcon bearing between moving parts to reduce wear and increase longevity. Linkage that consists of metal rubbing metal will not be approved.

.6 Dampers shall be designed for operation in temperatures ranging from -40°F (-40°C) to 212°F (100°C).

.7 Dampers shall be AMCA rated for Leakage Class 1A at 1 in w.g. (0.25 kPa) static pressure differential. Standard air leakage data to be certified under the AMCA Certified Ratings Program.

.8 Blade seals shall be extruded silicone, secured in an integral slot within the aluminum blade extrusions and shall be mechanically fastened to prevent shrinkage and movement over the life of the damper. Adhesive or clip-on type blade seals will not be approved.

Part 3 Execution

3.1 PREPARATION

.1 Verify that electric power is available and of the correct characteristics.

3.2 INSTALLATION

.1 Install accessories to manufacturer's instructions, NFPA 90A, and follow SMACNA HVAC Duct Construction Standards - Metal and Flexible. Refer to Section 23 31 00 for duct construction and pressure class.

.2 Provide flexible connections immediately adjacent to equipment in ducts associated with fans and motorized equipment , and supported by vibration isolators. Refer to Section 23 05 48.

3.3 DAMPER SCHEDULE

Drawing Code	**D-1**	**D-2**	**D-1**	**D-2**
Manufacturer	Tamco	Tamco	Tamco	Tamco
Model	Series 9000	Series 9000	Series 9000	Series 9000
LOCATION	WTP	WTP	PH	PH
Size	14”x14”	14”x14”	8”x8”	8”x8”
Configuration	Flanged to Duct	Flanged to Duct	Flanged to Duct	Flanged to Duct
Actuator	Belimo NFBUP/NFXUP	Belimo NFBUP/NFXUP	Belimo NFBUP/NFXUP	Belimo NFBUP/NFXUP

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Exhaust fans.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Administrative Requirements.

.2 Section 01 61 00 - Common Product Requirements.

.3 Section 01 78 10 - Execution Requirements.

.4 Section 23 05 13 - Motors.

.5 Section 23 05 48 - Vibration Isolation.

.6 Section 23 31 00 - Duct Work.

.7 Section 23 33 00 - Duct Work Accessories: Back-draft dampers.

.8 Section 23 34 13 - Axial Fans.

.9 Section 23 34 16 - Centrifugal Fans.

.10 Section 26 05 80 - Equipment Wiring: Electrical characteristics and wiring connections.

1.3 REFERENCES

.1 AMCA 99 - Standards Handbook.

.2 AMCA 210 - Laboratory Methods of Testing Fans for Aerodynamic Performance Rating.

.3 AMCA 261 - Directory of Products Licensed to Bear the AMCA Certified Ratings Seal.

.4 AMCA 300 - Reverberant Room Method for Sound Testing of Fans.

.5 AMCA 301 - Method of Publishing Sound Ratings for Air Moving Devices.

.6 NFPA 96 - Ventilation Control and Fire Protection of Commercial Cooking Operations.

.7 UL 705 - Power Ventilators.

1.4 SUBMITTALS

.1 Section 01 33 00: Procedures for submittals.

.2 Product Data: Provide data on fans and accessories including fan curves with specified operating point clearly plotted, sound power levels at rated capacity, and electrical characteristics and connection requirements.

.3 Manufacturer's Installation Instructions.

1.5 OPERATION AND MAINTENANCE DATA

.1 Section 01 78 10: Submittals for project closeout.

.2 Maintenance Data: Include instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams.

1.6 EXTRA MATERIALS

.1 Section 01 78 10: Submittals for project closeout.

.2 Provide two sets of belts for each fan.

Part 2 Products

2.1 INLINE EXHAUST FANS

.1 Manufacturers:

.1 EH PRICE

.2 Other acceptable manufacturers offering equivalent products.

.1 TWIN CITY.

.3 Substitutions: Refer to Section 01 62 00.

.2 Performance

.1 AS PER SCHEDULE

.3 Fan Unit: V-belt or direct driven with spun aluminum housing; resiliently mounted motor; 1/2 inch mesh.

.4 Electrical Characteristics and Components

.1 AS PER SCHEDULE

.2 Motor: Refer to Section 23 05 13.

.3 Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to code.

.4 Disconnect Switch: Factory wired, non-fusible, in housing for thermal overload protected motor.

.5 Sheaves: For V-belt drives, provide cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheaves selected so required rpm is obtained with sheaves set at mid-position; fan shaft with self aligning pre-lubricated ball bearings.

Part 3 Execution

3.1 INSTALLATION

.1 Install to manufacturer's instructions.

.2 Install flexible connections specified in Section 23 33 00 between fan inlet and ductwork. Ensure metal bands of connectors are parallel with minimum <25 mm><<one inch>> flex between ductwork and fan while running.

.3 Provide sheaves required for final air balance.

.4 Install motorized dampers on inlet. See drawings.

.5 Do not operate fans for any purpose until ductwork is clean, filters in place, bearings lubricated, and fan has been test run under observation.

3.2 POWER VENTILATOR SCHEDULE

Drawing Code	**EF-1**	**EF-2**
Manufacturer	EH Price	EH Price
Model	SQ-90-VG	SQ-75-VG
Fan Type	Centrifugal	Centrifugal
Hood/Housing	Inline	Inline
Air Flow Capacity	400cfm	150cfm
Static Pressure	0.5”WC	0.5”WC
Drive	Direct	Direct
Fan RPM	1642	1725
Motor hp	1/10	1/10
Electrical (V/Hz/PH)	115/60/3	115/60/3
Accessories		

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Electric unit heaters.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Administrative Requirements.

.2 Section 01 61 00 - Common Product Requirements.

.3 Section 01 78 10 - Execution Requirements.

.4 Section 26 05 80 - Equipment Wiring: Electrical characteristics and wiring connections.

1.3 REFERENCES

.1 ARI 410 - Forced-Circulation Air-Cooling and Air- Heating Coils.

1.4 SUBMITTALS FOR REVIEW

.1 Section 01 33 00: Procedures for submittals.

.2 Product Data: Provide coil and frame configurations, dimensions, materials, rows, connections, and rough-in dimensions.

.3 Shop Drawings: Indicate coil and frame configurations, dimensions, materials, rows, connections, and rough-in dimensions.

1.5 SUBMITTALS FOR INFORMATION

.1 Section 01 33 00: Submittals for information.

.2 Certificates: Certify that coil capacities meet or exceed specified requirements.

1.6 SUBMITTALS AT PROJECT CLOSEOUT

.1 Section 01 78 10: Submittals for project closeout.

.2 Warranty: Submit manufacturer warranty and ensure forms have been completed in Owners name and registered with manufacturer.

1.7 QUALITY ASSURANCE

.1 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years experience.

1.8 REGULATORY REQUIREMENTS

.1 Products Requiring Electrical Connection: Listed and classified by CSA as suitable for the purpose specified and indicated.

1.9 DELIVERY, STORAGE, AND HANDLING

.1 Section 01 61 00: Transport, handle, store, and protect products.

.2 Protect coil fins from crushing and bending by leaving in shipping cases until installation, and by storing indoors.

.3 Protect coils from entry of dirt and debris with pipe caps or plugs.

1.10 WARRANTY

.1 Section 01 78 10: Submittals for project closeout.

.2 Provide five (5) year manufacturer warranty.

Part 2 Products

2.1 ELECTRIC UNIT HEATERS

.1 Manufacturer: Ouellette

.2 Other acceptable manufacturers offering equivalent products.

.1 Substitutions: Refer to Section 01 62 00.

.3 Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, coil, controls, and accessories:

.1 Heating: Electric.

.4 Supply Fan: Propeller type with direct drive.

.1 Controls: Automatic reset thermal cut-out, built-in contactors, control circuit transformer and fuse.

.2 Room Thermostat: Cycles to maintain room temperature setting.

.3 Supply Fan Control: Energize from bonnet temperature independent of coil controls, with adjustable timed off delay and fixed timed on delay, with manual switch for continuous fan operation.

.5 Electrical Characteristics:

.1 2- 10 kW as per drawings.

.2 115 volts, single phase, 60 Hz.

Part 3 Execution

3.1 INSTALLATION

.1 Install to manufacturers written instructions.

.2 Install unit heaters with vibration isolation.

.3 Provide programmable thermostat.

.4 Provide connection to electrical power systems; refer to Section 26 05 80.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Industrial portable dehumidifier units.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Administrative Requirements.

.2 Section 01 61 00 - Common Product Requirements.

.3 Section 01 78 10 - Execution Requirements.

.4 Section 26 05 80 - Equipment Wiring: Electrical characteristics and wiring connections.

1.3 REFERENCES

.1 ARI 410 - Forced-Circulation Air-Cooling and Air-Heating Coils.

.2 SMACNA - HVAC Duct Construction Standards, Metal and Flexible.

1.4 SUBMITTALS FOR REVIEW

.1 Section 01 33 00: Procedures for submittals.

.2 Product Data: Provide catalogue data indicating general assembly, dimensions, weights, materials, and certified performance ratings.

.3 Shop Drawings: Indicate general assembly, dimensions, weights, and materials.

1.5 SUBMITTALS FOR INFORMATION

.1 Section 01 33 00: Submittals for information.

.2 Manufacturer's Instructions: Indicate assembly and setting operations.

1.6 SUBMITTALS AT PROJECT CLOSEOUT

.1 Section 01 78 10: Submittals for project closeout.

.2 Operation Data: Include assembly instructions, float adjustment, bleed rates, and electrical requirements.

.3 Maintenance Data: Instructions for lubrication filter replacement, cleaning and spare parts lists.

1.7 QUALITY ASSURANCE

.1 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years experience.

1.8 REGULATORY REQUIREMENTS

.1 Products Requiring Electrical Connection: Listed and classified by CSA as suitable for the purpose specified and indicated.

1.9 EXTRA MATERIALS

.1 Section 01 78 10: Submittals for project closeout.

.2 Provide two spare air filters.

Part 2 Products

2.1 MANUFACTURER

.1 Manufacturer: DRIEAZ Model LGR2800I.

.2 Other acceptable manufacturers offering equivalent products.

.1 Substitutions: Refer to Section 01 62 00.

2.2 CONSTRUCTION

.1	Power	8.0 amps, 115 volts	
.2	Water removal aham (80°f/60% rh)		130 pints | 61.5 liters / day
.3	Water removal max. (90°f/90% rh)		200 pts. | 61.5 liters / day
.4	Water removal min. (80°f/20% rh)		20 pts. | 9.5 liters / day
.5	Max. Process air	400 cfm | 679.7 cmh*	
.6	Air filter	3m HAF filter (DRI-EAZ part no. F421)	
.7	Power cord	25 ft. | 7.6 m detachable	
.8	Hose	40 ft. | 12.2 m	
.9	Construction:	Rotomolded polyethylene shell	
.10	Safety	ETL certified to UL 474 and CSA 22.2 NO. 92	

Part 3 Execution

3.1 INSTALLATION

.1 Install to manufacturer's instructions.

.2 Pipe drain and overflow to nearest floor drain.

.3 Connect unit to electrical supply. Refer to Section 26 05 80.

END OF SECTION

General

1.1 SECTION INCLUDES

.1 Thermostats.

.2 Humidistats.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Administrative Requirements.

.2 Section 01 61 00 - Common Product Requirements.

.3 Section 01 78 10 - Execution Requirements.

.4 Section 23 05 19 - Gages And Meters: Thermometer sockets, gauge taps.

.5 Section 23 05 48 - Vibration Isolation.

.6 Section 23 21 00 - Hydronic Piping: Installation of control valves, flow switches, temperature sensor sockets, gauge taps.

.7 Section 23 22 00 - Steam And Steam Condensate Piping: Installation of control valves, flow switches, temperature sensor sockets, gauge taps.

.8 Section 23 33 00 - Duct Work Accessories: Installation of automatic dampers.

.9 Section 25 50 01 - Analog Control Equipment.

.10 Section 25 50 02 - Digital Control Equipment.

.11 Section 25 90 00 - Sequence Of Operation.

.12 Section 26 27 26 - Wiring Devices: Elevation of exposed components.

.13 Section 26 05 80 - Equipment Wiring: Electrical characteristics and wiring connections.

1.3 REFERENCES

.1 AMCA 500 - Test Methods for Louvres, Dampers and Shutters.

.2 ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.

.3 ASTM B32 - Solder Metal.

.4 ASTM B280 - Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.

.5 ASTM D1693 - Environmental Stress - Cracking of Ethylene Plastics.

.6 NEMA DC 3 - Residential Controls - Electric Wall-Mounted Room Thermostats.

.7 NFPA 90A - Installation of Air Conditioning and Ventilation Systems.

1.4 SUBMITTALS FOR REVIEW

.1 Section 01 33 00: Procedures for submittals.

.2 Product Data: Provide description and engineering data for each control system component. Include sizing as requested. Provide data for each system component and software module.

.3 Shop Drawings: Indicate complete operating data, system drawings, wiring diagrams, and written detailed operational description of sequences. Submit schedule of valves indicating size, flow, and pressure drop for each valve. For automatic dampers indicate arrangement, velocities, and static pressure drops for each system.

1.5 SUBMITTALS AT PROJECT CLOSEOUT

.1 Section 01 78 10: Submittals for project closeout.

.2 Project Record Documents: Record actual locations of control components, including panels, thermostats, and sensors. Accurately record actual location of control components, including panels, thermostats, and sensors.

.3 Revise shop drawings to reflect actual installation and operating sequences.

.4 Operation and Maintenance Data: Include inspection period, cleaning methods, recommended cleaning materials, and calibration tolerances.

.5 Warranty: Submit manufacturers warranty and ensure forms have been filled out in Owners name and registered with manufacturer.

1.6 QUALITY ASSURANCE

.1 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years experience.

.2 Installer Qualifications: Company specializing in performing the work of this section with minimum three years experience.

1.7 REGULATORY REQUIREMENTS

.1 Products Requiring Electrical Connection: Listed and classified by CSA as suitable for the purpose specified and indicated.

1.8 WARRANTY

.1 Section 01 78 10: Submittals for project closeout.

.2 Correct defective Work within a five year period after Substantial Completion.

.3 Provide five year manufacturers warranty.

1.9 MAINTENANCE SERVICE

.1 Section 01 78 10: Submittals for project closeout.

.2 Provide service and maintenance of control system for one year from Date of Substantial Completion.

.3 Provide complete service of controls systems, including call backs. Make minimum of two complete normal inspections of approximately two hours duration in addition to normal service calls to inspect, calibrate, and adjust controls, and submit written reports.

1.10 EXTRA MATERIALS

.1 Section 01 78 10: Submittals for project closeout.

.2 Provide one of each type of thermostat and exposed sensor.

Part 2 Products

2.1 HUMIDISTATS

.1 Room Humidistats:

.1 Manufacturer: Johnson Controls.
.2 Other acceptable manufacturers offering equivalent products.
.1 Vaisala
.2 Schneider
.3 Substitutions: Refer to Section 01 62 00.
.3 Wall mounted, proportioning type.
.4 Throttling range: Adjustable 2 percent relative humidity.
.5 Operating range: 0 to 95 percent.
.6 Maximum temperature: 45 degrees C.
.7 Cover: Set point indication.

2.2 THERMOSTATS

.1 Electric Room Thermostats:

.1 Manufacturer: Johnson Controls.
.2 Other acceptable manufacturers offering equivalent products.
.1 Vaisala
.2 Schneider
.3 Substitutions: Refer to Section 01 62 00.
.3 Type: NEMA DC 3, 24 volts, with setback/setup temperature control.
.4 Service: heating only.
.5 Covers: set point adjustment with thermometer.

.2 Outdoor Humidity and Temperature Sensor:

.1 Manufacturer: Vaisala HMS 110.

.2 Other acceptable manufacturers offering equivalent products.

.1 Johnson Controls.

.2 Schneider.

.3 Substitutions: Refer to Section 01 62 00.

.3 Operating Range 0-100%RH, -40C-60C.

.4 2-wire 4-20mA current output.

Part 3 Execution

3.1 EXAMINATION

.1 Section 01 78 10: Verification of existing conditions before starting work.

.2 Verify that systems are ready to receive work.

.3 Beginning of installation means installer accepts existing conditions.

.4 Sequence work to ensure installation of components is complementary to installation of similar components in other systems.

.5 Coordinate installation of system components with installation of mechanical systems equipment such as air handling units and air terminal units.

.6 Ensure installation components is complementary to installation of similar components.

.7 Coordinate installation of system components with installation of mechanical systems equipment such as air handling units and air terminal units.

3.2 INSTALLATION

.1 Install to manufacturers instructions.

.2 Check and verify location of thermostats and humidistats and other exposed control sensors with plans and room details before installation. Locate 1 500 mm above floor. Align with lighting switches and humidistats.

.3 Mount freeze protection thermostats using flanges and element holders.

.4 Mount outdoor reset thermostats and outdoor sensors indoors, with sensing elements outdoors with sun shield.

.5 Provide conduit and electrical wiring to Section 26 05 80. Electrical material and installation to appropriate requirements of Division 16.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Sequence of operation:

- .1 Exhaust fans – general
- .2 Unit heaters.
- .3 Heating water.
- .4 Dehumidifier

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Administrative Requirements.

.2 Section 01 44 00 - Quality Assurance.

.3 Section 01 61 00 - Common Product Requirements.

.4 Section 01 78 10 - Execution Requirements.

.5 Section 25 30 00 - Instruments And Control Elements.

.6 Section 25 50 01 - Analog Control Equipment.

.7 Section 25 50 02 - Digital Control Equipment.

.8 Section 26 05 80 - Equipment Wiring: Electrical characteristics and wiring connections.

1.3 SYSTEM DESCRIPTION

.1 This section defines the manner and method by which controls function.

.2 Requirements for each type of control system operation are specified.

.3 Equipment, devices, and system components required for control systems are specified in other Sections.

1.4 SUBMITTALS FOR REVIEW

.1 Section 01 33 00: Procedures for submittals.

.2 Shop Drawings: Indicate mechanical system controlled and control system components.

- .1 Label with settings, adjustable range of control and limits. Include written description of control sequence.
- .2 Include flow diagrams for each control system, graphically depicting control logic.

.3 Include draft copies of graphic displays indicating mechanical system components, control system components, and controlled function status and value.

1.5 SUBMITTALS AT PROJECT CLOSEOUT

.1 Section 01 78 10: Submittals for project closeout.

.2 Project Record Documents: Record actual locations of components and set points of controls, including changes to sequences made after submission of shop drawings.

Part 2 Products

2.1 Not Used

.1 Not Used

Part 3 Execution

3.1 EXHAUST FANS

.1 EF-1 (PUMP HOUSE): Outside temperature sensor and dew point sensor monitors outdoor temperature and dewpoint and the thermostat and humidistat monitors building temperature and humidity. The outside air damper shall open and the exhaust fan shall operate when:

.1 The indoor temperature is greater than 30C. The damper shall close and the fan turn off when the temperature drops below 25C.

.2 The relative humidity in the building is higher than 90%, AND the dew point of the exterior air is less than the building temperature. Exhaust fan operation will cease and the air intake will close when the humidity in the building is reduced to 50%.

.3 The main light switch is turned on (indicating the building is occupied).

.2 EF-1 (WATER TREATMENT PLANT) Outside temperature sensor and dew point sensor monitors outdoor temperature and dewpoint and the thermostat and humidistat monitors building temperature and humidity. The outside air damper shall open and the exhaust fan shall operate when:

.1 The indoor temperature is greater than 30C. The damper shall close and the fan turn off when the temperature drops below 25C.

.2 The relative humidity in the building is higher than 90%, AND the dew point of the exterior air is less than the building temperature. Exhaust fan operation will cease and the air intake will close when the humidity in the building is reduced to 50%.

.3 The main light switch is turned on (indicating the building is occupied).

3.2 UNIT HEATERS

.1 Single temperature electric programmable room thermostat maintains constant space temperature of 20 degrees C by cycling electric heaters and unit fan motor. Unoccupied temperature setting of 15C (adjustable).

3.3 DOMESTIC HOT WATER ELECTRIC TANK

.1 Hot water tanks shall maintain 60 degrees C in water storage by cycling on/off electric immersion heaters as enabled from immersion aqua stat, all as a package from manufacturer.

3.4 DEHUMIDIFIER

.1 Dehumidifer shall operate automatically to maintain humidity levels in water treatment plant below 60% (adjustable). Condensate to be piped to nearest drain.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section Includes:
  .1 General requirements that are common to NMS sections found in Division 26 – Electrical, 27 – Communications, and 28 - Electronic Safety and Security.

.2 The word "Provide" shall mean "Supply and Install" the products and services specified.

.3 Provide materials and equipment of specified design, performance and quality; and current models with published certified ratings for which replacement parts are readily available. Provide project management and on-site supervision to undertake administration, meet schedules, ensure timely performance, ensure coordination, establishing orderly completion and the delivery of a fully commissioned installation.

.4 The most stringent requirements of this and other electrical sections shall govern.

.5 All work shall be in accordance with the project drawings and specifications and their intents, complete with all necessary components, including those not normally shown or specified, but required for a complete installation.

.6 Carefully examine all plans and specifications pertaining to this Contract and become familiar with all details. Visit the site and determine all factors affecting this section of the work and include all costs for same in tender.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)
  .1 CSA C22.1-15, Canadian Electrical Code, Part 1 (21st Edition), Safety Standard for Electrical Installations.

  .2 CAN3-C235-83(R2000), Preferred Voltage Levels for AC Systems, 0 to 50,000 V.

.2 The electrical installation shall comply with the requirements of the Electrical Supply Authority, the applicable edition of the Canadian Electrical Code, with all Provincial and Municipal Laws, Rules and Ordinances, and to the satisfaction of the Authorities Having Jurisdiction.

.3 Notify the Consultant of any discrepancies or conflictions with any regulation seven (7) working days before tenders close. Failing such notification, meet all such requirements without change to the contract price.

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

1.3 DESIGN REQUIREMENTS

.1 Operating voltages: to CAN3-C235.

.2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard.
.1 Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

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

1.4 SCOPE OF WORK

.1 Contractor shall supply all labour, equipment and materials necessary and reasonably implied, and provide commissioning and warranty for the complete and fully functional installation of the electrical work as shown on the plans and specified herein.

.2 Component subsystems of the electrical system will include, but are not limited to the following:
.1 Tie into existing service and provide distribution of electrical power.
.2 Provide receptacles or hardwired connections for all equipment.
.3 Provide lighting equipment including emergency and non-emergency lighting and exit signs.
.4 Provide power feeders to all mechanical equipment.
.5 Provide all required motor starters and control wiring associated.
.6 Provide complete raceway for power, lighting and life safety systems.
.7 Provide local disconnects where required by code.

1.5 SUBMITTALS

.1 Submittals: in accordance with Division 01.

.2 Shop drawings:
.1 Data shall be specific and technical.
.2 Identify each piece of equipment.
.3 Information shall include all scheduled data.
.4 Project and equipment designations shall be identified on each document.
.5 Size shall be 216mm x 280mm (8-1/2” x 11”) or 280mm x 430mm (11” x 17”)
.6 Keep one copy of shop drawings and product data on site, available for reference.
.7 Shop drawings of all equipment must be submitted to the Consultant for review in sufficient time to enable her to retain them for at least ten (10) working days.

.3 Quality Control: in accordance with Division 01 - Quality Control.
.1 Provide CSA certified equipment and material.
.2 Where CSA certified equipment and material is not available, submit such equipment and material to authority having jurisdiction for special approval before delivery to site, and submit such approval.
.3 Submit to Electrical Inspection Department, Local Fire Authorities and Supply Authority the necessary number of drawings and specifications for examination and approval prior to commencement of work. Obtain all required permits and pay all fees.
.4 Arrange for inspection of all work by the authorities having jurisdiction. On completion of the work, furnish final unconditional certificates of approval by the inspecting authorities.

1.6 QUALITY ASSURANCE

.1 Quality Assurance: in accordance with Division 01 - Quality Control.

.2 Qualifications: electrical Work to be carried out by qualified, licensed electricians or apprentices in accordance with authorities having jurisdiction.

.1 Employees registered in provincial apprentices program: permitted, under direct supervision of qualified licensed electricians, to perform specific tasks.

.2 Permitted activities: determined based on training level attained and demonstration of ability to perform specific duties.

.3 Health and Safety Requirements: do construction occupational health and safety in accordance with Division 01 – Health and Safety Requirements.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Material Delivery Schedule: provide Departmental Representative with schedule within 2 weeks after award of Contract.

1.8 SYSTEM START UP

.1 Instruct Departmental Representative and operating personnel in operation, care and maintenance of systems, system equipment and components.

.2 Arrange and pay for services of manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance and calibrate components and instruct operating personnel.

.3 Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant with aspects of its care and operation.

1.9 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Division 01 – Construction Waste Management and Disposal

.2 Avoid using landfill waste disposal procedures when recycling facilities are available.

.3 Place materials defined as hazardous or toxic waste in designated containers.

1.10 PROJECT COORDINATION

.1 Check drawings of all trades to verify space and headroom limitations for work to be installed. Coordinate work with all trades and make changes to facilitate a satisfactory installation. Make no deviations to the design intent involving extra cost without the Departmental Representative’s written approval.

.2 The drawings indicate the general location and route to be followed by the electrical services. Where details are not shown on the drawings or only shown diagrammatically, the services shall be installed in such a way as to conserve head room and interfere as little as possible with the free use of space through which they pass. All services in the ceiling shall be kept as tight as possible to beams or other limiting members at high level. All electrical services shall be coordinated in elevation to ensure that they are concealed in the ceiling or structural space provided unless detailed otherwise on drawings.

.3 Ensure that all materials and equipment fit into the allotted spaces and that all equipment can be properly serviced and replaced, if and when required. Advise the Departmental Representative of space problems before installing any material or equipment. Demonstrate to the Departmental Representative on completion of the work that all equipment installed can be properly, safely serviced and replaced, if and when required.

.4 The drawings show the general arrangement and extent of the work to be carried out, but the exact location and arrangement of all parts shall be determined as the work progresses. The location of equipment, outlets, etc., as given on the drawings are approximately correct, but it shall be understood that they are subject to such modifications as may be found necessary or desirable and the time of installation to meet any structural or architectural requirements. Such changes shall be implemented as directed by the Consultant, without additional charge.

1.11 SPRINKLER PROOF REQUIREMENTS

.1 In sprinklered rooms where electrical equipment is installed surface mounted, the electrical equipment contained in these rooms is to be protected by driphoods, shields, and gasketed doors as applicable to inhibit water ingress into electrical equipment. Exposed conduit connections are to utilize watertight connectors.

1.12 OPERATIONS AND MAINTENANCE MANUALS

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

- .1 Provide for each system and principal item of equipment as specified in technical sections for use by operation and maintenance personnel.
- .2 Operating instructions to include following:
  - .1 Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.
  - .2 Start up, proper adjustment, operating, lubrication, and shutdown procedures.
  - .3 Safety precautions.
  - .4 Procedures to be followed in event of equipment failure.
  - .5 Other items of instruction as recommended by manufacturer of each system or item of equipment.
- .3 Print or engrave operating instructions and frame under glass or in approved laminated plastic.
- .4 Post instructions where directed.
- .5 For operating instructions exposed to weather, provide weather-resistant materials or weatherproof enclosures.

.6 Ensure operating instructions will not fade when exposed to sunlight and are secured to prevent easy removal or peeling.

.7 Supply Red-Line Drawings in PDF to Consultant

Part 2 Products

2.1 MATERIALS AND EQUIPMENT

.1 Provide material and equipment in accordance with Division 01.

.2 Where equipment or materials are specified by technical description only, they are to be of the best commercial quality available for the intended purpose.

.3 Factory assemble control panels and component assemblies.

2.2 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS

.1 Provide all power and electrical system related control wiring, conduit wire, fittings, disconnect switches and motor starters for all mechanical equipment unless otherwise specified.

.2 Ground all motors to conduit system with separate grounding conductor in flexible conduit or bonding conductor in flexible conduit.

2.3 WARNING SIGNS

.1 Warning Signs: in accordance with requirements of authority having jurisdiction, including indication of multiple power sources.

2.4 WIRING TERMINATIONS

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

2.5 EQUIPMENT IDENTIFICATION

.1 Identify electrical equipment with nameplates and labels as follows:

.1 Nameplates: lamicoid 3 mm thick plastic engraving sheet, black or red face, black white core, lettering accurately aligned and engraved into core mechanically attached with self tapping screws.

.2 Sizes as follows:

NAMEPLATE SIZES

Size 1	10 x 50 mm	1 line	3 mm high letters
Size 2	12 x 70 mm	1 line	5 mm high letters
Size 3	12 x 70 mm	2 lines	3 mm high letters
Size 4	20 x 90 mm	1 line	8 mm high letters
Size 5	20 x 90 mm	2 lines	5 mm high letters

Size 6	25 x 100 mm	1 line	12 mm high letters
Size 7	25 x 100 mm	2 lines	6 mm high letters

.2 Labels: embossed plastic labels with 6 mm high letters unless specified otherwise.

.3 Wording on nameplates to be approved by Consultant prior to manufacture.

.4 Allow for minimum of twenty-five (25) letters per nameplate.

.5 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.

.6 Disconnects, starters and contactors: indicate equipment being controlled and voltage.

.7 Terminal cabinets and pull boxes: indicate system and voltage.

2.6 WIRING IDENTIFICATION

.1 Identify wiring with permanent indelible identifying markings, either numbered or coloured plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring.

.2 Maintain phase sequence and colour coding throughout.

.3 Colour coding: to CSA C22.1.

.4 Use colour coded wires in communication cables, matched throughout system.

2.7 CONDUIT AND CABLE IDENTIFICATION

.1 Colour code conduits, boxes and metallic sheathed cables.

.2 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor, and at 15 m intervals.

.3 Colours: 25 mm wide prime colour and 20 mm wide auxiliary colour.

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

2.8 FINISHES

.1 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original finish.

.2 Clean and prime paint non-galvanized exposed hanger, racks, fastenings to prevent rusting. Finish painting shall be provided by Division 09.

Part 3 Execution

3.1 INSTALLATION

.1 Do complete installation in accordance with CSA C22.1 except where specified otherwise.

.2 Do overhead and underground systems in accordance with CSA C22.3 No.1 except where specified otherwise.

.3 Comply with CSA Electrical Bulletins and Local Authorities having jurisdiction.

3.2 NAMEPLATES AND LABELS

.1 Ensure manufacturer's nameplates, CSA labels and identification nameplates are visible and legible after equipment is installed.

3.3 CONDUIT AND CABLE INSTALLATION

.1 Install conduit and sleeves prior to pouring of concrete.
.1 Sleeves through concrete: schedule 40 steel pipe, sized for free passage of conduit, and protruding 50 mm.

.2 Install cables, conduits and fittings to be embedded or plastered over, neatly and close to building structure so furring can be kept to minimum.

.3 Install roof jacks where conduit and cables penetrate roofs. Apply sealant after installation.

.4 All cables and conduits shall be concealed in finished areas.

3.4 LOCATION OF OUTLETS

.1 Do not install outlets back-to-back or in the same stud space in wall; allow minimum 400 mm horizontal clearance between boxes.

.2 Change location of outlets at no extra cost or credit, providing distance does not exceed 3000 mm (10’-0”), and information is given before installation.

.3 Locate light switches on latch side of doors unless otherwise indicated.

3.5 MOUNTING HEIGHTS

.1 Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicated otherwise.

.2 If mounting height of equipment is not specified or indicated, verify before proceeding with installation.

.3 Install electrical equipment at following heights unless indicated otherwise (to bottom of outlet).
- .1 Local switches: 47" (1200 mm).
- .2 Wall receptacles:
  - .1 General: 16" (400 mm).
  - .2 Above top of counters 6" (150 mm)or counter splash backs: 4" (100 mm).
  - .3 In mechanical rooms: 40" (1000mm).
- .3 Panelboards: as required by Code or as indicated.
- .4 Telephone and interphone outlets: 16" (400 mm).
- .5 Wall mounted telephone and interphone outlets: 47" (1200 mm).
- .6 Fire alarm stations: 47" (1200mm).
- .7 Fire alarm bells: 88" (2200mm)
- .8 Television outlets: 16" (400 mm).
- .9 Wall mounted speakers: 88" (2200mm)
- .10 Clocks: 84" (2150mm)
- .11 Emergency lighting 6" (150mm) below ceiling or 90" (2300mm) max.

3.6 CO-ORDINATION OF PROTECTIVE DEVICES

.1 Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to required values and settings.

3.7 FIELD QUALITY CONTROL

.1 Load Balance:
- .1 Measure phase current to panelboards with normal loads (lighting) operating at time of acceptance; adjust branch circuit connections as required to obtain best balance of current between phases and record changes.
- .2 Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment.
- .3 Provide upon completion of work, load balance report as directed in Division 1 - Submittals: phase and neutral currents on panelboards, dry-core transformers and motor control centres, operating under normal load, as well as hour and date on which each load was measured, and voltage at time of test.

.2 Conduct following tests in accordance with Section 01 - Quality Control:
- .1 Power distribution system including phasing, voltage, grounding and load balancing.
- .2 Circuits originating from branch distribution panels.
- .3 Lighting and its control.
- .4 Motors, heaters and associated control equipment including sequenced operation of systems where applicable.
- .5 Systems: fire alarm system, communications.
- .6 Insulation resistance testing:
  - .1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.
  - .2 Megger 350-600 V circuits, feeders and equipment with a 1000 V

instrument.

.3 Check resistance to ground before energizing.

.3 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.

3.8 CLEANING

.1 Do final cleaning in accordance with Division 01

.2 At time of final cleaning, clean lighting reflectors, lenses and other lighting surfaces that have been exposed to construction dust and dirt.

Part 1 General

1.1 RELATED SECTIONS

.1 Section 26 05 20 - Wire and Box Connectors - 0 - 1000 V.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)

.2 CSA C22.1-09

.3 National Electrical Manufacturers Association (NEMA)

1.3 PRODUCT DATA

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

Part 2 Products

2.1 BUILDING WIRES

.1 Conductors: stranded for 10 AWG and larger. Minimum size: 12 AWG.

.2 Copper conductors: size as indicated, with 1000 V insulation of chemically cross-linked thermosetting polyethylene material rated RW90.

.3 Conductors to be colour coded. Conductors 10 AWG and smaller shall have colour impregnated into insulation at the time of manufacture. Conductors sized 8 AWG and larger may be colour coded with adhesive colour coding tape, but only black insulated conductors shall be employed in this case, except for neutrals, which shall be white wherever possible. Where colour coding tape is utilized, it shall be applied for a minimum of 50 mm at terminations, junctions and pullboxes and conduit fittings. Conductors shall not be painted.

2.2 TECK CABLE

.1 Conductors:
- .1 Grounding conductor: copper.
- .2 Circuit conductors: copper, size as indicated.

.2 Insulation:
- .1 Type: ethylene propylene rubber.
- .2 Chemically cross-linked thermosetting polyethylene rated type RW90, 600 V.

.3 Inner jacket: polyvinyl chloride material.

.4 Armour: interlocking aluminum.

.5 Overall covering: thermoplastic polyvinyl chloride material.

.6 Fastenings:

.1 One hole steel straps to secure surface cables 50 mm and smaller. Two hole steel straps for cables larger than 50 mm.

.2 Threaded rods: 6 mm dia. to support suspended channels.

.7 Connectors:

.1 Watertight, approved for TECK cable.

2.3 ARMOURED CABLES

.1 Conductors: insulated, copper, size as indicated.

.2 Type: AC90.

.3 Armour: interlocking type fabricated from aluminum strip.

.4 Connectors: Approved for use with AC90

2.4 CONTROL CABLES

.1 Type LVT: 2 soft annealed copper conductors, sized as indicated, with thermoplastic insulation, outer covering of cotton braid thermoplastic jacket.

.2 Low energy 300 V control cable: solid annealed copper conductors sized as indicated, with PVC insulation type over each conductor and overall covering of interlocked armour of copper strip.

2.5 BUILDING WIRE AND CABLE

.1 Unless otherwise directed, building wire and cable shall be copper conductors, sized as indicated.

.2 Except where otherwise directed or required by Code or other applicable regulations, building wire and cable insulation shall be Type R90, cross-linked polyethylene insulated 600V, rated for not less than 90ºC.

Part 3 Execution

3.1 GENERAL INSTALLATION

.1 Unless specifically indicated otherwise, all wiring shall be installed in conduit. Use flexible conduits for final connections to suspend light fixtures and vibrating equipment.

.2 Before pulling wire, ensure conduit is dry and clean. To facilitate pulling, recognized specially manufactured wire pulling lubricants may be used. Do not use grease. Employ suitable techniques to prevent damage to wire when ambient temperature is below the minimum permitted for each insulation type.

.3 Conductors for lighting, receptacle and equipment branch circuits shall have ampacity not less than

the rating of the over-current device protecting the branch circuit, subject to applicable codes. Branch circuit conductors shall be sized for a maximum voltage drop of 2% from panelboard to the last outlet of a circuit.

3.2 INSTALLATION OF BUILDING WIRES

.1 Install wiring as follows:

.2 In conduit systems in accordance with Section 26 05 34.

3.3 INSTALLATION OF TECK CABLE 0 -1000 V

.1 Install cables.

.2 Group cables wherever possible on channels.

.3 Terminate cables in accordance with Section 26 05 20 - Wire and Box Connectors - 0 - 1000 V.

3.4 INSTALLATION OF ARMOURED CABLES

.1 Group cables wherever possible.

.2 Terminate cables in accordance with Section 26 05 20 - Wire and Box Connectors - 0 - 1000 V.

3.5 INSTALLATION OF ALUMINUM SHEATHED CABLE

.1 Group cables wherever possible on channels.

.2 Install cable in trenches in accordance with Section 16 .

.3 Lay cable in cabletroughs in accordance with Section 16 .

.4 Terminate cables in accordance with Section 26 05 20 - Wire and Box Connectors - 0-1000 V.

3.6 INSTALLATION OF CONTROL CABLES

.1 Install control cables in conduit.

.2 Ground control cable shield.

Part 1 General

1.1 RELATED SECTIONS

.1 Section 26 05 00 Common Work

1.2 WORK INCLUDED

.1 Supply and install all hangers, supports and inserts for the installation shown on the drawings and specified herein, as necessary to fasten electrical equipment securely to the building structure.

Part 2 Products

2.1 SUPPORT CHANNELS

.1 U shape, size 41 x 41 mm, 2.5 mm thick, surface mounted, suspended, or set in poured concrete walls and ceilings as required.

Part 3 Execution

3.1 INSTALLATION

.1 Secure equipment to hollow or solid masonry, tile and plaster surfaces with lead anchors or nylon shields.

.2 Secure equipment to poured concrete with expandable inserts.

.3 Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.

.4 Secure surface mounted equipment with twist clip fasteners to inverted T bar ceilings. Ensure that T bars are adequately supported to carry weight of equipment specified before installation.

.5 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.

.6 Fasten exposed conduit or cables to building construction or support system using straps.

- .1 One-hole steel straps to secure surface conduits and cables 50 mm and smaller.
- .2 Two-hole steel straps for conduits and cables larger than 50 mm.
- .3 Beam clamps to secure conduit to exposed steel work.

.7 Suspended support systems.

- .1 Support individual cable or conduit runs with 6 mm dia threaded rods and spring clips.
- .2 Support 2 or more cables or conduits on channels supported by 6 mm dia threaded rod hangers where direct fastening to building construction is impractical.

.8 For surface mounting of two or more conduits use channels at 1.52 m on centre spacing.

.9 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.

.10 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.

.11 Do not use wire lashing or perforated strap to support or secure raceways or cables.

.12 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Consultant.

.13 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

Part 1 General

1.1 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings and product data for cabinets in accordance with Section 01 33 00 - Submittal Procedures.

Part 2 Products

2.1 SPLITTERS

.1 Sheet metal enclosure, welded corners and formed hinged cover suitable for locking in closed position.

.2 Main and branch lugs to match required size and number of incoming and outgoing conductors as indicated.

.3 At least three spare terminals on each set of lugs in splitters less than 400 A.

2.2 JUNCTION AND PULL BOXES

.1 Welded steel construction with screw-on flat covers for surface mounting.

.2 Covers with 25 mm minimum extension all around, for flush-mounted pull and junction boxes.

.3 Junction boxes mounted in exterior walls shall be complete with box vapour barriers.

2.3 CABINETS

.1 Cabinets are to be code gauge sheet steel, welded construction, phosphatised and factory paint finish, suitable for field painting.

.2 Locks are to match panel boards

.3 Backboards to be 19 mm GIS fir plywood, one piece per cabinet, covering entire cabinet interior.

Part 3 Execution

3.1 SPLITTER INSTALLATION

.1 Install splitters and mount plumb, true and square to the building lines.

.2 Extend splitters full length of equipment arrangement except where indicated otherwise.

3.2 JUNCTION, PULL BOXES AND CABINETS INSTALLATION

.1 Install pull boxes in inconspicuous but accessible locations.

.2 Mount cabinets with top not higher than 2 m above finished floor.

.3 Only main junction and pull boxes are indicated. Install pull boxes so as not to exceed 30 m of conduit run between pull boxes.

3.3 IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results - Electrical.

.2 Install size 2 identification labels indicating system name, voltage and phase.

Part 1 General

1.1 REFERENCES

.1 CSA C22.1-15, Canadian Electrical Code, Part 1.

.2 26 05 00 – Common Work Results – For Electrical

Part 2 Products

2.1 OUTLET AND CONDUIT BOXES GENERAL

.1 Size boxes in accordance with CSA C22.1.

.2 102 mm square or larger outlet boxes as required for special devices.

.3 Gang boxes where wiring devices are grouped.

.4 Blank cover plates for boxes without wiring devices.

.5 347 V outlet boxes for 347 V switching devices.

.6 Combination boxes with barriers where outlets for more than one system are grouped.

2.2 SHEET STEEL OUTLET BOXES

.1 Electro-galvanized steel single and multi gang flush device boxes for flush installation, minimum size 76 x 50 x 38 mm or as indicated. 102 mm square outlet boxes when more than one conduit enters one side with extension and plaster rings as required.

.2 Electro-galvanized steel utility boxes for outlets connected to surface-mounted EMT conduit, minimum size 102 x 54 x 48 mm.

.3 102 mm square or octagonal outlet boxes for lighting fixture outlets.

.4 102 mm square outlet boxes with extension and plaster rings for flush mounting devices in finished plaster or tile walls.

2.3 MASONRY BOXES

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

2.4 CONCRETE BOXES

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

2.5 FLOOR BOXES

.1 Concrete tight electro-galvanized sheet steel floor boxes with adjustable finishing rings to suit floor finish with brass brushed aluminum faceplate. Device mounting plate to accommodate short or long ear duplex single receptacles. Minimum depth: 28 mm for receptacles; 73 mm for communication equipment.

.2 Adjustable, watertight, concrete tight, cast floor boxes with openings drilled and tapped for 12 mm and 19 mm conduit. Minimum size: 73 mm deep.

2.6 CONDUIT BOXES

.1 Cast FS or FD aluminum feraloy boxes with factory-threaded hubs and mounting feet for surface wiring of switches and receptacle.

2.7 OUTLET BOXES FOR NON-METALLIC SHEATHED CABLE

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

2.8 FITTINGS - GENERAL

.1 Bushing and connectors with nylon insulated throats.

.2 Knock-out fillers to prevent entry of debris.

.3 Conduit outlet bodies for conduit up to 32 mm and pull boxes for larger conduits.

.4 Double locknuts and insulated bushings on sheet metal boxes.

Part 3 Execution

3.1 INSTALLATION

.1 Support boxes independently of connecting conduits.

.2 Fill boxes with paper, sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of work.

.3 For flush installations mount outlets flush with finished wall using plaster rings to permit wall finish to come within 6 mm of opening.

.4 Provide correct size of openings in boxes for conduit, mineral insulated and armoured cable connections. Reducing washers are not allowed.

Part 1 General

1.1 REFERENCES

.1 Section 26 05 00 – Common Work Results for Electrical

.2 Section 26 05 29 – Fastening and Supports

1.2 LOCATION OF CONDUIT

.1 Drawings do not show all conduits. Those shown are diagrammatic form only.

.2 Electrical subcontractor shall produce layout sketches of conduit runs through mechanical and electrical service areas in order to pre-avoid any conflict with other construction elements and to determine the most efficient route to run conduit.

.3 Conceal all conduits in finished areas. Conduits may be surface mounted either only where indicated or in service areas accessible only to authorized personnel.

Part 2 Products

2.1 CONDUITS

.1 Electrical metallic tubing (EMT), with couplings; size as indicated.

.2 Rigid PVC conduit; size as indicated.

.3 Flexible metal conduit and liquid-tight flexible metal conduit; size as indicated.

2.2 CONDUIT FASTENINGS

.1 One hole steel straps to secure surface conduits 35mm and smaller. Two hole steel straps for conduits larger than 35mm.

.2 Beam clamps to secure conduits to exposed steel work.

.3 U-channel type supports for two or more conduits at 1.52 m intervals (surface-mounted or suspended).

.4 Threaded rods to support suspended channels, sized for the load.

2.3 CONDUIT FITTINGS

.1 Fittings manufactured for use with conduit specified.

.2 Manufacturer elbows where 90 degree bends are required for 63mm and larger conduits.

.3 Die cast set screw connectors and couplings. Insulated throat liners on connectors.

.4 Raintight connector fittings complete with O-rings, for use on weatherproof or sprinklerproof enclosures. Raintight couplings shall be used for surface conduit installations exposed to moisture or sprinkler heads. Raintight connectors shall be used for all top entries to panels, contactors and motor control centres.

Part 3 Execution

3.1 INSTALLATION

.1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.

.2 Conceal conduits except in mechanical and electrical service rooms.

.3 Use electrical metallic tubing (EMT) except where noted otherwise.

.4 Wiring home runs to panels and main branch wiring runs in ceiling spaces shall be run in conduit. Wiring drops from conduit systems into boxes for wiring devices in steel stud partitions may be wired with AC-90. AC-90 drops to light fixtures shall not run horizontally more than 1.83 m from conduit system junction boxes in ceiling space. AC-90 drops from conduit system in the ceiling space to feed outlets in steel stud partitions shall not run more than 1.83 m horizontally from the ceiling outlet box to the point where the AC-90 drops vertically into the partition.

.5 Use rigid PVC conduit for underground installations.

.6 Use flexible metal conduit for connection to motors, fluorescent light fixtures recessed in T-bar ceilings, suspended fixtures, transformers and equipment subject to movement or vibration. Provide a separate insulated grounding conductor within flexible conduit.

.7 All wiring under computer floors shall be in liquid-tight flexible metal conduit, or teck cable, where indicated.

.8 All wiring at roof deck shall be installed to the underside of the deck and shall be secured to the lower flute.

.9 Bend conduit cold. Replace conduit if kinked or flattened more than $1/10^{th}$ of its original diameter.

.10 Install polypropylene fish cord in empty conduits.

.11 Install two 27 mm spare conduits up to ceiling space and two 27 mm spare conduits down to ceiling spaces below from each recessed panelboard, cabinet, annunciator, etc. Terminate these conduits in 150 mm x 150 mm x 100 mm junction boxes in ceiling space or in case of exposed concrete slab, terminate each conduit in a flush concrete-type box with extension ring.

.12 Where conduits become blocked, remove and replace blocked section.

.13 Dry conduits out before installing wire.

.14 The length of any conduit run shall not exceed 33m and no conduit run shall have more than two 90 degree bends (or equivalent) before a pullbox is installed. Pullboxes shall be installed in accessible ceiling spaces. Conduits shall be supported within 300 mm of entering any junction box, pullbox, cabinet, or panelboard.

.15 Conduit shall be sized as per Canadian Electrical Code or as shown on drawings. Note that the sizes of branch circuit conductors scheduled and/or specified on the drawings are minimum sizes and shall be increased as required to suit length of run and voltage drop in accordance with Canadian Electrical Code. Where conductor sizes are increased to suit voltage drop requirements, increase the conduit size to suit at no extra cost.

3.2 SURFACE CONDUITS

.1 Run parallel or perpendicular to building lines.

.2 Do not locate conduits within 2m of infrared or gas-fired heaters.

.3 Group conduits wherever possible on suspended or surface channels.

.4 Do not pass conduits through structural members, except as indicated.

.5 Do not locate conduits less than 150 mm to steam or hot water lines.

.6 Do not locate on upper side of roof deck.

3.3 CONCEALED CONDUITS

.1 Run parallel or perpendicular to building lines.

.2 Do not install horizontal runs in masonry walls.

.3 Do not install conduits in terrazzo or concrete toppings.

3.4 CONDUITS IN CAST-IN-PLACE CONCRETE

.1 Colour code coverplates of junction boxes in conduit systems as per the colour code list below.

.2 Colour code by spray painting the coverplate on each junction box in the conduit run.

.3 In addition to colour coding coverplates on junction boxes with power wiring, the circuits being run in the box shall be identified on the inside coverplate with a permanent felt marker.

120/208V Normal Power	Yellow
120/208V Emergency Power	Fluorescent Red
Fire Alarm	Red
Telephone/sound	Purple
Security	Royal blue
CCTV	Black
Ground	Green
Controls	White
Satellite or cable TV	Fluorescent green

Part 1 General

1.1 SECTION INCLUDES

.1 Switches, receptacles, wiring devices, cover plates and their installation.

1.2 RELATED SECTIONS

.1 Section 26 05 00 - Common Work Results - Electrical.

.2 Section 26 05 32 – Outlet Boxes, Conduit Boxes and Fittings

1.3 REFERENCES

.1 Canadian Standards Association (CSA International)
- .1 CSA-C22.1-09 Canadian Electrical Code

1.4 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings and product data in accordance with Section 26 05 00 – Common Work Results – For Electrical.

Part 2 Products

2.1 SWITCHES

.1 Switches to be specification grade.

.2 15 A, 120 V, single pole, double pole, or three-way, switches as indicated.

.3 Manually-operated general purpose ac switches with following features:
- .1 Terminal holes approved for No. 10 AWG wire.
- .2 Silver alloy contacts.
- .3 Urea or melamine moulding for parts subject to carbon tracking.
- .4 Suitable for back and side wiring.
- .5 White toggle or to match existing.

.4 Toggle operated fully rated for tungsten filament and fluorescent lamps, and up to 80% of rated capacity of motor loads.

.5 Switches of one manufacturer throughout project.

2.2 RECEPTACLES

.1 Receptacles to be specification grade.

.2 Duplex receptacles, CSA type 5-15 R, 125 V, 15 A, U ground, with following features:
- .1 White urea moulded housing or to match existing.

.2 Suitable for No. 10 AWG for back and side wiring.
.3 Break-off links for use as split receptacles.
.4 Eight back wired entrances, four side wiring screws.
.5 Double wipe contacts and rivetted grounding contacts.

.2 Single receptacles CSA type 5-15 R, 125 V, 15 A, U ground with following features:
.1 Ivory brown urea moulded housing.
.2 Suitable for No. 10 AWG for back and side wiring.
.3 Four back wired entrances, 2 side wiring screws.

.3 Receptacles marked 20A are to be CSA type 5-20 R unless otherwise indicated.

.4 Other receptacles with ampacity and voltage as indicated.

.5 Receptacles of one manufacturer throughout project.

2.3 COVER PLATES

.1 Cover plates from one manufacturer throughout project.

.2 Sheet steel utility box cover for wiring devices installed in surface-mounted utility boxes.

.3 Stainless steel or unbreakable plastic cover plates, for wiring devices mounted in flush-mounted outlet box or to match existing.

.4 Cast gasketted cover plates for wiring devices mounted in surface-mounted FS or FD type conduit boxes.

.5 Weatherproof double lift spring-loaded cast aluminum cover plates, complete with gaskets for duplex receptacles as indicated.

.6 Weatherproof spring-loaded cover plates complete with gaskets for single receptacles or switches.

Part 3 Execution

3.1 INSTALLATION

.1 Switches:
.1 Install single throw switches with handle in "UP" position when switch closed.
.2 Install switches in gang type outlet box when more than one switch is required in one location.
.3 Mount toggle switches at height in accordance with Section 26 05 00 - Common Work Results - Electrical or as indicated.

.2 Receptacles:
.1 Install receptacles in gang type outlet box when more than one receptacle is required in one location.
.2 Mount receptacles at height in accordance with Section 26 05 00 - Common Work Results -

Electrical or as indicated.

.3 Cover plates:

.1 Protect stainless steel cover plate finish with paper or plastic film until painting and other work is finished.

.2 Install suitable common cover plates where wiring devices are grouped.

.3 Do not use cover plates meant for flush outlet boxes on surface-mounted boxes.

.4 Use weatherproof cover plates in wet or damp locations and where indicated.

Part 1 General

1.1 SECTION INCLUDES

.1 Equipment and installation for ground fault circuit interrupters (GFCI).

1.2 RELATED SECTIONS

.1 Section 26 05 00 - Common Work Results - Electrical.

1.3 REFERENCES

.1 Canadian Standards Association (CSA International)
  .1 CAN/CSA-C22.2 No.144-M91(R2001), Ground Fault Circuit Interrupters.

.2 National Electrical Manufacturers Association (NEMA)
  .1 NEMA PG 2.2-1999, Application Guide for Ground Fault Protection Devices for Equipment.

1.4 SUBMITTALS

.1 Submittals in accordance with Section 26 05 00 – Common Work Results – For Electrical.

Part 2 Products

2.1 MATERIALS

.1 Equipment and components for ground fault circuit interrupters (GFCI): to CAN/CSA-C22.2 No.144 NEMA PG 2.2.

.2 Components comprising ground fault protective system to be of same manufacturer.

2.2 BREAKER TYPE GROUND FAULT INTERRUPTER

.1 Single Two pole ground fault circuit interrupter for 15A and 20A, 120V, 1 phase circuit c/w test and reset facilities.

2.3 GROUND FAULT PROTECTOR UNIT

.1 Self-contained with 15 A, 120 V circuit interrupter and duplex single receptacle complete with:
  .1 Solid state ground sensing device.
  .2 Facility for testing and reset.
  .3 CSA Enclosure 1, surface flush mounted with stainless steel painted face plate or to match existing.

Part 3 Execution

3.1 INSTALLATION

.1 Do not ground neutral on load side of ground fault relay.

.2 Pass phase conductors including neutral through zero sequence transformers.

.3 Connect supply and load wiring to equipment in accordance with manufacturer's recommendations.

3.2 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results - Electrical and co-ordinate with Section 01 45 00 - Quality Control if required.

.2 Demonstrate simulated ground fault tests.

Part 1 General

1.1 SECTION INCLUDES

.1 Diesel engine driven generator sets

1.2 REFERENCES

.1 American National Standards Institute (ANSI)/American Petroleum Institute (API)

.1 ANSI/API 650, Welded Steel Tanks for Oil Storage Tenth Edition; Addendum 1.

.2 American National Standards Institute (ANSI)/National Electrical Manufacturers' Association (NEMA)

.1 ANSI/NEMA MG1, Motors and Generators.

.3 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-3.6, Regular Sulphur Diesel Fuel.

.4 International Organization for Standardization (ISO)

.1 ISO 3046-1-[2002], Reciprocating Internal Combustion Engines - Performance - Part 1: Declarations Of Power, Fuel And Lubricating Oil Consumptions, And Test Methods.

.5 National Electrical Manufacturers Association (NEMA)

.6 Underwriters' Laboratories of Canada (ULC)

.1 ULC-S601, Standard for Shop Fabricated Steel Aboveground Horizontal Tanks for Flammable and Combustible Liquids.

.2 CAN/ULC-S603, Standard for Steel Underground Tanks for Flammable and Combustible Liquids.

1.3 SYSTEM DESCRIPTION

.1 Generating system consists of:

.1 Enclosures

.2 Diesel engine.

.3 Alternator.

.4 Alternator control panel.

.5 Battery charger and battery.

.6 Fuel supply system.

.7 Exhaust system.

.8 Steel mounting base.

.9 Synchronizing panel.

.10 Automatic load transfer equipment to:

.1 Monitor voltage on phases of normal power supply

.2 Initiate cranking of standby generator unit on normal power failure or abnormal voltage on any one phase below pre-set adjustable limits for adjustable period of time.

.3 Transfer load from normal supply to standby unit when standby unit reaches rated frequency and voltage pre-set adjustable limits.

.4 Transfer load from standby unit to normal power supply when normal power restored, confirmed by sensing of voltage on phases above adjustable pre-set limit for adjustable time period.

.5 Shut down standby unit after running unloaded to cool down using adjustable time delay relay.

.6 Exercise the standby unit on a flexible user programmable schedule.

.2 System designed to operate as standby power source.

1.4 **SHOP DRAWINGS**

.1 Submit shop drawings in accordance with Section [01 33 00 - Submittal Procedures].

.2 Include full physical, electrical, thermal, and finish details, with descriptions of operation and wiring diagrams:

.1 Engine: make and model, with performance curves.

.2 Alternator: make and model.

.3 Voltage regulator: make, model and type.

.4 Automatic transfer switch: make, model and type.

.5 Battery: make, type and capacity.

.6 Battery charger: make, type and model.

.7 Alternator control panel: make and type of meters and controls.

.8 Governor type and model.

.9 Cooling air requirements in m^3 /s.

.10 British standard or DIN rating of engine.

.11 Flow diagrams for:

.1 Diesel fuel.

.2 Cooling air.

.12 Dimensioned drawing showing complete generating set mounted on steel base, including vibration isolators, exhaust system, drip trays, and total weight.

.13 Continuous full load output of set at 0.8PF lagging.

.14 Description of set operation including:

.1 Automatic starting and transfer to load and back to normal power, including time in seconds from start of cranking until unit reaches rated voltage and frequency.

.2 Manual starting.

.3 Automatic shut down and alarm on:

.1 Overcranking.

.2 Overspeed.

.3 High engine temp.

.4 Low lube oil pressure.

.5 Short circuit.

.6 Alternator overvoltage.

.7 Lube oil high temperature.

.8 Over temperature on alternator.

1.5 CLOSEOUT SUBMITTALS

.1 Provide operation and maintenance data for diesel generator for incorporation into manual specified in Section [01 78 00 - Closeout Submittals].

.2 Include in Operation and Maintenance Manual instructions for particular unit supplied and not general description of units manufactured by supplier and:

.1 Operation and maintenance instructions for engine, alternator, control panel, automatic transfer switch, manual bypass switch, battery charger, battery, fuel system, engine room ventilation system, exhaust system and accessories, to permit effective operation, maintenance and repair.

.2 Technical data:

.1 Illustrated parts lists with parts catalogue numbers.

.2 Schematic diagram of electrical controls.

.3 Flow diagrams for:

.1 Fuel system.

.2 Lubricating oil.

.3 Cooling system.

.4 Certified copy of factory test results.

.5 Maintenance and overhaul instructions and schedules.

.6 Precise details for adjustment and setting of time delay relays or sensing controls which require on site adjustment.

.3 Include in Operation and Maintenance Manual completed copies of all commissioning materials and training materials.

1.6 WARRANTY

.1 For Work of this Section, the 12 month warranty period prescribed in subsection GC32.1 of General Conditions "C" is extended to 60 months or 1500 operating hours, or whichever occurs first.

1.7 EXTRA MATERIALS

.1 Provide maintenance materials in accordance with Section [01 78 00 - Closeout Submittals].

.2 Include:

.1 2 fuel filter replacement elements.

.2 2 lube oil filter replacement elements.

.3 2 air cleaner filter elements.

.4 2 sets of fuses for control panel.

.5 Special tools for unit servicing.

Part 2 Products

2.1 PERFORMANCE

.1 Not used.

Part 3 Execution

3.1 NOT USED

.1 Not used.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 26 05 00 – Common Work Results - Electrical.

1.2 SHOP DRAWINGS AND PRODUCT DATA

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

.2 Submit complete photometric data prepared by independent testing laboratory for luminaires where specified, for approval review by Consultant.

.3 Submit list of replacement lamp data for each luminaire. Include lamp type, voltage, wattage, base type and order code. Include list in maintenance manual.

1.3 GUARANTEE

.1 Replace

.1 Incandescent and tungsten halogen bulbs burnt out within 3 months of takeover.
.2 Fluorescent and HID lamps burnt out within 12 months of takeover.
.3 Ballasts that fail or exceed their labeled noise level rating within 12 months of takeover.

1.4 COORDINATION

.1 Coordinate luminaire locations with work of other trades.

.2 Verify all ceiling types and finishes before ordering fixtures and provide fixtures suitable for mounting in or on ceilings being installed in each area, as specified. Where fixture types specified are not suitable for ceiling being installed, obtain written instructions from the consultant before ordering fixtures.

Part 2 Products

2.1 GENERAL

.1 Luminaires shall carry the CSA label.

.2 Provide supporting devices, plaster frames, junction boxes and outlet boxes where required.

.3 Fixture type catalogue numbers do not necessarily denote required mounting equipment or accessories. Provide all appropriate mounting accessories for all mounting conditions.

.4 Provide lenses or diffusers of glass or acrylic material as indicated. Acrylic lenses used with fluorescent luminaries shall be a minimum of 3 mm thick.

.5 Include finishes to Section 26 05 00 and as indicated.

.6 Where soffits or ceilings have thermal insulation, provide fixtures which are CSA approved for such use.

.7 Provide lamps as indicated

.8 Conduct lamp burn in procedures as per manufacturers recommendations.

2.2 LUMINAIRES

.1 Fluorescent luminaire design and mounting as per Lighting Schedule

.2 Incandescent luminaire design and mounting as per Lighting Schedule

.3 Luminaires in cell areas must be stamped with manufacturer and model number on the faceplate.

Part 3 Execution

3.1 INSTALLATION

.1 Locate and install luminaires as indicated.

.2 In cell areas, the area between luminaires and adjacent surfaces must be grouted using a polymer fortified high-yield grout.

3.2 LUMINAIRE SUPPORTS

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

3.3 LUMINAIRE ALIGNMENT

.1 Align luminaires mounted in continuous rows to form straight uninterrupted line.

.2 Align luminaires mounted individually parallel or perpendicular to building grid lines unless otherwise shown.

3.3 CLEANING

.1 Prior to take-over of the project, clean the lenses and reflectors of all luminaires with a damp cloth to remove dust, smudges and fingerprints.

Part 1 General

1.1 SECTION INCLUDES

.1 Materials and installation for emergency lighting systems.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 26 05 21 - Wires and Cables (0-1000 V).

.3 Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

1.3 REFERENCES

.1 Canadian Standards Association (CSA International)
.1 CSA C22.2 No.141-M1985(R2010), Unit Equipment for Emergency Lighting.

1.4 SUBMITTALS

.1 Submit product data in accordance with Section 26 05 00 – Common Work Results – For Electrical.

.2 Data to indicate system components, mounting method, source of power and special attachments.

1.5 WARRANTY

.1 Provide a written guarantee stating that the battery for emergency lighting is guaranteed against defects in material and workmanship for a period of 10 years, with a no-charge replacement during the first 5 years, and a pro-rate charge on the second 5 years from the date of the final acceptance from the owner.

Part 2 Products

2.1 EQUIPMENT

.1 Emergency lighting equipment: to CSA C22.2 No.141.

.2 Supply voltage: 120 V, AC.

.3 Output voltage: 12 V DC.

.4 Operating time: 60 min.

.5 Battery: sealed, maintenance free.

.6 Charger: solid state, multi-rate, voltage/current regulated, inverse temperature compensated, short circuit protected with regulated output of plus or minus 0.01V for plus or minus 10% input variations.

.7 Solid state transfer circuit.

.8 Low voltage disconnect: solid state, modular, operates at 80% battery output voltage.

.9 Lamp heads: integral on unit or remote, 300 degrees rotation.

.10 Auxiliary equipment:

.1 Test switch.
.2 Battery disconnect device.
.3 AC input and DC output terminal blocks inside cabinet.

.11 Acceptable product:

.1 As specified on drawings

2.2 WIRING OF REMOTE HEADS

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

.2 Conductors: in accordance with Section 26 05 21 - Wires and Cables
0-1000 V, sized in accordance with manufacturer's recommendations.

Part 3 Execution

3.1 INSTALLATION

.1 Install unit equipment and remote mounted fixtures.

.2 Direct heads.

.3 Connect exit signs to unit equipment.

Part 1 General

1.1 RELATED SECTIONS

.1 Section 26 05 00 - Common Work Results - Electrical.

1.2 REFERENCES

.1 Canadian Standards Association, (CSA International)

.1 CSA-T529-95(R2000), Telecommunications Cabling Systems in Commercial Buildings (Adopted ANSI/EIA TIA 568a with modifications).

.2 CSA-C22.2 No. 214-02, Communications Cables (Bi-national Standard, with UL 444).

.3 CAN/CSA-C22.2 No. 182.4-M90(R2001), Plugs, Receptacles, and Connectors for Communication Systems.

.2 Telecommunications Industry Association (TIA)

.1 TIA/EIA-568-2001, Commercial Building Telecommunications Cabling Standards Set.

1.3 SYSTEM DESCRIPTION

.1 Structured system of telecommunications cables (copper and optical fibre) installed within buildings for distributing voice and data (including video) signals.

.2 Installed in physical star configuration with separate horizontal and backbone sub-systems. Horizontal cables link work areas to telecommunications closet located on same floor. Telecommunications closets linked to central equipment room by backbone cables.

Part 2 Products

2.1 STATION WIRE (ZSW)

.1 4-pair, 24 AWG, 100 ohm cable with insulated copper conductor in separate outer jacket: to C22.2 No. 214. FT-4 fire-rated jacket.

.2 Voice-grade electrical transmission requirements: to CSA T529 and TIA-EIA-568.

.3 Data-grade electrical transmission requirements to: CSA T529 and TIA-EIA-568.

2.2 SHIELDED TWISTED PAIR (STP) CABLE

.1 2 pair 150 ohm cable: to CSA-T529.

2.3 COAXIAL CABLE (CXC)

.1 For cable television, 75 ohm impedance. Centre conductor No. 18 AWG solid copper; insulation of teflon; shield of aluminum foil plus braid; shield coverage 97%. Loss at 500 MHz not to exceed 5 dB per 30 m.

.2 For 50 ohm coaxial cable systems, type BNC connector for service outlet to: CSA-T529.

Part 3 Execution

3.1 INSTALLATION OF HORIZONTAL DISTRIBUTION CABLES

.1 Install horizontal cables, as indicated in conduits or ceiling space from termination in telecommunications closet to outlets.

.2 Terminate 1 ZSW cables per work station terminated in accordance with CAN/CSA C22.2 No. 182.4 and CSA-T529.

.3 Terminate STP cable in accordance with CSA-T529.

.4 For distribution of television signals, terminate CXC cable on type F connectors. For distribution of data signals, terminate CXC cable in accordance with CSA-T529.

3.2 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results - Electrical.

Part 1 General

1.1 RELATED SECTIONS

.1 Section 26 05 00 - Common Work Results - Electrical.

1.2 REFERENCES

.1 NBC-5, National Building Code of Canada 2010

.2 Government of Canada
- .1 TB OSH Chapter 3-03, Treasury Board of Canada, Occupational Safety and Health, Chapter 3-03, Standard for Fire protection Electronic Data Processing Equipment.

.3 Underwriter's Laboratories of Canada (ULC)
- .1 CAN/ULC-S524, Installation of Fire Alarm Systems.
- .2 ULC-S525, Audible Signal Appliances.
- .3 CAN/ULC-S526, Visual Signal Appliances, Fire Alarm.
- .4 CAN/ULC-S527, Control Units.
- .5 CAN/ULC-S528, Manual Pull Stations.
- .6 CAN/ULC-S529, Smoke Detectors.
- .7 CAN/ULC-S530, Heat Actuated Fire Detectors.
- .8 CAN/ULC-S531, Smoke Alarms.
- .9 CAN/ULC-S536, Inspection and Testing of Fire Alarm Systems.
- .10 CAN/ULC-S537, Verification of Fire Alarm Systems.

1.3 DESCRIPTION OF SYSTEM

.1 System includes:
- .1 Addressable control panel to carry out fire alarm and protection functions including receiving alarm signals, initiating general alarm, supervising system continuously, actuating zone annunciators, and initiating trouble signals.
- .2 Trouble signal devices.
- .3 Power supply facilities.
- .4 Manual alarm stations.
- .5 Automatic alarm initiating devices.
- .6 Audible signal devices.
- .7 End-of-line devices.
- .8 Annunciators.
- .9 Visual alarm signal devices.
- .10 Ancilliary devices
- .11 Other features and components as required

.2 The loading of device loops shall be based on approximately 80% load. Provide additional loops to comply with this loading where required or directed.

.3 The loading of bell, horn or strobe circuits shall not exceed 75% circuit capacity. Provide additional circuits to comply with this loading where required or directed.

1.4 REQUIREMENTS OF REGULATORY AGENCIES

.1 The equipment and installation shall comply with the current ULC and Building Code requirements.

.2 National Building Code

.3 Local and Municipal By-Laws

.4 Authorities having jurisdiction

1.4 REQUIREMENTS OF REGULATORY AGENCIES

.1 Submit shop drawings in accordance with Section 26 05 00 – Common Work Results - Electrical.

.2 Include:
- .1 Layout of equipment.
- .2 Zoning.
- .3 Complete wiring diagram, including schematics of modules.

1.5 CLOSEOUT SUBMITTALS

.1 Provide operation and maintenance data for fire alarm system for incorporation into the Operating and Maintenance Manual

.2 Include:
- .1 Operation and maintenance instructions for complete fire alarm system to permit effective operation and maintenance.
- .2 Technical data - illustrated parts lists with parts catalogue numbers.
- .3 Copy of approved shop drawings.
- .4 List of recommended spare parts for system.
- .5 Verification report

Part 2 Products

2.1 MATERIALS

.1 Equipment and devices: ULC listed and labeled and supplied by single manufacturer.

2.2 SYSTEM OPERATION

.1 Single stage operation. Operation of any alarm initiating device to:
- .1 Cause audible signal devices to sound throughout building.
- .2 Transmit signal to fire department via monitoring station.
- .3 Cause zone of alarm device to be indicated on control panel and remote annunciators.
- .4 Cause air conditioning and ventilating fans to shut down or to function so as to provide required control of smoke movement.
- .5 Cause fire doors and smoke control doors if normally held open, to close automatically.

2.3 CONTROL PANEL

.1 Class A.

.2 Single stage operation.

.3 Enclosure: CSA Enclosure, c/w lockable concealed hinged door, full viewing window, flush lock and 2 keys.

.4 Supervised, modular design with plug-in modules:

.1 Alarm receiver with trouble and alarm indications and provision for remote supervised annunciation, for class A initiating circuit.

.2 Spare zones: compatible with smoke detectors and open circuit devices.

.3 Space for future modules.

.4 Latching type supervisory receiver circuits. Discrete indication for both off-normal and trouble.

.5 The operator control panel must be intuitive in design.

2.3 ANNUNCIATOR PANEL

.1 Supervised, with LED indicator lights or LCD display for zone indication.

.2 Indication for trouble

.3 Smoke detector in each cell must be indicated separately.

2.4 POWER SUPPLY

.1 120V, ac, 60Hz input, 24Vdc output from rectifier to operate alarm and signal circuits, with standby power of gel cell batteries minimum expected life of 4 years, sized in accordance with NBC.

2.5 WIRING

.1 Twisted copper conductors installed in conduit.

.2 Minimum wire gauges:

.1 120 VAC wiring, #12 AWG minimum, installed in conduit.

.2 To initiating circuits: #18 AWG minimum, ULC listed, and in accordance with manufacturer's requirements.

.3 To signal circuits: #16 AWG minimum for horn/strobe circuits, ULC listed, #14 AWG for bell circuits, and in accordance with manufacturer's requirements.

.4 To control circuits: #16 AWG minimum, ULC listed, and in accordance with manufacturer's requirements.

.3 Size all signaling and control circuits for maximum 3% voltage drop at last signaling/control device on each circuit.

Part 3 Execution

3.1 INSTALLATION

.1 Install systems in accordance with CAN/ULC-S52.

.2 Locate and install manual alarm stations and connect to alarm circuit wiring.

.3 Install end-of-line devices at end of alarm and signaling circuits, as required.

.4 Ensure that wiring is free of opens, shorts or ground before system testing and handing over.

3.2 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results - Electrical and CAN/ULC-S537.

.2 Fire alarm system:

- .1 Test all zones, signal, alarm, ancillary and annunciation devices which have been installed.
- .2 Test each device and alarm circuit to ensure manual stations, thermal and smoke detectors, and sprinkler system devices transmit alarm to control panel and actuate alarm states and operate ancillary devices.
- .3 Test each signal device and each signal circuit, including auxiliary inputs and trouble signals.
- .4 Check annunciator panels to ensure zones are shown and actuated correctly.
- .5 Simulate grounds and breaks on alarm and signaling circuits to ensure proper operation of systems.
- .6 Test to be carried out by the contractor or contractor's agent.
- .7 Tabulated, contractor stamped, signed and dated test results are to be submitted for review and approval, and included in the O&M manual.

3.3 VERIFICATION

.1 Verify all zones, signal, and alarms which have been installed or modified in any fashion. Verification to CAN/ULC S537. Include verification costs in tender price.

.2 The contractor will be responsible for correcting deficiencies in the contractor's work that are reported by the verification agent.

Part 1 General

1.1 REFERENCES

.1 National Electrical Manufacturers Association (NEMA)

.1 NEMA ICS 1-2000(R2008), Industrial Control and Systems: General Requirements.

1.2 SCOPE OF WORK

.1 The Treatment Control Panel MCP-1000 shall be provided complete with the equipment supplier as part of the equipment package. The integrator shall be familiar with water treatment systems.

.2 The main control panel MCP-1000 shall control chlorine dosing and monitor the overall treatment and raw water pumping system.

.3 The panel fabricator shall be CSA licensed to build service entrance rated industrial control panels.

.4 Review all drawings and specs.

.5 Assist in finalizing I/O with various equipment vendors.

1.3 SYSTEM INTEGRATOR

.1 Acceptable system integrators shall be Manco Controls, Celco Automation , Indus Automation, Hund Automation, Osorno, or approved equal.

.2 Integrator shall have minimum five years of experience in water treatment plant controls and integration in the province of Manitoba.

1.4 DESCRIPTION OF CONTROL SYSTEM

.1 Work of this Section consists of supply and installation of a complete functional control and instrumentation system.

.2 Process Control:

.1 Refer to Section 46 07 13 - Packaged Water Treatment Plant Equipment for the process control narrative.

.3 The work includes, but is not limited to, the following:

.1 Panel construction, operator devices and indications.

.2 Coordination of controls to work with all equipment, and interfacing between other panels.

.3 Training for plant operators as specified herein.

1.5 SPARES

.1 Supply the following spare parts: Miscellaneous fuses and renewables as recommended by panel builder. Minimum (12) fuses each kind and (12) LEDs each type and color, and (2) each kind for Relays.

1.6 SUBMITTALS

.1 In addition to the requirements of the specification, the Contractor shall provide the following as a minimum:

.1 Dimensioned, referenced front of control panel layouts and general control panel arrangement drawings.

.2 Internal control panel layout drawings.

.3 Fully itemized and referenced panel wiring and termination drawings.

.4 Indicate terminals for field wiring by electrician, and field equipment terminals to be wired to each.

.5 Fully itemized instrument loop drawings for all analog process loops, digital, and motor control, to be generally in accordance with ISA-5.4 format.

.6 Field tests such as wiring interconnections, device control outputs, analog, status and alarm inputs.

.7 Instrument calibration records.

.8 Bill of materials, including all components such as enclosure, relays, timers, counters, instrumentation components (analogue and digital), interface devices, power supplies.

Part 2 Products

2.1 CONTROL PANELS

.1 Control panels

.1 Provide space and capacity in control panels for 20% additional equipment. Note however that this site features limited wall space so a smaller enclosure may be suitable. Coordinate dimensions with Electrical Contractor and notify Engineer.

.2 Wet location enclosures NEMA 4X.

.3 Hinged doors with latches.

.4 Main breaker disconnect devices with 22 kAIC interrupt rating.

.5 Terminal blocks for all wiring.

.6 Power supplies.

.7 Wiring duct.

.8 Labeling.

.9 Set of panel drawings.

.10 Set of spare parts and renewable parts.

.11 Provide hand switches such that plant shall be manually operable.

.12 Provide all devices, hardware, and appurtenances for complete functional panels and systems.

.13 All operator interface devices shall be mounted on the doors.

.14 Provide min 450mm HMI touch screen for plant operation, monitoring, alarming, and troubleshooting.

.15 Design of the panel and devices contained therein shall provide a proper working interface with all other plant.

.16 All devices, terminal blocks, etc. shall be mounted on the backpan, mounting of equipment on the sides of panel is not acceptable.

2.2 DEVICES

.1 AC Control Relays

.1 Control Relays: to CSA C22.2 No.14.

.2 Relay Accessories

.1 Standard contact cartridges: normally-open - convertible to normally-closed in field.

.3 Solid State Timing Relays

.1 Construction: electronic timing relay with solid-state timing circuit to operate output contact.

.2 Operation: on-delay or off-delay.

.3 Potentiometer: self contained to provide time interval adjustment.

.4 Supply voltage: 120 V or 24 V, AC or DC, 60 Hz.

.5 Temperature range: minus 20 degrees C to plus 60 degrees C.

.6 Output contact rating: maximum voltage 300 V AC or DC.

.4 Operator Control Stations

.1 Enclosure: CSA Type 4, surface mounting:

.5 Pushbuttons

.1 Heavy duty, Oil tight. Operator flush type, with minimum 1-NO and 1-NC contacts rated at 240 V, 10 A, AC or DC, labels as indicated.

.6 Selector Switches

.1 Maintained, labelled, 2 and 3 position, operators heavy duty oil tight, contact arrangement as indicated.

.7 Indicating Lights

.1 Heavy duty, oil tight, full voltage, LED type, push-to-test, supply voltage: 120 VAC or 24 VAC or 24 VDC, lamp voltage: 120 VAC.

Part 3 Execution

3.1 FABRICATION

.1 Panel assembly, sub-components, and all internal components shall be CSA or cUL approved. Cabinet construction shall be performed by an established panel manufacturer who

shall comply with all manufacturing standards and good practices, factory and Department of Labour regulations, and CSA or cUL certification for the work.

.2 Local approvals for panel construction will not be accepted.

.3 Obtain from the component suppliers the manufacturer's wiring diagrams to determine the equipment terminals and record these terminal numbers on the wiring diagrams.

3.2 TESTING PRE-DELIVERY

.1 The panel builder shall provide for the setup, testing and programming in their facility of the complete control system.

.2 The panel supplier shall provide any required services of a certified instrument technician to perform system commissioning and tests.

.3 The panel supplier shall supply all temporary services or components (i.e. data cable, fuses) for the purposes of these tests.

.4 Upon completion of the tests and prior to shipping, the Contractor shall furnish the Engineer with a certified copy of all tests performed and their results. Tests shall clearly describe all methods.

3.3 INSTALLATION

.1 Supply, install, wire, and connect all control panels, stations, and devices.

.2 Locate all panels and secure to floor or walls as applicable.

.3 Install any components shipped loose according to supplied instructions.

.4 Commission all field wiring before terminating.

.5 The Contractor shall coordinate with the panel builder and programmer to install the system, hardware and software. Panel builder or programmer assistance at installation shall be at no additional cost to the Owner.

3.4 INSTALLATION, ACCEPTANCE FIELD TESTING, FINAL COMMISSIONING

.1 The Contractor shall provide the services of qualified instrument technicians to commission and demonstrate the operation of the control system.

.2 Where specialized vendor assistance may be required, the supplier and Contractor shall ensure this is available during proposed commissioning period and pay for all costs associated with this assistance.

.3 The Contractor shall complete instrument record sheets at the time of calibration and ensure all instruments meet specifications. The Contractor shall submit record sheets to the Engineer during construction / installation period.

.4 The Contractor shall confirm correctness of operation of all instrumentation and end devices.

.5 The Contractor shall have documented and certified, the mass balance for the entire system. Agreement between masses, volumes, flows, levels, pressures, and times shall also be documented using every available measure and excluding none.

.6 Prior to commencement of software commissioning, the Contractor shall ensure that all spare parts, expendables and test equipment pertinent to the equipment being tested are on site.

.7 Commissioning and startup shall include but not be limited to the following:

.1 Process control strategy verification.

.2 Process sequence verification.

.3 Operator interface device verification down to final control devices.

.4 Motor lockouts

.5 System power fail/restart testing to verify sequence operation.

.6 Verification of all trip, alarm and display functions.

.8 Commissioning shall be considered complete when, in the opinion of the Engineer, the control system hardware and software or designated portion has properly operated for fourteen (14) continuous days, 24 hours per day, without significant interruption.

.1 This 14 day period shall be in addition to any test or retest periods or operational demonstrations specified elsewhere.

.2 Excessive alarms may be considered significant interruption. Suppression of alarms may not be considered acceptable remediation.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 The manufacturer shall ensure product meets the latest standards.

1.2 SCOPE OF WORK

.1 Scope of supply shown in drawings. Review all drawings including P&ID drawings.

1.3 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings and product data.

1.4 OPERATION & MAINTENANCE DATA

.1 Provide operation and maintenance data for incorporation into manual.

.2 Record instrument configuration parameters and include in manuals.

Part 2 Products

2.1 EQUIPMENT SUPPLIER STANDARD INSTRUMENTS

.1 Where the Treatment Equipment Supplier, Distribution Pumping Supplier, or Process Wastewater Tank Pump Supplier have standardized instruments that they use in their packages, which differ from those listed here, the standard instruments shall be acceptable in the packages they supply.

2.2 MAGNETIC FLOW METER

.1 Provide flanged PVC spool piece for each size of magnetic flow meter installed.

.2 Magnetic flow meter suitable for use in raw water and distribution water applications. CSA 4X enclosure, hazardous location approval in hazardous locations. Size as indicated, review piping.

.3 Meter complete with flanges, liner approved for potable water, stainless steel electrodes (measuring, reference, and empty pipe detection), and stainless steel grounding rings.

.4 Power supply: 120 VAC or 24 VDC

.5 Output: 4 - 20 mA flow, and three dry contacts for pulse output (total flow), empty pipe, flow meter fault. Meter shall have selectable low flow level below which flow is zeroed. Flow in both directions shall be provided.

.6 Provide a remote mounted transmitter and locate for easy access and viewing. Indicate instantaneous flow rate (L/s) and totalized flow (m^3). Provide cable length to suit, min 3 m extra length.

.7 Accuracy: ± 0.2% of full scale value at 3 points, calibrated.

.8 AWWA Compliant.

.9 Standard of acceptance:

.1 E&H Promag 53W, or Equal.

.10 All magnetic flow meters and associated equipment shall be a product of one manufacturer.

2.3 PRESSURE INDICATING TRANSMITTERS

.1 Tag: PIT-1005, 2101, 2102, 3202, 3101

.2 All pressure indicating transmitters shall be the 2 wire type, powered by 24 VDC.

.3 Accuracy shall be ± 0.10% of calibrated span or better.

.4 Output shall be isolated current limited 4-20 mA with user-selectable linear scaling.

.5 Loop load limit shall be 600 ohms minimum at 24 VDC supply.

.6 Zero elevation and suppression (where applicable) shall be adjustable to 500% (minimum) of calibrated span and within the upper and lower limits of the cap scale. Damping shall be continuously adjustable. Turndown ratio shall be 15:1 minimum.

.7 Static and overpressure limits shall be 14 MPa minimum. Normal operating temperature rating of cell and electronics shall be -40C to +85C or better.

.8 Housings shall be CSA 4X or suitable for area in which it is installed, suitable for hazardous location where so installed.

.9 Diaphragms shall be ceramic or Hastelloy C. Flanges, vent drain plugs and flange adapters shall be 316 SS. Flange bolts shall be stainless steel.

.10 Transmitters shall be suitable for service as indicated on the plans.

.11 Electrical cabling shall be via NPT conduit connections.

.12 All transmitters shall include a flat bracket to facilitate wall or pipe mounting.

.13 Absolute and gauge pressure transmitters shall be fitted with two valve manifolds (316 SS). Differential pressure transmitters shall be fitted with 3 valve manifolds (316 SS).

.14 Each type of pressure transmitter shall be equipped with "smart transmitter" electronics to provide the user with the capability to calibrate and troubleshoot the device via a separate hand held communications terminal.

.15 All transmitters shall include a digital display of output signal in engineering units. Accuracy of display to be +/-0.1% of span.

.16 Standard of acceptance for differential pressure transmitters, gauge pressure transmitters and absolute pressure transmitters:

.1 Rosemount 2051;

.17 Acceptable manufacturers: Rosemount, ABB, Krohne, Siemens, E&H.

.18 All pressure transmitters and associated equipment shall be a product of one manufacturer.

2.4 PRESSURE SWITCHES

.1 Visible calibrated dial.

.2 On/off indication.

.3 Adjustable deadband.

.4 Hermetically sealed mercury switch.

.5 External switch setpoint adjustments via thumbscrews.

.6 Weatherproof enclosure suitable for wet location.

.7 Repeatability: +/- 1% of full operating range.

.8 Process connection: 1/4” male NPT.

.9 Electrical connection: 1/2” conduit hub.

.10 Circuit shall be 24VDC.

.11 Vertical mounting.

.12 Adjustable operating range:

.1 Low pressure adjustable down to 5 psig (or lower).
.2 High pressure adjustable up to 150 psig (or higher).
.3 Minimum deadband shall be 6 psig or less.

.13 Standard of acceptance: Dwyer Mercoid, DAW-33 series or equal.

2.5 CHLORINE ANALYSER / ORP MONITOR

.1 Transmitter Outputs: Free Chlorine (4-20 mA) to loop control and RPU; two (2) control relays; one (1) alarm relay.

.2 CSA Approval; NSF 61 Certified.

.3 Chlorine flow cell complete with probe holders, pressure control, and flow adjustment.

.4 Minimum Range: 0-5 mg/L or (0-5 ppm) Free Chlorine Measurement.

.5 Accuracy: +/- 5%.

.6 Programmable user menus and built-in keys.

.7 Enclosure Rating: Wall mounted, NEMA 4X enclosure.

.8 Service: Operating temperature parameters = 1ºC - 30ºC.

.9 Measurement: Amperometric analysis probe with temperature compensation and active pH compensation.

.10 Analyser shall operate within the following pH range: 6.0 – 9.5.

.11 The signal converter (transmitter) shall be wall mount, 120 VAC powered with 4-20 mA outputs and relay fault outputs, dry contact, fail safe open. Manual calibration. Digital LCD display.

.12 Diagnostics and Alarms: Internal diagnostics and configurable alarm functions. Automatically indicate any existing diagnostic or alarm condition. Configurable relay outputs to activate on an alarm or diagnostic condition to provide remote indication of such events.

.13 Manufacturer shall provide sufficient cable to permit connection of the measuring device to the controller, based on locations.

.14 Standard of Acceptance: SWAN (Amperometric)

- .1 Transmitter: AMI Trides Free Chlorine Monitor A-26.111.000
- .2 pH Sensor, buffers and mounting apparatus A-87.127.010
- .3 Pressure Regulator, 15 psi max, with ½” NPT male x 3/8” OD straight barbed nylon fittings 1750-352
- .4 Sample Line: 6mm ID x 9mm OD tubing
- .5 Drain Line: 14mm ID x 20mm OD tubing (drain to reservoir)
- .6 Factory mounted on HDPE
- .7 Acceptable manufacturers E&H, Prominent, or approved equal.

.15 All chlorine analysers and associated equipment provided by the Contractor shall be the same model from one manufacturer unless otherwise approved by the Engineer.

.16 Other accessories including tubing, sensors, probes, cables, power cords, controllers, isolation valve, receptacle, pressure regulating valve, instrument transformers, calibration equipment shall be included in the Contract price.

.17 All software included for the chlorine analyser, transmitter, etc. shall be included.

.18 Equipment shall be commissioned and calibrated by a Certified Manufacturer's technician, and a commissioning report is required.

.19 Chlorine analysers shall be installed to manufacturer recommendations. Install such that water samples are drawn from a representative source.

.20 Calibration:

.1 Prior to start-up, submit to Engineer calibration sheets for each instrument which is adjustable indicating the setpoint(s) and by whom the calibration was performed.

.2 For micro-processor based instruments in which parameters must be entered as part of configuring or calibration, list all the values entered.

.3 List the settings of all DIP-switches, jumpers, etc.

2.6 TURBIDIMETER

.1 Nephelometric turbidimeter sensor and interface unit.

.2 Range: 0.001 - 100 NTU.

.3 Accuracy: +/- 2% of reading or +/- 0.015 NTU from 0 NTU to 40 NTU; +/- 5% of reading from 40 NTU to 100 NTU.

.4 Resolution: to 0.0001 NTU between 0.0001 NTU and 9.9999 NTU; 0.001 NTU between 10.000 NTU and 99.999 NTU.

.5 Repeatability: better than +/- 1% of reading or +/- 0.002 NTU.

.6 Microprocessor based, on-line.

.7 Light detector immersed in sample, optic components in a sealed assembly that is removable for calibration and servicing without interrupting sample flow.

.8 User selectable bubble removal, to prevent bubbles form producing incorrect readings.

.9 User selectable signal averaging (6 s, 30 s, 60 s, 90 s), alarm and recorder output hold, and self-test diagnostics.

.10 Interface module with user-friendly menu-driven functions; data logging for selectable interval of 15 min, 1 h, 24 h, 30 days, or 180 days; 2 analog outputs (0-20 mA or 4-20 mA selectable, and configurable to span any portion of the 0-100 NTU range), 3 alarm contacts (configurable setpoint alarms, 5 A / 230 VAC SPDT); accept power between 100 VAC and 240 VAC, 40 VA; suitable for wall, panel, pole, or floor stand mounting.

.11 NEMA 4X; operating environment 0-40 C, 5-95% non-condensing humidity; suitable for use in the environment where it is to be installed.

.12 Optional network card for MODBUS/RS232, MODBUS/RS485, or LonWorks.

.13 1 L each calibration standard and verification standard.

.14 CSA, USEPA 180.1.

.15 Standard of acceptance: Hach 1720E w/ sc100 controller, cables and cords, floor stand where indicated. Acceptable manufacturers: Hach, Rosemount.

Part 3 Execution

3.1 INSTALLATION

.1 Assemble and/or install all equipment in strict accordance with manufacturer's and supplier's instruction.

.2 Supply and install all instruments as shown on the drawings.

.3 Provide proper fastenings and supports.

.4 Any damage resulting from either failure to observe the installation instructions or as a result of proceeding with the work without complete knowledge of how it is to be done will be the Contractor's responsibility. Make equipment installation and connections by a qualified journeyman to the best standard.

.1 Carry out work to produce a neat, accurate, secure, functional installation.

.5 Repair at own expense, any damage done to the installation or materials while carrying out the work.

.6 Do not run 120 VAC power and 4-20 mA control signals in the same conduit. Install a ground wire in the conduit and bond instrument to ground. Connect shield drain wire to ground at one end only (in the control panel).

.7 Scale analog outputs from instruments according to the Engineer's requirements.

3.2 SYSTEM DEMONSTRATIONS

.1 Provide for field training and instructions as specified in Startup, and Commissioning.

3.3 CALIBRATION

.1 Calibration shall be by an agency specializing in instrument calibration and familiar with wastewater pumping stations and all instrumentation used on site.

.2 The calibration agency shall provide and complete comprehensive calibration report forms indicating full instrument make and model numbers, instrument configurations and settings, and instruments performance during calibration.

.3 Calibrate instruments individually.

.4 Carry out manual tests to check instrument readings versus measurements made by other means, e.g. perform draw down and refill tests using tape measure and stop watch. Compare level results of level instrument against levels measured from tape measure. Compare volume results of flow instrument against volumes calculated by flow estimates from draw down and refill tests. Compare volume flow rate results of flow instrument against volume flow rate results calculated from draw down and refill tests. Carry out such testing for as many instruments as practicable. Cross compare various results to confirm agreement and mass balance to the extent possible.

.5 For each variable ensure that it is consistent everywhere it is indicated throughout the system, e.g. compare flow meter local display against PLC value of flow, HMI value of flow, trend screen values of flow, and SCADA value of flow. Ensure units and scaling are in agreement and consistent.

.6 Coordinate units for engineering measurements with operators. Preference shall be SI metric in the most commonly used units (mm, m^3, L, s, kPa) except where operators request otherwise.

.7 Instrumentation shall provide consistent, accurate, repeatable results to stated tolerances prior to being accepted. Calibration agent shall record successful performance for each instrument, on calibration forms.

3.4 WARRANTY

.1 A written Supplier's Warranty shall be provided for the equipment specified in this section. The warranty shall be for a minimum period of one (1) year from the date of Substantial Performance. Such warranty shall cover all defects or failures of materials or workmanship which occur as the result of normal operation and service.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Agriculture and Agri-Food Canada

.1 The Canadian System of Soil Classification, Third Edition, 1998.

.2 U.S. Environmental Protection Agency (EPA)/Office of Water

.1 EPA 832R92005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.2 DEFINITIONS

.1 Compost:

.1 Mixture of soil and decomposing organic matter used as fertilizer, mulch, or soil conditioner.

.2 Compost is processed organic matter containing 40% or more organic matter as determined by Walkley-Black or Loss On Ignition (LOI) test.

.3 Product must be sufficiently decomposed (i.e. stable) so that any further decomposition does not adversely affect plant growth (C:N ratio below (25) (50)), and contain no toxic or growth inhibiting contaminates.

.4 Composed bio-solids to: CCME Guidelines for Compost Quality, Category (A) (B).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

1.4 QUALITY ASSURANCE

.1 Pre-installation meetings: conduct pre-installation meeting to verify project requirements, installation instructions and warranty requirements in accordance with Section 01 32 16.07 - Construction Progress Schedules - Bar (GANTT) Chart.

1.5 WASTE MANAGEMENT AND DISPOSAL

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

.2 Do not dispose of unused soil amendments into sewer systems, into lakes, streams, onto ground or in locations where it will pose health or environmental hazard.

Part 2 Products

2.1 TOPSOIL

.1 Topsoil for seeded areas planting beds : mixture of particulates, micro organisms and organic matter which provides suitable medium for supporting intended plant growth.

.1 Soil texture based on The Canadian System of Soil Classification, to consist of 45% sand, minimum 25 % clay, and contain 10 % organic matter by weight.

.2 Contain no toxic elements or growth inhibiting materials.

.3 Finished surface free from:

.1 Debris and stones over 50 mm diameter.

.2 Course vegetative material, 10 mm diameter and 100 mm length, occupying more than 2% of soil volume.

.4 Consistence: friable when moist.

2.2 SOIL AMENDMENTS

.1 Fertilizer:

.1 Fertility: major soil nutrients present in following amounts:

.2 Nitrogen (N): 20 to 40 micrograms of available N per gram of topsoil.

.3 Phosphorus (P): 40 to 50 micrograms of phosphate per gram of topsoil.

.4 Potassium (K): 75 to 110 micrograms of potassium per gram of topsoil.

.5 Calcium, magnesium, sulfur and micro-nutrients present in balanced ratios to support germination and/or establishment of intended vegetation.

.6 Ph value: 6.5.

.2 Peatmoss:

.1 Derived from partially decomposed species of Sphagnum Mosses.

.2 Elastic and homogeneous, brown in colour.

.3 Free of wood and deleterious material which could prohibit growth.

.4 Shredded particle minimum size: 5 mm.

.3 Sand: washed coarse silica sand, medium to course textured.

.4 Organic matter: compost Category A, in accordance with CCME PN1340, unprocessed organic matter, such as rotted manure, hay, straw, bark residue or sawdust, meeting the organic matter, stability and contaminant requirements.

.5 Use composts meeting Category B requirements for land fill reclamation and large scale industrial applications.

.6 Limestone:

.1 Ground agricultural limestone.

.2 Gradation requirements: percentage passing by weight, 90% passing 1.0 mm sieve, 50% passing 0.125 mm sieve.

.7 Fertilizer: industry accepted standard medium containing nitrogen, phosphorous, potassium and other micro-nutrients suitable to specific plant species or application or defined by soil test.

Part 3 Execution

3.1 PREPARATION OF EXISTING GRADE

.1 Verify that grades are correct.

.2 Grade soil, eliminating uneven areas and low spots, ensuring positive drainage.

.3 Remove debris, roots, branches, stones in excess of 50 mm diameter and other deleterious materials.

- .1 Remove soil contaminated with calcium chloride, toxic materials and petroleum products.
- .2 Remove debris which protrudes more than 75 mm above surface.
- .3 Dispose of removed material off site.

.4 Cultivate entire area which is to receive topsoil to minimum depth of 100 mm.

- .1 Cross cultivate those areas where equipment used for hauling and spreading has compacted soil.

3.2 PLACING AND SPREADING OF TOPSOIL/PLANTING SOIL

.1 Place topsoil after Consultant has accepted subgrade.

.2 Spread topsoil in uniform layers not exceeding 150 mm.

.3 For sodded areas keep topsoil 15 mm below finished grade.

.4 Spread topsoil as indicatedto following minimum depths after settlement.

- .1 150 mm for seeded areas.
- .2 135 mm for sodded areas.
- .3 300 mm for flower beds.
- .4 500 mm for shrub beds.

.5 Manually spread topsoil/planting soil around trees, shrubs and obstacles.

3.3 FINISH GRADING

.1 Grade to eliminate rough spots and low areas and ensure positive drainage.

- .1 Prepare loose friable bed by means of cultivation and subsequent raking.

.2 Consolidate topsoil to required bulk density using equipment approved by Consultant.

- .1 Leave surfaces smooth, uniform and firm against deep footprinting.

3.4 ACCEPTANCE

.1 Consultant will inspect and test topsoil in place and determine acceptance of material, depth of topsoil and finish grading.

3.5 SURPLUS MATERIAL

.1 Dispose of materials except topsoil not required off site

3.6 CLEANING

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

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

END OF SECTION

Part 1 General

1.1 ADMINISTRATIVE REQUIREMENTS

.1 Scheduling:

.1 Schedule sod laying to coincide with preparation of soil surface.

.2 Schedule sod installation when frost is not present in ground.

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 seed, and fertilizer.

.2 Submit 2 copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements 01 35 43 - Environmental Procedures.

.3 Samples:

.1 Submit 0.5 kg container of each type of fertilizer used.

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

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

1.3 QUALITY ASSURANCE

.1 Qualifications:

.1 Landscape Planting Supervisor: Landscape Industry Certified Technician with Softscape Installation designation.

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:

.1 Labelled bags of fertilizer identifying mass in kg, mix components and percentages, date of bagging, supplier's name and lot number.

.2 Fertilizer must be dry.

.3 Storage and Handling Requirements:

.1 Store fertilizer off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Replace defective or damaged materials with new.

1.5 WARRANTY

.1 For seeding, 12 months warranty period is extended to 24 months.

.2 End-of-warranty inspection will be conducted by Departmental Representative.

Part 2 Products

2.1 GRASS SEED

.1 Canada "Certified" seed, "Canada No. 1Lawn Grass Mixture" in accordance with Government of Canada "Seeds Act" and "Seeds Regulations".

.2 In packages individually labelled in accordance with "Seeds Regulations" and indicating name of supplier.

2.2 WATER

.1 Free of impurities that would inhibit germination and growth.

2.3 FERTILIZER

.1 To Canada "Fertilizers Act" and Regulations.

.2 Complete synthetic fertilizer with guaranteed minimum analysis as specified.

Part 3 Execution

3.1 SEED BED PREPARATION

.1 Remove and dispose of weeds; debris; stones 50 mm in diameter and larger; soil contaminated by oil, gasoline and other deleterious materials; off site.

.2 Verify that grades are correct. If discrepancies occur, notify Consultant and commence work when instructed by Consultant.

.3 Fine grade surface free of humps and hollows to smooth, even grade, to tolerance of plus or minus 15 mm, surface draining naturally.

.4 Cultivate fine graded surface approved by Consultant to 25 mm depth immediately prior to seeding.

3.2 SEED PLACEMENT

.1 Ensure seed is placed under supervision of certified Landscape Planting Supervisor.

.2 For mechanical seeding:

.1 Mechanical landscape drill seeder ("Brillion" type or equivalent) which accurately places seed at specified depth and rate and rolls in single operation.

.2 Use equipment and method acceptable to Departmental Representative DCC Representative Consultant.

.3 For manual seeding:

.1 Use manually operated drop seeder ("Cyclone" type or equivalent).

.2 Use manually operated, water ballast, landscaping type, smooth steel drum roller. Ballast as directed by Departmental Representative DCC Representative Consultant.

.3 Use equipment and method acceptable to Departmental Representative DCC Representative Consultant.

.4 On cultivated surfaces, sow seed uniformly as per manufacturers recomendation

.4 Blend applications 150 mm into adjacent grass areas to form uniform surfaces.

.5 Sow half of required amount of seed in one direction and remainder at right angles as applicable.

.6 Incorporate seed by light raking in cross directions.

.7 Consolidate mechanically seeded areas by rolling area if soil conditions warrant or if directed by Consultant with equipment approved by Consultant immediately after seeding.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Keep pavement and area adjacent to site clean and free from mud, dirt, and debris at all times.

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

.1 Clean and reinstate areas affected by Work.

3.4 PROTECTION

.1 Erect plastic snow fence around newly seeded areas sufficient to protect against deterioration due to pedestrian or other traffic.

3.5 MAINTENANCE DURING ESTABLISHMENT PERIOD

.1 Ensure maintenance is curried out under supervision of certified Landscape Maintenance Supervisor.

.2 Perform following operations from time of seed application until acceptance by Consultant:

.1 Water seeded area to maintain optimum soil moisture level for germination and continued growth of grass. Control watering to prevent washouts.

.2 Repair and reseed dead or bare spots to allow establishment of seed prior to acceptance.

.3 Cut grass to 50 mm whenever it reaches height of 70 mm. Remove clippings which will smother grass

.4 Fertilize seeded areas after first cutting in accordance with fertilizing program. Spread half of required amount of fertilizer in one direction and remainder at right angles and water in well.

.5 Control weeds by mechanical or chemical means utilizing acceptable integrated pest management practices.

.6 Adjust protection barrier as necessary to protect against deterioration due to pedestrian or other traffic as needed.

3.6 FINAL ACCEPTANCE

.1 Seeded areas will be accepted by Consultant provided that:

.1 Areas are uniformly established free of rutted, eroded, bare or dead spots and extent of weeds apparent in grass is acceptable.

.2 Areas have been cut at least twice.

.3 Areas have been fertilized.

.2 Areas seeded in fall will be accepted in following spring, one month after start of growing season provided acceptance conditions are fulfilled.

3.7 MAINTENANCE DURING WARRANTY PERIOD

.1 Perform following operations from time of acceptance until end of warranty period.

.1 Water seeded area to maintain optimum soil moisture level for continued growth of grass. Control watering to prevent washouts.

.2 Repair and reseed dead or bare spots to satisfaction of Consultant.

.3 Cut grass to 50 mm whenever it reaches height of 70 mm. Remove clippings which will smother grass as directed by Consultant.

.4 Fertilize seeded areas in accordance with fertilizing program. Spread half of required amount of fertilizer in one direction and remainder at right angles and water in well.

.5 Control weeds by mechanical or chemical means utilizing acceptable integrated pest management practices.

END OF SECTION

Part 1 General

1.1 BURIED PIPE INSULATION SYSTEM

.1 The pipe shall be insulated using the U.I.P.® factory insulation process, as supplied by Urecon Ltd., complete with integral conduit for electric heat trace cable and black polyethylene jacket with UV inhibitor. The jacket thickness is dependent on the diameter and intended function. The insulation of associated joints, fittings and accessories shall be as per Urecon's recommendations, depending on the size and type of pipe involved. The product shall be manufactured in accordance to ISO 9001-2000 Standards, or approved equal.

.2 The electric heat tracing system shall be constant watt parallel resistance THERMOCABLE®, supplied by Urecon.

Part 2 Products

2.1 INSULATION

.1 Material: rigid polyurethane foam, factory applied.

.2 Thickness: 50 mm (2 in.) or as required.

.3 Density: (ASTM D 1622) 35 to 46 kg/m^3

.4 Closed cell content: (ASTM D 6226) 90%, minimum.

.5 Water absorption: (ASTM D 2842) 4.0% by volume.

.6 Thermal conductivity: (ASTM C518) 0.020 to 0.026 W/m °C

2.2 SYSTEM PROPERTIES

.1 System compressive strength: (modified ASTM D 1621 with 125 mil jacket) approximately 414 to 552 kPa, varies with pipe diameter.

.2 Temperature limitations:

.1 Minimum ambient installation temperature @ -43 °C

.2 Service temperature approximately -45°C

2.3 OUTER JACKET ON PIPE INSULATION

.1 Tape wrap system

.2 Jacket material: Scapa #366 polyethylene, UV inhibited.

.3 Sealant: butyl rubber and resin, applied hot in 1.27 mm multiple layers providing a shrink tightened waterproof bond throughout its entire length.

.4 Minimum elongation: (ASTM D 1000) 300%, 6 month test.

.5 Tensile strength: (ASTM D-1000) 6.83 kg/cm wide.

2.4 INSULATED PIPE JOINTS

.1 Insulated pipe joints shall be completed using pre-fabricated rigid polyisocyanurate or urethane half shells and sealed with the application of suitable wrap around adhesive lined heat shrink sleeves as supplied by Urecon. The heat shrink sleeves shall overlap the insulation jacket by a minimum of 75 mm on either side of the joint.

2.5 HEAT TRACING CONDUIT

.1 Heat tracing conduit shall consist of an extruded molding and shall be applied to the pipe prior to application of the insulation. The conduit will be securely fastened to the pipe to prevent the ingress of foam therein during the insulation process. All conduit shall be checked after insulating to insure they are not plugged. The ends shall be sealed prior to shipping to prevent any foreign material from entering the conduit while in transit or during installation.

2.6 ELECTRIC TRACING SYSTEM

.1 Heat tracing cable:

- .1 Constant watt parallel resistance THERMOCABLE®, supplied by Urecon.
- .2 Watt density: 10 W/m
- .3 Model C10-240-COJ, supplied by Urecon

.2 Electronic thermostats:

- .1 Model No UTC-2030-01, supplied by Urecon
- .2 Auto-cycle ground fault detection circuitry
- .3 240 V single phase VAC, 60 Hz
- .4 30 A, 2 pole output relay
- .5 Nema 4 painted steel enclosure
- .6 Single 100 ohms RTD temperature sensor.
- .7 Low temperature alarm factory set at 0° C
- .8 Control temperature factory set at 3 °C.
- .9 On-off control with 1 °C deadband.
- .10 Provide dry contact for “alarm” signal to PLC system

Part 3 Execution

3.1 INSTALLATION

3.1 INSULATED PIPE INSTALLATION

.1 Install insulated pipe in accordance with manufacturer’s instructions to lines and grades indicated on drawings.

.2 Terminate insulation in accordance with manufacturer’s instructions for exposed, buried and sub-aqueous installations.

.3 Rotate pipe such that heat trace conduit is located on underside of pipe.

3.2 HEAT TRACE INSTALLATION

.1 Install and wire to manufacturer's instructions.

.2 Install heat trace as indicated on drawings

.3 Locate thermostats as indicated on drawings.

.4 Provide separate thermostat for each pipe run.

.5 Locate temperature sensor on each pipe run in accordance with supplier's recommendations.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Holding tank.

1.2 RELATED SECTIONS

.1 Section 31 05 16 - Aggregate Materials.

.2 Section 31 23 16 - Excavating.

.3 Section 31 23 18 - Trenching.

.4 Section 31 23 23 - Backfilling.

.5 Section 33 31 13 - Site Sanitary Sewerage Piping: Effluent discharge.

.6 Section 33 05 13 - Manholes And Catch Basins: Effluent discharge.

.7 Section 22 10 00 - Plumbing Piping: Building sanitary drainage piping; effluent discharge.

1.3 REFERENCES

.1 AASHTO T180 - Moisture-Density Relations of Soils Using a 4.54 kg> Rammer and an 457 mm> Drop.

.2 ANSI A21.11 - Rubber Gasket Joints For Cast Iron and Ductile Iron Pressure Pipe and Fittings.

.3 ASTM A74 - Cast Iron Soil Pipe and Fittings.

.4 ASTM C4 - Clay Drain Tile and Perforated Clay Drain Tile.

.5 ASTM C12 - Standard Practice for Installing Vitrified Clay Pipe Lines.

.6 ASTM C425 - Compression Joints for Vitrified Clay Pipe and Fittings.

.7 ASTM C564 - Rubber Gaskets for Cast Iron Soil Pipe and Fittings.

.8 ASTM C700 - Vitrified Clay Pipe, Extra Strength, Standard Strength and Perforated.

.9 ASTM D698 - Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN/m; (12,400 ft - lb/ft;)).

.10 ASTM D1556 - Test Methods for Density and Unit Weight of Soil In-Place by the Sand-Cone Method.

.11 ASTM D1557 - Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (2,700 kN - m/m; (56,000 ft - lb/ft;)).

.12 ASTM D2311 - Perforated Homogeneous Bituminized Fiber Pipe For General Drainage.

.13 ASTM D2729 - Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

.14 ASTM D2751 - Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings.

.15 ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

.16 ASTM D3017 - Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

.17 ASTM D3034 - Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

1.4 SUBMITTALS FOR REVIEW

.1 Section 01 33 00: Submission procedures.

.2 Shop Drawings: Indicate tank size and configuration; plan, location and inverts of filtre field; inverts of connecting piping.

.3 Product Data: Provide data on tank accessories.

1.5 SUBMITTALS AT PROJECT CLOSEOUT

.1 Section 01 73 03: Submission procedures.

.2 Accurately record actual locations and inverts of buried pipe, components, and connections.

1.6 REGULATORY REQUIREMENTS

.1 Conform to Manitoba Plumbing code and regulations for Work of this section.

.2 Provide certificate of compliance from authority having jurisdiction indicating approval of systems.

Part 2 Products

2.1 HOLDING TANK

.1 Manufacturers:

.1 BARKMAN CONCRETE.

.2 Substitutions: Refer to Section 01 61 00.

.2 Holding Tank: Reinforced precast concrete construction, 27.5 MPa, 28 day minimum strength, concrete lid with lift rings, vent, inlet inspection hole, inlet turned down minimum 300 below effluent level.

.1 Tank Capacity: 3 785L 1,000gallon.

.3 Concrete manhole extension. Inside diameter 30”, outside diameter 35”, height 6’.

Part 3 Execution

3.1 EXAMINATION

.1 Verify existing conditions to Section 01 73 03.

.2 Verify that building sanitary sewer connection, size, location and invert are as indicated.

3.2 PREPARATION

.1 Ream pipe ends and remove burrs.

.2 Remove scale and dirt from components before assembly.

.3 Establish invert elevations for all components in the system.

.4 Hand trim excavation to suit septic tank, distribution box and field tile arrangement. Remove stones, roots or other obstructions.

3.3 TANK AND TANK BEDDING

.1 Hand trim excavation for accurate placement of tank to elevations indicated.

.2 Place bedding material level in one continuous layer not exceeding 8inches compacted depth, compact to 95 percent.

.3 Backfill around sides of tank, tamp in place and compact to 95 percent.

.4 Maintain optimum moisture content of bedding material to attain required compaction density.

.5 Install septic tank and distribution box and related components on bedding in accordance with manufacturer's instructions. Position components to permit access to inspection ports.

3.4 CONNECTING PIPING

.1 Place pipe and fittings on clean excavated subsoil.

.2 Coordinate the work with connections to building sanitary sewer piping outlet.

END OF SECTION

Part 1 General

1.1 SUBMITTALS

.1 Drawings to include:

.1 Assembly drawings and material list

.2 Details of all parts and principal dimensions.

.3 Details of the electrically driven operators, their electrical connections and power requirements.

.4 Electrical actuator wiring diagrams.

1.2 OPERATIONS AND MAINTENANCE DATA

.1 Provide operation and maintenance data for incorporation into manuals.

1.3 SHIPMENT, PROTECTION AND STORAGE

.1 Deliver valves to site using loading methods which do not damage casings or coatings.

.2 Clearly tag valves, stating size, type, coatings and mating parts.

.3 Store on site until ready for incorporation in the work using methods recommended by manufacturer to prevent damage, undue stresses, or weathering.

.4 Labels:

.1 Embossed plastic labels with 6 mm high letters unless specified otherwise.

Part 2 Products

2.1 GENERAL

.1 Provide valves of the same type, size range and service from a single manufacturer.

.2 Provide new, unused valves for the work.

.3 Valve materials to be free from defects or flaws, with true alignment and bores.

.4 Unless otherwise indicated, valves shall be the same size as the pipe run in which they are to be installed.

.5 Clearly mark valve bodies in raised lettering to indicate the valve type, rating, and where applicable, the direction of flow. Conform to MSS SP25.

.6 Valves to open counter-clockwise.

2.2 DRAWINGS

.1 Isometric and floor plans may not show all valves in order to maintain clarity, refer to Piping and Instrumentation Diagrams for all valve references.

2.3 VALVE ENDS

.1 In PVC pipe runs 50 mm diameter and smaller, valves to have socket-welded union connections unless indicated otherwise. Threads to conform to ANSI B1.20.1.

.2 Valves in pipe runs equal to or greater than 75 mm diameter to be flanged unless indicated otherwise.

.3 For cast iron body valves, drill flanges to Class 125 pattern conforming to ANSI B16.1. Do not use grooved joint valve ends.

.4 Lug style body valves shall have tapped holes, suitable for the bolt spacing of the pipe flanges placed on either side.

.5 End flanges for gate valves to be integral with the gate valve body and be faced and drilled in accordance with ANSI B16.1, Class 125 flanges.

2.4 RAW WATER PUMP CHECK VALVES

.1 To be used at Raw Water Pumps. CHV-1101, CHV-1102

.2 Stainless Steel Threaded.

.3 Standard of Acceptance: Flowmatic 80SSa with inlet and outlet tap ports.

2.5 AIR RELIEF VALVE

.1 Body: Cast iron

.2 End conns: NPT

.3 Stainless steel trim and float and Buna-N seat with stainless steel flow diffuser screen.

.4 Rating: 1035 kPa (150 psi)

.5 Coating: Fusion bond epoxy ANSI/NSF 61 approved

.6 Standard of acceptance:

.1 Cla-Val, Apco, Valmatic or equal

2.6 COMBINATION AIR/VACUUM RELEASE VALVES

.1 Unit shall be suitable for releasing air or relieving vacuum accumulated in the pipeline.

.2 Pipe air/water vent discharge to drain with PVC piping.

.3 Construction:

.1 Size: 25mm threaded connection
.2 Body: factory coated cast iron ASTM A-126, Class B
.3 Trim: Stainless Steel
.4 Seat: Buna-N

.4 Standard of acceptance:

.1 Cla-Val, Apco, Valmatic or equal.

2.7 STAINLESS STEEL BALL VALVES (BAV)

.1 Stainless steel ball valve – stainless steel 316 body and ball, PTFE seat, stainless steel 316 handle.

.2 Standard of Acceptance:

.1 Mueller GB3932-T-FP.

2.8 PVC BALL VALVES (BAV)

.1 PVC Ball Valve, NSF 61 Certified, with socket-welded union connections

.2 Standard of Acceptance:

.1 Chemline Type 21 True Union Ball Valves

.1 EPDM Seals

.2 Teflon Seat

.3 Teflon Seat

2.9 SAMPLE TAP BALL VALVES

.1 PVC Chemline Labcock Valve LCTHx (1/4” threaded x 3/8” ID Hose

.2 Supply 3.0m of 3/8” tubing roll for plant use.

2.10 FLOW CONTROL VALVES (Hand Wheel Operated)

.1 Standard of Acceptance Hayward Diaphragm Valve.

.1 Model: DAB1020UEEA

2.11 PRESSURE RELIEF VALVES

.1 Size: 13 mm

.2 Adjustment Range: 276 to 1379 kPa (40 to 200 psi)

.3 Body: brass

.4 Standard of Acceptance:

.1 Cla-Val Model 55B-60 or equal

2.12 MANUAL OPERATORS

.1 Provide valves with manual operators unless specifically indicated otherwise.

.2 Lever operators on ball valves to be two position. Provide butterfly valves with 10 position latching levers except where used to balance air flows. Where used to balance air flows provide infinite position, screw down levers.

.3 Gear operator to be worm gear type, equipped with a hand wheel and a visual indicator of the valve position. Equip operators with adjustable, self-locking mechanical stop-limiting devices designed to hold the valve in any intermediate position between full open and full closed to prevent overtravel of the disc/ball in the open and closed positions. Gear operators to be grease lubricated. Where gear operators are intended for direct bury or submergence, seal units with long life lubricant.

.4 Manual operators for butterfly and gate valves for buried service to include an AWWA operating nut and be gasketed and grease packed for submerged operation at water pressures to 700 kPa. Operators for exposed service to be gasketed for weatherproof service. Gear boxes to be placed above ground and liquid surfaces.

.5 Supply tee wrenches of steel, furnished with sockets to suit nut dimensions. Provide operating nuts to AWWA Standard.

.6 Operate each fully assembled valve at least three times in the shop to test the function of the operating mechanism and the general operation.

Part 3 Execution

3.1 PREPARATION

.1 Valve and piping arrangement indicated in the drawings is based on typical dimensions for valves of the specified type. Make the necessary modifications in piping to allow for discrepancies between valve dimensions shown and those supplied for the work.

.2 Field measure and check all equipment locations, pipe alignments, and structural installation prior to installation of valves. Ensure that valve locations and orientations provide suitable access to manual operators and that sufficient space and accessibility is available for pneumatic and electric actuators.

.3 Where conflicts are identified, inform the Engineer and initiate the necessary piping modifications at no cost to the Owner.

3.2 VALVE INSTALLATION

.1 In horizontal pipe runs, other than in locations where space does not permit, mount all valves except for butterfly valves and trunnion ball valves with a vertical operating shaft with the actuator at the top. In no case install a valve with the operator shaft pointing down.

.2 Mount butterfly valves and trunnion ball valves with shaft in a horizontal orientation.

.3 Do not overtorque bolts to correct for misalignment when joining valves to pipe or fittings,

.4 Support valves in position using temporary supports until valves are fixed in place.

.5 Permanently support valves to prevent transmission of loads to adjacent pipework and/or equipment.

.6 Where valves are installed in PVC pipework greater than 100 mm diameter, support valves independently and brace against operating loads and torque to prevent transmission of stresses to adjacent pipework.

.7 Generally pipe supports and hangers are not shown unless for indication purposes only.

.8 Install gate valves in the closed position.

.9 Install valves which are bubble tight in one direction to seal in a direction opposite to normal flow unless otherwise noted or directed by the Engineer.

.10 Unless otherwise specified, install single seated ball valves and knife gate valves with the seat downstream. Install at tank connections with seat away from tank. Install on pump discharge and suction lines with seat adjacent to the pump.

.11 Install all valves in accordance with manufacturer's recommendations.

.12 Protect valves installed below grade with a shrink sleeve or polyethylene sheath attached to the pipe with tapewrap.

3.3 VALVE EXTENSIONS

.1 Install valve stem extensions where necessary to provide clearance from insulation.

3.1 IDENTIFICATION TAGS

.1 Fit each valve and control mechanism with lamacoid 3 mm thick plastic engraving sheet, coloured face, black or white core as directed. Attach the tag with stainless steel chain. Tags shall incorporate equipment name and number.

.2 Contractor to provide complete equipment and valve tag list to owner for mountable schedule.

3.2 VALVE TESTING

.1 Operate valves under simulated and/or real process conditions to ensure operation as intended.

.2 Valves to be pressure tested in conjunction with the pipes in which the valves are installed.

END OF SECTION

Part 1 General

1.1 WORK DESCRIPTION

.1 Supply and install all process and potable piping as specified herein and shown on the Contract Drawings.

.2 All process pipe shall be Schedule 80 PVC or Schedule 10 SS, or Schedule 40 SS, and as shown on Drawings. Flanges and unions shall be added at convenient locations for easy disassembling. Pipe shall be adequately restrained to mitigate against thrust and vibrations.

.1 Floor to ceiling supports may be required to prevent any lateral movement of pipes, or ladder frame securely anchored to floor.

.3 Process pipe shall have automatic air release vents installed at all high points.

.4 All pipe supports and equipment stands to be stainless steel construction.

.5 Install sample taps at locations shown. Coordinate locations with Engineer.

1.2 SUBMITTALS

.1 Provide as specified in Section 01 33 00 – Submittal Procedures.

1.3 OPERATING AND MAINTENANCE DATA

.1 Provide operation and maintenance data for incorporation into manuals as required by Engineer and specifications.

Part 2 Products

2.1 GENERAL

.1 All pipe materials to be new, free from defects and conforming to applicable reference standards.

.2 All materials in contact with water to be NSF approved for potable water.

.3 Where any standard referenced has been superseded prior to bidding, the Contractor shall comply with the current standard.

2.2 POLYVINYL CHLORIDE (PVC) PIPE

.1 All PVC Schedule 80 pipe shall be manufactured from a Type I, Grade I Polyvinyl Chloride (PVC) compound with a Cell Classification of 12454 per ASTM D1784. The pipe shall be manufactured in strict compliance to ASTM D1785 and D2665 (where applicable), consistently meeting and/or exceeding the Quality Assurance test requirements of these standards with regard to material, workmanship, burst pressure, flattening, and extrusion quality. Standard lengths of pipe sizes 6” and larger shall be

bevelled each end by the pipe manufacturer. All pipe shall be stored indoors after production at the manufacturing site until shipped from factory. This pipe shall carry the NSF International seal of approval for potable water applications. The pipe shall also comply to CAN/CSA B137.0 and CAN/ CSA B137.3 for pressure pipe applications.

.2 Fittings: Moulded PVC fittings and connectors for socket welding connections: "Heavy Duty" for Schedule 80 pipe, CSA B.137.3, fibreglass reinforced. Slip-on PVC flanges to Class 125 ANSI B16.1 dimensions; soft rubber gaskets.

.3 Stainless steel nuts, bolts & washers.

.4 Solvent Welding

.1 For PVC solvent welded pipe, ends to be joined shall be square and free of sawbucks. All joints shall be wiped clean using methylethyl ketone.

.2 Solvent cement shall be applied to the outside of the pipe and the inside of the fitting in accordance with the manufacturer's recommendations. Use only the solvent cement supplied by the pipe manufacturer. Apply only when ambient temperature is above 10°C.

2.3 STAINLESS STEEL PIPE

.1 Pipe shall be schedule 10 /304, unless otherwise specified.

.1 Dimensions to ASME/ANSI B36.19.

.2 Shall conform to AWWA C220, latest revision.

.3 Shall conform to ASTM A312, ASTM A778.

.2 Fittings shall be smooth flow type, 304 stainless steel.

.1 Dimensions to ASME/ANSI B16.9.

.2 Shall conform to AWWA C226, latest revision.

.3 Shall conform to ASTM A403, ASTM A774.

.3 Jointing shall be welded, stainless steel flanges, or rolled grooved joints (rigid), or stainless steel back-up flanges.

.1 Contractor shall have the Engineer’s approval to replace a flanged connection as shown in the plans with a welded joint.

.2 Slip-on flanges and back-up flanges to be 304 stainless steel, Class 150.

.1 Dimensions to ANSI B16.5 rating.

.2 Gaskets to be Buna N.

.3 Shall conform to AWWA C2BB, latest revision

.4 Provide flat-faced flanges on each side of butterfly valves.

.5 Compatible flanges for mating to equipment or valves.

.4 Rolled grooved joints to conform to AWWA C606.

.1 Standard of acceptance: Stainless steel couplers.

.2 Grooved style flange adapters are not acceptable. Welded flanges are the standard.

.3 All connections shall be rigid, unless otherwise specified.

2.4 FLANGES

.1 Unless otherwise noted, make flanges on steel pipe, conforming to ANSI B16.5.

.2 Do not use slip-on flanges that are attached to a pipe by means of set screws and gaskets.

.3 Temporary blind flanges may be carbon steel.

2.5 FITTINGS

.1 For steel pipelines 75 mm in diameter or greater, fittings to conform to ANSI B16.9, ANSI B16.11 or ANSI B16.5. Provide fittings with a wall thickness equal to or greater than the pipe.

.2 Provide concentric reducers in vertical lines unless indicated otherwise.

.3 Provide long radius elbows unless otherwise shown. Provide smooth flow stainless steel elbows 350 mm and less, to ANSI B16.9.

2.6 GASKETS

.1 For flat faced flanges, use full-face gaskets. For raised-face flanges, use ring type gaskets. Conform to ASTM B16.21.

.1 Use gasket materials for flanged connections suitable for the temperature, pressure, and corrosivity of the fluid conveyed in the pipeline.

.2 Unless otherwise specified, minimum Gasket Material Thickness for full face gaskets:

.1 75 to 250 mm pipe diameter; 1.6 mm thick.

.2 Greater than 250 mm pipe diameter; 3.2 mm thick.

.3 Unless otherwise specified, minimum gasket material thickness for raised face ring gaskets:

.1 75 to 100 mm pipe diameter; 1.6 mm thick.

.2 Greater than 100 mm pipe diameter; 3.2 mm thick.

2.7 FASTENERS

.1 Threads: to ANSI B1.1, standard coarse thread series.

.1 Submerged, buried, encased service and in reservoir:

.1 Studs and bolts: to ASTM A193, Gr.B8, C1.1, 304 S.S.

.2 Nuts: to ASTM A194, Gr.8, 304 S.S.

.3 Washers: flat, 304 S.S.

.2 General purpose: (Access Hatches)

.1 Studs and bolts: to ASTM A193, Gr. B7, zinc plated

.2 Nuts: to ASTM A194 Gr. 2H, zinc plated

.3 Washers: flat, zinc plated

.3 Temporary: (Blind flange covers excluding Access Hatches)

.1 Studs, bolts and nuts: to ASTM A307 Grade A/B

.2 Washers: flat

2.8 DISSIMILAR METAL CONNECTIONS

.1 Where dissimilar metals are to be connected, furnish dielectric fittings and/or isolating flanges.

2.9 INTERIOR FINISHES

.1 Do not shop coat the internal surface of stainless steel or plastic piping.

2.10 PIPING IDENTIFICATION LABELLING

.1 Label all equipment flow directions, valves, etc. according to the equipment identification list which will be furnished by the Engineer.

.2 Use self-sticking pipe markers, self-sticking arrows and pipe banding tape following paint applications. Labelling materials to be suitable for high and low temperatures and must be reviewed by Engineer prior to application.

.3 Exposed Locations:

.1 Identify exposed piping and ductwork in locations as follows:

.1 At every end of every piping or duct run;

.2 Adjacent to each valve, strainer, damper and similar accessory;

.3 At each piece of connecting equipment;

.4 On both sides of every pipe and duct passing through a floor, wall or partition, as appropriate;

.5 On each side of branch connections;

.6 At least once in each room, and at least once on pipe and duct runs less than 6 m in length.

.4 Concealed Locations: At maximum 6m internals on piping and ductwork above suspended accessible ceilings, at least once in each room or area and at each access door location.

.5 Identification for piping is to consist of classification colour bands, identification wording to identify the pipe service and directional arrows to indicate direction of flow, all in accordance with the table following. The order is to be as follows: band, pipe marker, band, arrow and band at each location. Where the full pipe is painted in the appropriate identification colour, additional banding will not be required.

.6 Colour Bands:

Commodity	Colour
Raw Water	Green
Filtered Water (prior to UV)	Aqua
Potable or Finished Water (post UV)	Blue
Backwash Waste	Brown
Chlorine Solution	Yellow

.7 Pipe/Label Letter Sizes:

Outside Pipe Diameter	Letter Size
Less than or equal to 25 mm	12 mm
Greater than 25 mm but less than 100 mm	25 mm
Equal or greater than 100 mm	50 mm

.8 Lettering and arrows are to be on separate labels. Banding tape width to be 50 mm.

.9 Standard of Acceptance, TT&L Pressure Sensitive Pipe Markers.

2.11 PROCESS AND PLUMBING PIPING INSULATION

.1 All plumbing and WTP process piping to be insulated when:

.1 Running over walking paths;
.2 Potential to drip on other equipment;
.3 As shown in specific locations on plans.

.2 Standard of Acceptance:

.1 Straight piping: Aerocel- SSPT 12 mm thickness, or equal.
.2 Fittings: Aerocel Aerofit 12 mm thickness, or equal.
.3 Pipe support clamp locations: Aerocel Aerofix-U rigid load bearing sections at clamp locations.

.3 Do not install pipe insulation until pressure testing of piping is completed and approved by Engineer.

2.12 PRESSURE GAUGES

.1 Provide liquid filled pressure gauges at:

.1 Discharge side of all pumps;

.2 Both sides of pressure regulating or reducing valve;

.3 Each water supply entering and leaving plant;

.4 Water supply to any truck fill or fire water supply;

.5 Water supply to building plumbing;

.6 and in locations shown on Plans, or directed by Engineer..

.2 Standard of Acceptance: **100mm Ashcroft 1279** Duragauge Plus; or equal

.1 6mm nominal NPT connections.

.2 Gauges to read in kilopascals (large scale) and pounds per square inch (small scale). (0-1,000 kPa).

.3 Provide isolation valves and pulsation dampers at all pressure gauges.

.4 Install eccentric plug valve isolators and flushing connections on all gauges.

.3 Provide each gauge with diaphragm seal.

.1 Standard of Acceptance: Ashcroft 201, or equal.

Part 3 Execution

3.1 PIPING INSTALLATION

.1 General:

.1 Conform to requirements of ANSI B31.3 and CSA B51 code for pressure piping.

.2 Install straight, parallel and close to walls and ceilings, with specified pitch. Use standard fittings for direction changes.

.3 Pitch 1:100 in direction of flow, without pockets, to low points.

.4 Minimize contamination by leaving pipe valves and fittings in sealed cartons until prior to their use and seal openings in piping system after installation.

.5 Use teflon tape only for threaded pipe. Do not use any form of thread lubricant.

.6 Install groups of piping parallel to each other, spaced to permit application of insulation if required, identification, and service access, on suitable hangers.

.7 Install eccentric reducers in horizontal piping to permit drainage and eliminate air pockets.

.8 Where pipe sizes differ from connection sizes of equipment, install reducing fittings close to equipment. Reducing bushings are not permitted.

.9 Install flanged or welded nozzles, branch connections, welding outlets, adapters and taps, true and faced at right angles to the axis of the pipe. Do not extend connection inside of pipe.

.10 Support piping during construction to prevent abnormal stresses on the pipe works.

.11 Install pipe supports and hangers where indicated on the drawings or as required.

.12 Install flanges by aligning top two holes of flange with spirit level.

.2 Flanges Bolting to Valves:

.1 Do not weld adjacent flanges on butterfly valves when the valve is in place.

.2 Remove valve prior to welding.

.3 Clean gasket surfaces, flange faces and butt welding connections.

.4 Protect connecting surfaces.

.3 Bolted Connections:

.1 Clean pipe ends and gaskets.

.2 Lubricate gaskets with soapy water and bolts with thread lubricant.

.3 Tighten bolts progressively by crossover method and not in rotation around the joint.

.4 Tighten bolts to the torque recommended by the manufacturer.

.5 Use properly sized wrenches for bolt tightening to prevent rounding of nut and bolt heads.

3.2 PROCESS PIPE SUPPORT AND SPACING

.1 Support locations and spacing shall generally be to provide for installation as shown on the Plans. All supports shall be galvanized or stainless steel or concrete support. Where not specifically shown, supports shall be installed at locations to be determined by the Contractor and reviewed by the Engineer, and in accordance with the following:

Nominal Pipe Size (mm)	Maximum Spacing (mm)
50	1500
75	1500
100	1500
150	1500
200 and up	2000

.2 All pipe fittings shall be carefully aligned and supported before the joints are securely bolted in order to prevent excessive stresses in the pipes. Special care shall be taken to see that the pipe is not moved thereafter.

.3 Install concrete supporting piers for pipes placed near the floor level as per the Drawings. Piping shall be securely supported by brackets and/or hangers well fastened to inserts in walls and ceilings. Vertical pipes shall be supported by lateral struts secured to adjacent walls.

.4 Piping supports, hangers, braces, etc., shall be attached to steel structures by means of approved clamps, unless provision has been made for the fastening of such supports.

.5 Fastening by welding or drilling, unless specified in the Drawings, shall be permitted only with the written approval of the Engineer.

.6 The Contractor shall locate supports sufficiently close to prevent sagging, warping and vibration, also to avoid excess stresses from concentrated loads between supports.

.7 Piping shall be supported independently of valves.

3.3 PIPE THROUGH WALLS

.1 Unless otherwise specified, pipes through floors and roofs of concrete or similar material shall be set in suitable openings. Suitable pipe connections shall be provided on both sides of the opening to permit ready dismantling of the pipelines with wall or floor sleeves, packed, as detailed on the Drawings.

.2 Suitable wall/floor pieces shall be furnished to eliminate leakage. The wall pieces shall be cast directly in the walls or floors as may be permitted by the Engineer. "Puddle collars" shall be an integral part of the casting.

.3 Install compressible rubber packing between cored hole and piping when pipes pass through cored holes in concrete walls or floors. Standard of Acceptance: Link Seal.

3.4 PROTECTION OF OPENINGS

.1 Protect equipment and system openings from dirt, dust and other foreign materials.

.2 Thoroughly clean piping, ducts and equipment of dirt, cuttings, and other foreign substances prior to being put into operation.

3.5 EQUIPMENT PIPING CONNECTIONS

.1 Where equipment connections are a different size from the piping serving it, all associated isolating valves and fittings to be the larger pipe size unless specifically indicated otherwise on the drawings.

3.6 JOINTS - GENERAL

.1 Connect piping using joints not readily disassembled only where shown and where not otherwise specified. Provide joints which may be disassembled at the minimum, within 1.0 metre of any connection to equipment, on both sides of structural penetrations, within 0.6 metres of all threaded end valves, and at the spacing specified.

.2 For stainless steel piping less than 38 mm in diameter, butt-weld or use threaded couplings. Use unions where disassembly is required.

.3 For steel piping equal to or greater than 75 mm in diameter, where not specified or shown otherwise, butt-weld according to CSA B51 or furnish slip-on flanges, conforming to ANSI B16.5, Class 150. Unless indicated otherwise on the drawings or detail specifications, where disassembly is required, use flanges.

3.7 PRESSURE TESTING

.1 Pressure all piping to 690 kPa (100 psi) for 2 hours, and observe for leakage.

.2 Repair any leakage observed during test.

END OF SECTION

Part 1 General

1.1 SCOPE OF WORK

.1 The water treatment equipment is designed to be purchased as a package from a single vendor for ease of training and technical support. The treatment package shall include at minimum the following:

- .1 Multimedia filters
- .2 Cartridge filters
- .3 Ion exchange units (OCR)
- .4 UV reactors
- .5 Chlorine Feed Equipment
- .6 Instrumentation for treatment controls
- .7 Controls and Integration of all systems for fully remote monitored system by equipment supplier (MCP-1000)
- .8 The scope of supply includes on-site training, start-up and commissioning services by equipment vendor representatives.

.2 Additional equipment listed within this specification may be included within or supplied separate from the treatment package.

.3 No alternatives to the equipment will be allowed unless approved in writing by the Engineer.

.4 All wetted components to be NSF Certified for potable use.

.5 For skid-mounted equipment packages, Equipment Supplier or General Contractor shall be responsible for building modifications required to accommodate the equipment skid.

1.2 LIST OF EQUIPMENT SUPPLIERS

.1 Osorno Enterprises Inc.

Contact: Irena Motnenko
796 Elgin Ave. Winnipeg, MB R3E 1B4
Ph: (204) 488-1538
Email: i.motnenko@osorno.ca

.2 EDA Environmental Ltd.

Contact: Brad Staerk
180 Wyatt Road, Winnipeg, MB R2X 2X6
Ph: (204) 632-9154
Email: bstaerk@edaenv.ca

.3 Waste'n'Water Tech / Aslan

Contact: Dominic Janssen

Suite 309 – 11979 40th Street SE, Calgary, AB T2Z 4M3
Ph: (204) 998-3349
Email: dominic@watertech.ca

.4 Or approved suppliers after equipment package review. Full details of all equipment to be submitted for approval process.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Specifications.

.2 Product Data:

.1 Provide manufacturer's printed product literature and datasheets for water treatment equipment, and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 CLOSEOUT SUBMITTALS

.1 Provide instructions and exploded views of water treatment assemblies.

1.5 EXTRA MATERIALS

.1 Provide spare parts in accordance with Specifications and this section.

.2 Deliver to Site upon completion of the Work of this Section.

.3 Store where directed by Engineer.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle in accordance with Specifications.

.2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

Part 2 Products

2.1 WATER TREATMENT PLANT EQUIPMENT

.1 Normal Treatment Rate: 1.00 L/sec (varies with demand and raw water pump flow rate).

.2 Provide complete treatment system as shown which will operate at a variable rate based on pressure in the distribution system, and starts and stops automatically dependent upon water requirements.

.3 Contractor to provide Control Panel in accordance with Section 26 91 91 to operate full treatment system including chemical feed systems, and monitor and annunciate alarms. Panel designed for full remote monitoring of plant by equipment vendor or third party contract.

.4 Plant to reduce turbidity, pathogens, UVT/TOC from surface water source.

.5 Plant to consist of: water control, chemical feed systems, multimedia filter (100% redundancy), cartridge filtration units, OCR ion exchange (8 BV/hr), and UV disinfection.

.6 Raw Water Quality: provided in Appendix A

.7 Treatment Objectives:

Parameter	Units	Treatment Objective
pH		6.5 - 8.5
TOC	mg/L	< 4.0 UVT objective > 60%
Turbidity	NTU	<1.0 95% of the time
UV Disinfection		Minimum dose of 40 mJ/cm^2 @ 1.00 L/sec 4 log reduction of viruses; 6 log reduction of bacteria; 8 log reduction of cysts

.1 As well as meet all other requirements of the current publication of the Guidelines for Canadian Drinking Water Quality.

.8 The intent of the system is to bypass a portion of the flow around the OCR units and blend the bypass stream and OCR filtrate downstream of the units such that UVT and TOC is within the treatment objectives while keeping the corrosivity of the water to a minimum.

.9 Water control:

.1 Raw water pumps start and stop and speed modulation will be controlled by pressure in the distribution system.

.2 Pump speed will modulate to maintain a constant pressure to the distribution system.

.3 Pumps will start based on a low pressure setpoint.

.4 Pumps will be set to stop a high-pressure setting.

.5 Maximum flow rate is limited by pumping rate and low pressure cut-off.

.6 Chlorine feed rate will be paced based on flow. Refer to 26 91 91 Control Panels for more control logic.

.7 Multimedia and ion exchange filter backwash will be controlled individually by the filter head units.

2.2 MULTIMEDIA FILTERS

.1 Vertical cylindrical FRP vessels, NSF rated.

.2 Capacity: 1.0 L/Sec Each filter (full treatment flow is maintained when one filter is in backwash)

.1 Interlock filters so only one filter (or ion exchange vessel) is in backwash at one time. Likely required due to raw water flow rate limitation.

.3 Working pressure rating: 1034 kPa (150 psi)

.4 Service: 120 V; 1 ph

.5 Each Filter will have independent valve heads for maximum redundancy.

.6 Standard of Acceptance:

.1 Viqua C53-AG16-15SM or equal.

.1 Valve Model: Clack, Fleck or Culligan

2.3 CARTRIDGE FILTRATION

.1 Cartridge Filters to follow in series after multimedia filters.

.2 All cartridge filter housings and components are to be NSF rated.

.3 Housings:

.1 Construction 304SS

.2 Two (2) required

.3 Supply 2 spare O-rings per vessel

.4 Standard of acceptance: Harmsco Hurricane HUR-170 MUNI or equal

.4 Filters for each housing as follows:

.1 0.35 Micron PP Plus; Model: Harmsco HC/170-0.35

.2 1 Micron Absolute Poly Pleat; Model: Harmsco PP-HC/170-1

2.4 ORGANIC COLOUR REMOVAL FILTER – ION EXCHANGE

.1 Vertical cylindrical FRP vessels, NSF rated.

.2 Media: Purolite A860 or equal.

.3 Each Filter will have independent valve heads for maximum redundancy.

.4 Design is for maximum 8 Bed volumes an hour at 1.0 L/sec

.1 Interlock filters so only one filter (or media filter) is in regen at one time. Likely required due to raw water flow rate limitation.

.5 Run in parallel operation.

.6 Service: 120 V, 1 ph

.7 Working pressure rating: 1034 kPa (150 psi)

.8 Standard of Acceptance:

.1 Viqua 43X-1665-15SM-26 or equal

.1 Valve model: Clack, Fleck or Culligan

2.5 UV DISINFECTION SYSTEM

.1 Supply and install three UV systems.

.1 Each system complete with pre filter, flow meter, UV sensor, dimming ballast, solenoid valve, communication centre with dry contact board, transient voltage suppressor, and any pipe insulation of incoming and outgoing piping per manufacturer's instructions.

.2 Rated capacity per unit: 0.95 L/s (15 USgpm) @ 40 mJ/cm^2 @ 50% UVT:

.2 Standard of acceptance: Viqua Pro 30 with Professional Plus Controller

2.6 CHLORINE FEED SYSTEM

.1 Contractor to provide power and control wiring to feed pump location shown on plans. Contractor to install chlorine feed injection quill, isolation valve, and length of tubing in PVC conduit from injection location to feed pump location. Provide 1.0 m of extra tubing coil at feed pump location.

.2 System shall accept a 4-20 mA signal via Control Panel to start and stop chlorine pumps. The operators will manually set dosage rate.

.3 Feed Pumps:

.1 Provide two (2) chemical feed pumps.

.2 120 VAC 60 Hz power required

.3 Pumping, piping, fittings and controls shall be complete systems as supplied by the manufacturer.

.4 All materials and equipment shall be suitable and compatible for the specific chemical application.

.5 Each chemical feed system shall deliver the specified chemical at the required capacity and concentration as noted to each point of application. If the equipment model noted for each system does not provide this performance, the contractor shall replace or repair at their costs. All work subject to the approval of the Engineer.

.6 All pumps shall be supplied complete with mounting stands, hardware, foot valves, suction and discharge piping/tubing, injection quill, calibration column, dust covers, couplers and fittings, power cord, and all required equipment for a fully functioning system. The complete system shall be panel mounted on stand as shown on plans.

.7 Pressure rating: 16 bar

.8 Maximum flow: 7.5 L/h

.9 Body: PVC

.10 Gasket material: PTFE

.11 Standard of acceptance:

.1 Grundfos DDA series Model # DDA7.5-16AR-PVC/T/C-F-31U7U7B, or equal.

.12 To be supplied with:

.1 Installation kit

.2 One (1) spare parts kit.

.4 Accessories

.1 Shall be mounted on UHWDPE backboard and shall include:

.1 Graduated cylinder

.2 One (1) NEMA 4X terminal box for control signals

.3 Two (2) control cables

.4 One (1) lot of ball valves

.5 Pressure Gauge on feed side (100 mm face)

.6 Two multi-function backpressure/pressure relief valves: Grundfos or equal.

.7 Drains to source tank

.8 Pressure relief to source tank

.5 Chemical Quill Injectors

.1 PVC, 13 mm threaded quill.

.2 Installed on a 50 mm branch tee fitting.

.3 Supplied with one backpressure valve per injection point

.1 Chemline SB-10 backpressure valve

.4 Standard of Acceptance:

.1 Injection Quill: Saf-T-flo: EB-125-S-P-100-B-V, with Flexible Hose Assembly

.2 Supply one spare quill.

2.7 RAW WATER INTAKE PIPE AND SCREEN

.1 Intake Screen:

.1 Supply and install a DFO Compliant Intake Screen

.2 Intake screen to be mounted on custom stainless steel stand. Maintain intake screen 450 mm off of lake bottom.

.3 Material: Stainless Steel.Standard of acceptance: Sure-Flo Model SCS-3-DD-SS or equal.

2.8 RAW WATER PUMPING SYSTEM

.1 Pumps:

.1 Stainless Steel Construction

.2 Integral Discharge Check Valve

.3 100 mm (4”) Nominal Pump Size

.4 100 mm (4”) Nominal Motor Size

.5 1.5 hp, 230 V, 3~,60 Hz Submersible Motor

.6 32 mm (1.25”) NPT Discharge

.7 Capacity: 1.0 L/s @ 68 m TDH

.8 Standard of acceptance: Grundfos SP Series, Model No. 16S15-14

.2 Variable Frequency Drives:

.1 Nema 12 Enclosure

.2 Pump Control Software
.3 Stainless Steel High Temperature 4-20 mA Pressure Transducer and Cable Kit
.4 Supply power: 240 V 1~
.5 7.5 Amp Rating at 240/1/60 Input – 230/3 Output (2 HP)
.6 Constant Pressure Application
.7 Dual DC Link Reactors, 3 to 5%
.8 Standard of acceptance: Goulds Aquavar IPC Series, Model # AVB10020B0X0X0X1

.3 Single Phase Harmonic Guards:

.1 Nema 1 Enclosure
.2 17 A Rating
.3 Standard of acceptance: MTE Corporation, Model No. MSG0017A

.4 Load Reactors:

.1 Nema 1 Enclosure
.2 3% Impedance
.3 Standard of acceptance: MTE Corporation, Model No. RL-00811

2.9 HYDRO PNEUMATIC TANKS

.1 Construction: fibreglass shell and polyethylene liner with plastic stand.

.2 Volume:

.1 Raw water tanks (TK 1501/1502): 151 L (40 USgal)
.2 Potable water tanks (TK 4601/4602) 227 L (60 USgal)

.3 Working pressure rating: 1034 kPa (150 psi)

.4 Standard of acceptance: Pentair or equal

2.10 CHLORINE CONTACT TANKS

.1 Construction: fibreglass shell and polyethylene liner with plastic stand.

.2 Volume: 700 L (185 USgal)

.3 Working pressure rating: 1034 kPa (150 psi)

.4 Standard of acceptance: Pentair or equal

2.11 CHLORINE SOLUTION HOLDING TANK

.1 Construction: Polyethylene

.2 Volume 76 L (20 USgal)

.3 Standard of acceptance: Norwesco or equal

2.12 SPILL PALLETS:

.1 Supply One (1) single drum, low profile spill pallet.

.2 All polyethylene construction.

.3 Approved Manufacturers:

.1 PIG Poly Modular Spill Deck - PIG # PAK 527 – single
.2 Enpac Low Profile Spill Pallet

2.13 SPARE PARTS

.1 Provide the following spare parts with equipment.

.1 One (1) extra filter control valve for multimedia filters.
.2 One (1) extra filter control valve for OCR filters.
.3 One (1) spare parts kit for each filter control valve.
.4 One (1) change of media for each multi media filter.
.5 One (1) change of media for each OCR filter.
.6 50 (20kg) bags of quality salt for ion exchange
.7 Twelve (12) extra spare pleated cartridge filters: 0.35 micron HUR/170
.8 Twelve (12) extra spare pleated cartridge filters: 1 micron absolute HUR/170
.9 Four (4) spare quartz sleeve for UV lamps.
.10 Four (4) spare bulbs for UV lamps.
.11 Two (2) spare UV sensors for UV lamps.
.12 Two (2) spare solenoid valves for UV lamps.

Part 3 Execution

3.1 APPLICATION

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

3.2 INSTALLATION

.1 System to be completely accessible for removal, modification and cleaning.

.2 Install pipe system in accordance with equipment manufacturer's recommendations.

3.3 PROCESS CONTROL NARRATIVE

.1 General

.1 Main Control Panel MCP-1000 shall

.1 Monitor and record pressure, flow, turbidity and chlorine concentration from process instrumentation shown in the P&IDs

.2 Monitor filter and UV units for faults.

.3 Control chlorine dosing system

.4 Monitor raw water pump speed and, run status and faults.

.5 Annunciate alarms based on setpoints and equipment faults.

.2 Raw Water Pumps

.1 Shutdown pumps in the event of an emergency shutdown of the treatment process.

.2 In normal operation pumps shall operate as follows

.1 (Pt 7501/7502) Low Pressure at upstream end of distribution system will trigger Pump Start. (45 psi - adjustable)

.2 (PT 7501/7502) High Pressure at upstream end of distribution system will trigger Pump Stop. (65 psi - adjustable)

.3 (PT7501/7202) In between pump starts and stops, pump speed will modulate to maintain a set pressure of 60 psi at the upstream end of the distribution system.

.3 (Pressure switch PAH 1301) High-High Pressure in system (pressure switch):

.1 High pressure alarm and stop raw water pumps

.4 (Pressure switch PALL 1301) Low-Low pressure in system:

.1 Low pressure alarm.

.3 Filters

.1 Monitor multimedia and OCR filter units for fault signals.

.2 If a unit fails, alarm.

.3 If unit is placed in “Offline” mode at HMI, do not annunciate alarms for that unit.

.4 There will be the ability to remotely trigger a backwash or regen cycle at any time.

.4 UV System

.1 Monitor UV units for Fault signals.

.2 If a reactor fails, then alarm.

.3 If unit is placed in “Offline” mode at HMI, do not annunciate alarms for that unit.

.5 Chemical Feed Systems

.1 Start chemical feed systems when a treatment cycle begins.

.2 Pace chlorine dosing pumps based on flow measured at FIT-5101

.3 Chlorine Feed Pumps to operate in an alternating Duty/Standby arrangement.

.4 Monitor chemical feed pumps for Fault signals. Alarm on one Fault and switch to Standby pump. On two faults (both pumps), alarm.

.5 Leave instructions and worksheets for operator to configure feed pumps for a desired mg/L dose rate.

.6 Instrumentation

.1 Monitor and store flow pressure, turbidity and chlorine concentration data from instruments shown in P&IDs.

.2 Shutdown raw water pumps and/or annunciate alarm if alarm setpoint is reached.

.7 Alarm Condition

.1 Activate panel sounder.

.2 Energize outdoor alarm beacon – Visual only outside. No audible.

.1 Blue strobe complete with aluminum signage below strobe: “If light flashing Call: xxx-xxx-xxxx.”

.3 Silence audible sounder and de-energize beacon on press of ‘Acknowledge’ pushbutton, until a further alarm occurs.

.4 Make visible indication at control panel on HMI.

.8 Warn Condition

.1 Make visible indication at control panel (amber LEDs and labels, or equivalent indication).

.9 Indication

.1 Make visible indication of status at control panel (LEDs and labels, or equivalent indication) as indicated.

.10 Provide spare auxiliary contacts on relays and overloads.

.11 Panel shall be sized to accommodate future equipment including: three 15A/2P or smaller circuit breakers; voice dialer; radio communication modem; 20% additional relays; increased power supplies and appurtenances to support the additions listed.

END OF SECTION