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Part 1 General

1.1 ENGINEERS / ARCHITECT ON RECORD

Divisions 01, 03,



Jared Visscher, P.Eng.
Structural Engineer

Divisions 02, 04, 06, 07, 08, 09, 10



Isaac Hayes, AAA
Architect

Divisions 21, 22, 23



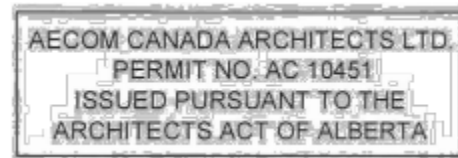
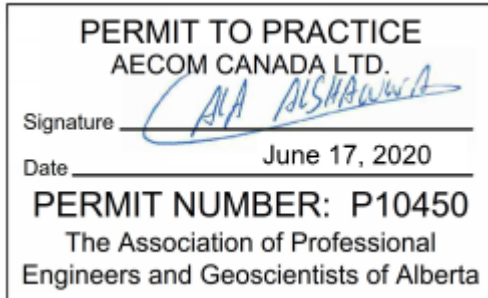
Jiaxun Zhu, P.Eng.
Mechanical Engineer

Divisions 26, 27



Simon Guo, P.Eng.
Electrical Engineer

1.2 PERMIT TO PRACTICE



Part 2 Products

.1 Not used.

Part 3 Execution

.2 Not used.

END OF SECTION

Part 1 General**1.1 WORK COVERED BY CONTRACT DOCUMENTS**

- .1 Work of this Contract comprises general construction & renovation of the West Wing of the 50 bed unit, located at the Drumheller Correctional Institution.

1.2 CONTRACT METHOD

- .1 Construct Work under stipulated price contract.
- .2 Relations and responsibilities between Contractor and subcontractors

1.3 SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit Project construction progress schedule in accordance with Section 01 32 16.16 - Construction Progress Schedule - Critical Path Method (CPM).
- .3 Sustainable Design Submittals:
 - .1 Construction Waste Management:
 - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements
 - .2 Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating percentage of construction wastes recycled or salvaged
- .4 Submit site-specific and Work Plan Health and Safety Plan in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.4 WORK BY OTHERS

- .1 Co-operate with other Contractors in carrying out their respective works and carry out instructions from Departmental Representative.
- .2 Co-ordinate work with other contractors. If any part of work under this Contract depends for its proper execution or result upon work of another contractor, report promptly to Departmental Representative, in writing, any defects which may interfere with proper execution of Work.

1.5 WORK SEQUENCE

- .1 Construct Work in stages to accommodate Departmental Representative's continued use of the other areas of the 50 Bed Unit during construction. The West Wing will be unoccupied during construction.
- .2 Co-ordinate Progress Schedule and co-ordinate with Departmental Representative Occupancy during construction.
- .3 Proposed stages:
 - .1 Mobilization
 - .2 Temporary construction fencing, as per CSC requirements noted on drawings, including at proposed laydown area.
 - .3 Demolition of existing interior walls, mechanical, and electrical. Ensure fire safety for the remained of the building is unimpacted during construction

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- .4 Demolition of existing slab on grade and below slab mechanical which needs to be replaced.
 - .5 Installation of screw piles, replacement of below slab mechanical piping, and new slab construction.
 - .6 Construct new interior walls, including all mechanical, electrical, and architectural finishes back to original condition.
 - .4 Maintain fire access/control.
 - .5 Protect workers and public safety.
- 1.6 CONTRACTOR USE OF PREMISES**
- .1 Limit use of premises for Work, for storage, and for access to allow:
 - .1 Partial Departmental Representative occupancy.
 - .2 Work by other contractors.
 - .3 Public usage.
 - .2 Remove or alter existing work to prevent injury or damage to portions of existing work which remain.
 - .3 Repair or replace portions of existing work which have been altered during construction operations to match existing or adjoining work, as directed by Departmental Representative.
 - .4 Ensure that operations conditions of exiting work at completion are still the same, equal to or better than that which existed before new work started.
- 1.7 DEPARTMENTAL REPRESENTATIVE OCCUPANCY**
- .1 Departmental Representative will occupy premises during entire construction period for execution of normal operations.
 - .2 Co-operate with Departmental Representative in scheduling operations to minimize conflict and to facilitate Departmental Representative usage.
- 1.8 EXISTING PRODUCTS**
- .1 All equipment noted on the drawings is existing and will be reinstalled.
 - .2 Take responsibility for handling and installing of existing products same as for other Contractor-furnished products.
 - .3 Installation shall be as per Departmental Representative's Operations and Maintenance Manual, where available, or to match existing condition or as otherwise directed, if it is not.
- 1.9 ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING BUILDING**
- .1 Execute work with least possible interference or disturbance to occupants and normal use of premises. Arrange with Departmental Representative to facilitate execution of work.
 - .2 Do not use existing building elevators in building for moving workers and material.
- 1.10 EXISTING SERVICES**
- .1 Notify, Departmental Representative and utility companies of intended interruption of services and obtain required permission.

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- .2 Where Work involves breaking into or connecting to existing services, give Departmental Representative 48 hours notice for necessary interruption of mechanical or electrical service throughout course of work. Minimize duration of interruptions. Carry out work at times as directed by governing authorities with minimum disturbance to pedestrian, vehicular traffic, and occupant operations.
- .3 Provide alternative routes for personnel and vehicular traffic.
- .4 Establish location and extent of service lines in area of work before starting Work. Notify Departmental Representative of findings.
- .5 Submit schedule for approval by Departmental Representative for any shut-down or closure of active service or facility including power and communications services. Adhere to approved schedule and provide notice to affected parties.
- .6 Provide temporary services to maintain critical building and tenant services.
- .7 Provide adequate bridging over trenches which cross sidewalks or roads to permit normal traffic.
- .8 Where unknown services are encountered, immediately advise Departmental Representative and confirm findings in writing.
- .9 Protect, relocate or maintain existing active services. When inactive services are encountered, cap off in manner approved by authorities having jurisdiction.
- .10 Record locations of maintained, re-routed and abandoned service lines.

1.11 DOCUMENTS REQUIRED

- .1 Maintain at job site, one copy of 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, System Components List C/W Commissioning Verification Forms and Check Sheets and Commissioning Issues/Resolution Log.
 - .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 to facilitate work as stated.
- .2 Maintain existing services to building and provide for personnel and vehicle access.
- .3 Where security is reduced by work provide temporary means to maintain security.
- .4 Departmental Representative will assign sanitary facilities for use by Contractor's personnel. Keep facilities clean.
- .5 Closures: protect work temporarily until permanent enclosures are completed.

1.3 ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING BUILDING

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

1.4 EXISTING SERVICES

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

1.5 SPECIAL REQUIREMENTS

- .1 Submit schedule in accordance with Section 01 32 16.16 - Construction Progress Schedule - Critical Path Method (CPM)
- .2 Ensure Contractor's personnel employed on site become familiar with and obey regulations including safety, fire, traffic and security regulations.
- .3 Keep within limits of work and avenues of ingress and egress.
- .4 Ingress and egress of Contractor vehicles at site is limited to West Gate.

1.6 SECURITY

- .1 Where security has been reduced by Work of Contract, provide temporary means to maintain security.
- .2 Security clearances:
 - .1 Personnel employed on this project will be subject to security check. Obtain clearance, as instructed, for each individual who will require to enter premises.

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- .2 Obtain requisite clearance, as instructed, for each individual required to enter premises.
- .3 Personnel will be checked daily at start of work shift and provided with pass which must be worn at all times. Pass must be returned at end of work shift and personnel checked out.

1.7 BUILDING SMOKING ENVIRONMENT

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

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

Part 1 General**1.1 REFERENCE STANDARDS**

- .1 Departmental Representative/Contractor Agreement.
- .2 Canadian Construction Documents Committee (CCDC)
 - .1 CCDC 2, Stipulated Price Contract.

1.2 APPLICATIONS FOR PROGRESS PAYMENT

- .1 Refer to CCDC 2.
- .2 Make applications for payment on account monthly as Work progresses.
- .3 Date applications for payment last day of agreed monthly payment period and ensure amount claimed is for value, proportionate to amount of Contract, of Work performed and Products delivered to Place of Work at that date.
- .4 Submit to Departmental Representative, at least 14 days before first application for payment. Schedule of values for parts of Work, aggregating total amount of Contract Price, to facilitate evaluation of applications for payment.

1.3 SCHEDULE OF VALUES

- .1 Refer to CCDC 2.
- .2 Provide schedule of values supported by evidence as Departmental Representative may reasonably direct and when accepted by Departmental Representative, be used as basis for applications for payment.
- .3 Include statement based on schedule of values with each application for payment.
- .4 Support claims for products delivered to Place of Work but not yet incorporated into Work by such evidence as Departmental Representative may reasonably require to establish value and delivery of products.

1.4 PROGRESS PAYMENT

- .1 Refer to CCDC 2.
- .2 Departmental Representative will issue to Departmental Representative, no later than 10 days after receipt of an application for payment, certificate for payment in amount applied for or in such other amount as Departmental Representative determines to be due. If Departmental Representative amends application, Departmental Representative will give notification in writing giving reasons for amendment.
- .3 With every request for progress payment, an original Statutory Declaration is required, with original wet signature.

1.5 SUBSTANTIAL PERFORMANCE OF WORK

- .1 Refer to CCDC 2.
- .2 Prepare and submit to Departmental Representative comprehensive list of items to be completed or corrected and apply for a review by Departmental Representative to establish Substantial Performance of Work or substantial performance of designated portion of Work when. Failure to include items on list does not alter responsibility to complete Contract.

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- .3 No later than 10 days after receipt of list and application, Departmental Representative will review Work to verify validity of application, and no later than 7 days after completing review, will notify Contractor if Work or designated portion of Work is substantially performed.
- .4 Departmental Representative: state date of Substantial Performance of Work or designated portion of Work in certificate.
- .5 Immediately following issuance of certificate of Substantial Performance of Work, in consultation with Departmental Representative, establish reasonable date for finishing Work.

1.6 PAYMENT OF HOLDBACK UPON SUBSTANTIAL PERFORMANCE OF WORK

- .1 Refer to CCDC 2.
- .2 After issuance of certificate of Substantial Performance of Work:
 - .1 Submit application for payment of holdback amount.
 - .2 Submit sworn statement that accounts for labour, subcontracts, products, construction machinery and equipment, and other indebtedness which may have been incurred in Substantial Performance of Work and for which Departmental Representative might in be held responsible have been paid in full, except for amounts properly retained as holdback or as identified amount in dispute.
- .3 After receipt of application for payment and sworn statement, Departmental Representative will issue certificate for payment of holdback amount.
- .4 Where holdback amount has not been placed in a separate holdback account, Departmental Representative will, 10 days prior to expiry of holdback period stipulated in lien legislation applicable to Place of Work, place holdback amount in bank account in joint names of Departmental Representative and Contractor.
- .5 Amount authorized by certificate for payment of holdback amount is due and payable on day following expiration of holdback period stipulated in lien legislation applicable to Place of Work. Where lien legislation does not exist or apply, holdback amount is due and payable in accordance with other legislation, industry practice, or provisions which may be agreed to between parties. Departmental Representative may retain out of holdback amount sums required by law to satisfy liens against Work or, if permitted by lien legislation applicable to Place of Work, other third party monetary claims against Contractor which are enforceable against Departmental Representative.

1.7 PROGRESSIVE RELEASE OF HOLDBACK

- .1 Refer to CCDC 2.
- .2 Where legislation permits, if Departmental Representative has certified that Work of subcontractor or supplier has been performed prior to Substantial Performance of Work, Departmental Representative will pay holdback amount retained for such subcontract Work, or products supplied by such supplier, on day following expiration of holdback period for such Work stipulated in lien legislation applicable to Place of Work.
- .3 In addition to provisions of preceding paragraph, and certificate wording, ensure that such subcontract Work or products is protected pending issuance of final certificate for payment and be responsible for correction of defects or Work not performed regardless of whether or not such was apparent when such certificates were issued.

1.8 FINAL PAYMENT

- .1 Refer to CCDC 2, GC 5.7.

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- .2 Submit application for final payment when Work is completed.
- .3 Departmental Representative will, no later than 10 days after receipt of application for final payment, review Work to verify validity of application. Departmental Representative will give notification that application is valid or give reasons why it is not valid, no later than 7 days after reviewing Work.
- .4 Departmental Representative will issue final certificate for payment when application for final payment is found valid.

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 bi-weekly date agreed to with the Departmental Representative.
- .2 Prepare agenda for meetings.
- .3 Distribute written notice of each meeting four days in advance of meeting date to all related parties including clients and 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 and Departmental Representative.
- .8 Representative of Contractor, Subcontractor and suppliers attending meetings will be qualified and authorized to act on behalf of party each represents.

1.2 PRECONSTRUCTION MEETING

- .1 Within 15 days after award of Contract, request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.
- .2 Senior representatives of Departmental Representative, Contractor, major Subcontractors, field inspectors and supervisors will be in attendance.
- .3 Establish time and location of meeting and notify parties concerned minimum 5 days before meeting.
- .4 Incorporate mutually agreed variations to Contract Documents into Agreement, prior to signing.
- .5 Agenda to include:
 - .1 Appointment of official representative of participants in the Work.
 - .2 Schedule of Work: in accordance with Section 01 32 16.16 - Construction Progress Schedule - Critical Path Method (CPM).
 - .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 related - Construction Facilities sections
 - .5 Site security in accordance with Section 01 35 14 – Project Security and Safety Procedures.
 - .6 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements.
 - .7 Departmental Representative provided products.
 - .8 Record drawings in accordance with Section 01 33 00 - Submittal Procedures.
 - .9 Maintenance manuals in accordance with Section 01 78 00 - Closeout Submittals.

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

1.3 PROGRESS MEETINGS

- .1 During course of Work and two (2) weeks prior to project completion, schedule progress meetings bi-weekly.
- .2 Contractor, major Subcontractors involved in Work, and Departmental Representative 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 Safety Moment
 - .2 Review, approval of minutes of previous meeting.
 - .3 Review of Work progress since previous meeting.
 - .4 Field observations, problems, conflicts.
 - .5 Problems which impede construction schedule.
 - .6 Review of off-site fabrication delivery schedules.
 - .7 Corrective measures and procedures to regain projected schedule.
 - .8 Revision to construction schedule.
 - .9 Progress schedule, during succeeding work period.
 - .10 Review submittal schedules: expedite as required.
 - .11 Maintenance of quality standards.
 - .12 Review proposed changes for effect on construction schedule and on completion date.
 - .13 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 REFERENCE STANDARDS**

- .1 Project Management Institute (PMI Standards)
 - .1 A Guide to the Project Management Body of Knowledge (PMBOK Guide) - Fifth Edition.
 - .2 Practice Standard for Scheduling - 2011.

1.2 DEFINITIONS

- .1 Activity: Distinct, scheduled portion of work performed during course of a project.
- .2 Activity Duration: time in calendar units between start and finish of a scheduled activity. See also Duration.
- .3 Assumption: factor in planning process that is considered true, real, or certain without proof or demonstration.
- .4 Bar Chart (Gantt Chart): graphic display of schedule-related information.
 - .1 In typical bar chart, schedule activities or work breakdown structure components are listed down left side of chart, dates are shown across the top, and activity durations are shown as date-placed horizontal bars.
- .5 Baseline: approved version of a work product that can be changed only through formal change control procedures and is used as a basis for comparison.
- .6 Budget: approved estimate for a project or work breakdown structure component or schedule activity.
- .7 Cash Flow: projection of progress payment requests based on cash loaded construction schedule.
- .8 Change Control: process whereby modifications to documents, deliverables, or baselines associated with a project are identified, documented, approved, or rejected.
- .9 Completion Milestones: they are firstly Substantial Completion and secondly Final Certificate.
- .10 Constraint: scheduled limiting factor that effects execution of a project, program, portfolio, or process.
- .11 Contract: mutually binding agreement that obligates a seller to provide a specified product or service or result and obligates a buyer to pay for it.
- .12 Control: comparing actual performance with planned performance, analyzing variance, assessing trends, to effect process improvements, evaluating possible alternatives, and recommending appropriate corrective action as needed.
- .13 Corrective Action: intentional activity that realigns performance of project work with project management plan.
- .14 Critical Path: sequence of activities that represents longest path through a project, which determines shortest possible duration.
- .15 Critical Path Activity: activity on critical path in a project schedule.

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- .16 Critical Path Method (CPM): method used to estimate minimum project duration and determine amount of scheduling flexibility on logical network of paths within schedule model.
- .17 Data Date: point in time when the status of the project is recorded.
- .18 Decomposition: technique used for dividing and subdividing project scope and project deliverables into smaller, more manageable parts.
- .19 Deliverable: unique and verifiable product, result, or capability to perform a service that is required to be produced to complete a process, phase, or project.
- .20 Duration: total number of work periods (not including holidays or other non-working periods) required to complete a schedule activity or work breakdown structure component.
 - .1 Usually expressed as workdays or work weeks.
- .21 Early Finish Date (EF): in Critical Path Method, earliest possible point in time when uncompleted portions of schedule activity can finish based on schedule network logic, data date, and schedule constraints.
 - .1 Early finish dates can change as Project progresses and changes are made to Project plan.
- .22 Early Start Date (ES): in Critical Path Method, earliest possible point in time when uncompleted portions of a schedule activity can start based on schedule network logic, data date, and schedule constraints.
 - .1 Early start dates can change as Project progresses and changes are made to Project Plan.
- .23 Execute: directing, managing, performing, and accomplishing project work; providing deliverables, and providing work performance information.
- .24 Finish Date: point in time associated with a schedule activity's completion.
 - .1 Usually qualified by one of following: actual, planned, estimated, scheduled, early, late, baseline, target, or current.
- .25 Float: (also known as slack) amount of time a schedule activity can be delayed without delaying early start date of a successor or violating a schedule constraint.
 - .1 This resource is available to both Departmental Representative and Contractor.
- .26 Forecast: estimate or prediction of conditions and events in project future based on information and knowledge available at time of forecast.
 - .1 Information is based on projects past performance and expected future performance, and includes information that could impact project in future, a such as estimate at completion and estimate to complete.
- .27 Gantt Chart: see Bar Chart.
- .28 Impact Analysis: schedule analysis technique that adds a modeled delay to an accepted construction schedule to determined possible outcome of that delay on project completion.
- .29 Imposed Date: a fixed date imposed on a schedule activity or schedule milestone, usually in form of a "start no earlier than" and "finish no later than" date.
- .30 Lag: amount of time whereby a successor activity is required to be delayed with respect to a predecessor activity.

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- .31 Late Finish Date (LF): in critical path method, latest possible point in time when uncompleted portions of a schedule activity can finish based on schedule network logic, project completion date, and schedule constraints.
- .32 Late Start Date (LS): in critical path method, latest possible point in time when uncompleted portions of a schedule activity can start based on schedule network logic, project completion date, and schedule constraints.
- .33 Lead: amount of time whereby a successor activity can be advanced with respect to a predecessor activity.
- .34 Logic Diagram: see Project network diagram.
- .35 Logical Relationship: dependency between two activities or between an activity and a milestone.
- .36 Master Schedule: summary-level schedule that identifies major deliverable; work breakdowns structure components, and key schedule milestones.
- .37 Milestone: significant point or event in a project, program, or portfolio.
- .38 Monitor: collect project performance data with respect to a plan, procedure performance measures, and report and disseminate performance.
- .39 Network: see Project Schedule Network Diagram.
- .40 Non-Critical Activities: activities which when delayed, do not affect specified Contract duration.
- .41 Project Control System: fully computerized system utilizing commercially available software packages.
- .42 Project Management: application of knowledge, skills, tools, and techniques, to project activities to meet project requirements.
- .43 Project Management Plan: approved document that describes how project will be executed, monitored, and controlled.
 - .1 Primary uses of Project management plan are to document planning assumptions and decisions, facilitate communication among stakeholders, and document approved scope, cost, and schedule baselines.
 - .2 Project management plan may be summary or detailed.
- .44 Project Management Planning: development and maintenance of Project Management Plan.
- .45 Project Management Planning, Monitoring and Control System: overall system operated to enable monitoring of Project Work in relation to established milestones.
- .46 Project Schedule: planned dates for performing activities and planned dates for meeting milestones.
- .47 Project Schedule Network Diagram: graphical representation of logical relationships among project schedule activities.
 - .1 Always drawn from left to right to reflect Project chronology.
- .48 Project Scope: work performed to deliver a product, service, or result with specified features and functions.
- .49 Quantified days duration: working days based on 5-day work week, discounting statutory holidays.

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- .50 Risk: uncertain event or condition that, if it occurs, has positive or negative effect on one or more project objectives.
- .51 Schedule: see Project Schedule.
- .52 Schedule Data: collection of information for describing and controlling schedule.
- .53 Scope: see Project Scope.
- .54 Start Date: point in time associated with activity's start, usually qualified by one of following: actual, planned, estimated, scheduled, early, late, target, baseline, or current.
- .55 Work Breakdown Structure (WBS): hierarchical decomposition of total scope of work to be carried out by project team to accomplish project objectives and create the required deliverables.

1.3 ADMINISTRATIVE REQUIREMENTS

- .1 Project Meeting:
 - .1 Meet with Departmental Representative within 15 working days of Award of Contract date, to establish Work requirements and approach to project construction operations.
 - .2 Participate in regular project progress meetings with Departmental and Departmental Representative specifically intended to discuss update of detailed schedule and contract changes.
- .2 Scheduling:
 - .1 Ensure that planning process is iterative and results in generally top-down processing with more detail being developed as planning progresses, and decisions concerning options and alternatives are made.
 - .2 Ensure project schedule efficiencies through monitoring of project in detail to ensure integrity of Critical Path, by comparing actual completions of individual activities with their scheduled completions, and review progress of activities that has started but are not yet completed.
 - .3 Monitor sufficiently often so that causes of delays can immediately be identified and mitigated.
- .3 Project monitoring and reporting:
 - .1 Keep team aware of changes to schedule, and potential consequences as project progresses.
 - .2 Use narrative reports to provide advice on seriousness of challenges and measures to overcome them.
 - .3 Begin narrative reporting with statement on general status of project followed by summarization of delays, potential problems, corrective measures and project status criticality.
- .4 Critical Path Method (CPM) Requirements:
 - .1 Ensure Master Plan and Detail Schedule are practical and remain within specified contract duration.
 - .2 Revise Master Schedule and Detail Schedule deemed impractical by Departmental Representative and resubmit for approval.
 - .3 Change to Contract Duration:

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- .1 Acceptance of Master Schedule and Detail Schedule showing scheduled Contract duration shorter than specified Contract duration does not constitute change to Contract.
- .2 Duration of Contract may only be changed through bilateral Agreement.
- .4 Consider Master Schedule and Detail Schedule deemed practical by Departmental Representative, showing Work completed in less than specified Contract duration, to have float.
- .5 First Milestone on Master Schedule and Detail Schedule will identify start Milestone with an Early Start, "ES", constraint date equal to Award of Contract date.
- .6 Calculate dates for completion of milestones from Plan and Schedule using specified time periods for Contract.
- .7 Substantial Completion with Late Finish, "LF", constraint equal to calculated date.
- .8 Calculations on updates such that if early finish of Interim Certificate falls later than specified Contract duration then float calculation to reflect negative float.
- .9 Delays to non-critical activities with float may not be basis for time extension.
- .10 Do not use float suppression techniques such as software constraints, preferential sequencing, special lead/lag logic restraints, extended activity times or imposed dates other than required by Contract.
- .11 Allow for adverse weather conditions normally anticipated and show in Master Plan and Detail Schedule.
 - .1 Specified Contract duration has been predicated assuming normal amount of adverse weather conditions.
- .12 Provide necessary crews and manpower to meet schedule requirements for performing Work within specified Contract duration.
 - .1 Simultaneous use of multiple crews on multiple fronts on multiple critical paths may be required.
- .13 Arrange participation on and off site of subcontractors and suppliers, as required by Departmental Representative, for purpose of network planning, scheduling, updating and progress monitoring.
 - .1 Approvals by Departmental Representative of original networks and revisions do not relieve Contractor from duties and responsibilities required by Contract.
- .14 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.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit to Departmental Representative Project Control System for planning, scheduling, monitoring and reporting of project progress.
- .3 Submit Project Control System to Departmental Representative for approval.
 - .1 Failure to comply with each required submission, may result in progress payment being withheld in accordance with Federal Government's GC 5 Terms of Payment.
- .4 Include costs for execution, preparation and reproduction of schedule submittals in bid documents.

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- .5 Submit letter ensuring that schedule has been prepared in co-ordination with major sub-contractors.
- .6 Refer to article "PROGRESS MONITORING AND REPORTING" of this specification Section for frequency of Project control system submittals.
- .7 Submit impact analysis of schedule for changes that result in extension of contract duration.
 - .1 Include draft schedule update and report as outlined in article "PROGRESS MONITORING AND REPORTING".
- .8 Submit Project planning, monitoring and control system data as part of initial schedule submission and monthly status reporting in following form.
 - .1 USB Drive or other suitable storage files in original scheduling software Microsoft Project containing schedule and cash flow information, labelled with data date, specific update, and person responsible for update.
 - .2 Master Schedule Bar Chart.
 - .3 Construction Detail Schedule Bar Chart.
 - .4 Listing of project activities including milestones and logical connectors, networks (sub-networks) from Project start to end. Sort activities by activity identification number and accompany with descriptions. List early and late start and finish dates together with durations, codes and float.
 - .5 Criticality report listing activities and milestones with zero and up to 2 days total float used as first sort for ready identification of critical paths through entire project. Early and late starts and finishes dates, together with durations, codes and float for critical activities.
 - .6 Progress report in early start sequence, listing for each trade, activities due to start, underway, or finished within 1 month from monthly update date. List activity identification number, description and duration. Provide columns for entry of actual start and finish dates, duration remaining and remarks concerning action required.

1.5 QUALITY ASSURANCE

- .1 Use experienced personnel, fully qualified in planning and scheduling to provide services from start of construction to Final Certificate, including Commissioning.

1.6 WORK BREAKDOWN STRUCTURE (WBS)

- .1 Prepare construction Work Breakdown Structure (WBS) within 10 working days of Award of Contract date.
 - .1 Develop WBS through at least five levels: project, stage, element, sub-element and work package.

1.7 PROJECT MILESTONES

- .1 Mandatory and recommended project milestones form targets for both Master Schedule and Detail Schedule of CPM construction network system.
 - .1 Recommended: Selective Demolition and Decommissioning of Existing Equipment completed within 15 working days of Award of Contract date.
 - .2 Recommended: substructure completed within 30 working days of Award of Contract date.

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- .3 Recommended: interior finishing and fitting, mechanical and electrical work completed within 65 working days of Award of Contract date.
- .4 Recommended: interim Certificate (substantial completion) within 70 working days of Award of Contract date.
- .5 Recommended: outside work completed within 75 working days of Award of Contract date.
- .6 Mandatory: final Certificate completion within 75 working days of Award of Contract date.

1.8 MASTER SCHEDULE

- .1 Structure and base CPM construction networks system on WBS coding in order to ensure consistency throughout Project.
- .2 Prepare comprehensive construction Master Schedule (CPM logic diagram) and dependent Cash Flow Projection within 15 working days of finalizing Agreement to confirm validity or alternates of identified milestones.
 - .1 Master Schedule will be used as baseline.
 - .1 Revise baseline as conditions dictate and as required by Departmental Representative.
 - .2 Departmental Representative as Project progresses will review and return revised baseline within 5 workdays.
- .3 Reconcile revisions to Master Schedule and Cash Flow Projections with previous baseline to provide continuous audit trail.
- .4 Initial and subsequent Master Schedule will include:
 - .1 USB Drive or other suitable storage containing schedule and cash flow information, clearly labelled with data date, specific update, and person responsible for update.
 - .2 Bar chart identifying coding, activity durations, early/late and start/finish dates, total float, completion as percentile, current status and budget amounts.
 - .3 Network diagram showing coding, activity sequencing (logic), total float, early/late dates, current status and durations.
 - .4 Actual/projected monthly cash flow: expressed monthly and shown in both graphical and numerical form.

1.9 DETAIL SCHEDULE

- .1 Provide detailed project schedule (CPM logic diagram) within 15 working days of Award of Contract date showing activity sequencing, interdependencies and duration estimates. Include listed activities as follows:
 - .1 Shop drawings.
 - .2 Samples.
 - .3 Approvals.
 - .4 Procurement.
 - .5 Construction.
 - .6 Installation.
 - .7 Site works.
 - .8 Testing.
 - .9 Commissioning and acceptance.

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- .2 Detail CPM schedule to cover in detail minimum period of 3 months beginning from Award of Contract date.
 - .1 Show remaining activities for CPM construction network system up to Final Certificate and develop complete detail as project progresses.
 - .2 Detail activities completely and comprehensively throughout duration of project.
- .3 Relate Detail Schedule activities to basic activities and milestones developed and approved in Master Schedule.
- .4 Clearly show sequence and interdependence of construction activities and indicate:
 - .1 Start and completion of all items of Work, their major components, and interim milestone completion dates.
 - .2 Activities for procurement, delivery, installation and completion of each major piece of equipment, materials and other supplies, including:
 - .1 Time for submittals, resubmittals and review.
 - .2 Time for fabrication and delivery of manufactured products for Work.
 - .3 Interdependence of procurement and construction activities.
 - .3 Include sufficient detail to assure adequate planning and execution of Work.
- .5 Provide level of detail for project activities such that sequence and interdependency of Contract tasks are demonstrated and allow co-ordination and control of project activities. Show continuous flow from left to right.
- .6 Ensure activities with no float are calculated and clearly indicated on logical CPM construction network system as being, whenever possible, continuous series of activities throughout length of Project to form "Critical Path". Increased number of critical activities is seen as indication of increased risk.
- .7 Insert Change Orders in appropriate and logical location of Detail Schedule. After analysis, clearly state and report to Departmental Representative for review effects created by insertion of new Change Order.

1.10 REVIEW OF CONSTRUCTION DETAIL SCHEDULE

- .1 Allow minimum 5 workdays for review by Departmental Representative of proposed construction Detail Schedule unless otherwise specified.
- .2 Upon receipt of reviewed Detail Schedule make necessary revisions and resubmit to Departmental Representative for review within maximum 5 workdays unless otherwise specified.
- .3 Promptly provide additional information to validate practicability of Detail Schedule as required by Departmental Representative.
- .4 Submittal of Detail Schedule indicates that it meets Contract requirements and will be executed generally in sequence.

1.11 COMPLIANCE WITH DETAIL SCHEDULE

- .1 Comply with reviewed Detail Schedule.
- .2 Proceed with significant changes and deviations from scheduled sequence of activities that cause delay, only after written receipt of approval by Departmental Representative.
- .3 Identify activities that are behind schedule and causing delay. Provide measures to regain slippage.

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- .1 Corrective measures may include:
 - .1 Increase of personnel with more experience/qualifications on site for effected activities or work package.
 - .2 Increase in materials and equipment.
 - .3 Overtime work.
- .4 Submit to Departmental Representative, justification, project schedule data and supporting evidence for approval of extension to Contract completion date or interim milestone date when required. As part of supporting evidence, include:
 - .1 Written submission of proof of delay based on revised activity logic, duration and costs, showing time impact analysis illustrating influence of each change or delay relative to approved contract schedule.
 - .2 Prepared schedule indicating how change will be incorporated into overall logic diagram. Demonstrate perceived impact based on date of occurrence of change and include status of construction at that time.
 - .3 Other supporting evidence requested by Departmental Representative.
 - .4 Do not assume approval of Contract extension prior to receipt of written approval from Departmental Representative.
- .5 In event of Contract extension, display in Detail Schedule that scheduled float time available for work involved has been used in full without jeopardizing earned float.
 - .1 Departmental Representative will determine and advise Contractor number of allowable days for extension of Contract based on project schedule updates for period in question, and other factual information.
 - .2 Construction delays affecting project schedule will not constitute justification for extension of contract completion date.

1.12 PROGRESS AND REPORTING

- .1 On an ongoing basis, Detail Schedule on job site to show "Progress to Date". Arrange participation on and off site of subcontractors and suppliers, as, and when necessary, for purpose of network planning, scheduling, updating and progress monitoring. Inspect Work with Departmental Representative at least twice monthly to establish progress on each current activity shown on applicable networks.
- .2 Update and reissue project Work Breakdown Structure and relevant coding structures as project develops and changes.
- .3 Perform Detail Schedule update bi-weekly with status dated (Data Date) on last working day of month. Update to reflect activities completed to date, activities in progress, logic and duration changes.
- .4 Do not automatically update actual start and finish dates by using default mechanisms found in project management software.
- .5 Submit to Departmental Representative copies of updated Detail Schedule.
- .6 Requirements for monthly progress monitoring and reporting are basis for progress payment request.
- .7 Submit monthly written report based on Detail Schedule, showing Work to date performed, comparing Work progress to planned, and presenting current forecasts. Report summarize progress, defining problem areas and anticipated delays with respect to Work schedule, and critical paths. Explain alternatives for possible schedule recovery to mitigate potential delay. Include in report:

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- .1 Description of progress made.
- .2 Pending items and status of permits, shop drawings, change orders, possible time extensions.
- .3 Status of Contract completion date and milestones.
- .4 Current and anticipated problem areas, potential delays and corrective measures.
- .5 Review of progress and status of Critical Path activities.

Part 2 Products**2.1 NOT USED**

- .1 Not used.

Part 3 Execution**3.1 NOT USED**

- .1 Not used.

END OF SECTION

Part 1 General**1.1 ADMINISTRATIVE**

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

1.2 SHOP DRAWINGS AND PRODUCT DATA

- .1 Refer to CCDC 2 GC 3.11.
- .2 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.
- .3 Submit drawings stamped and signed by professional engineer registered or licensed in the Province of Alberta, Canada.
- .4 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been co-ordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.
- .5 Allow 10 days for Departmental Representative's review of each submission.
- .6 Adjustments made on shop drawings by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.

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

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

1.3 SAMPLES

- .1 Submit for review samples in duplicate as requested in respective specification Sections. Label samples with origin and intended use.
- .2 Deliver samples prepaid to Departmental Representative's business address.
- .3 Notify Departmental Representative in writing, at time of submission of deviations in samples from requirements of Contract Documents.
- .4 Where colour, pattern or texture is criterion, submit full range of samples.

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- .5 Adjustments made on samples by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.
- .6 Make changes in samples which Departmental Representative may require, consistent with Contract Documents.
- .7 Reviewed and accepted samples will become standard of workmanship and material against which installed Work will be verified.

1.4 PHOTOGRAPHIC DOCUMENTATION

- .1 Submit electronic copy of colour digital photography in jpg format, standard resolution monthly with progress statement.
- .2 Project identification: name and number of project and date of exposure indicated.
- .3 Number of viewpoints: Number of locations as required adequately show work progress.
 - .1 Viewpoints and their location as determined by Departmental Representative.
- .4 Frequency of photographic documentation: weekly.
 - .1 Upon completion of: each major phase of the project, and at the end of the month showing progress of work.

1.5 CERTIFICATES AND TRANSCRIPTS

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

Part 2 Products**2.1 NOT USED**

- .1 Not Used.

Part 3 Execution**3.1 NOT USED**

- .1 Not Used.

END OF SECTION

Part 1 General**1.1 INTENT**

- .1 Due to the nature of the facility where the Work is being performed, special procedures must be followed during the course of the Work.
- .2 Comply with requirements specified in this Section and as otherwise determined by the Departmental Representative to maintain the required degree of security and safety for the User, Contractor's Personnel, Departmental Representative's personnel and the public.

1.2 DEFINITIONS

- .1 User: means facility inhabitants and staff.
- .2 "CSC" means Correctional Service Canada.
- .3 "Director" means Director, Warden or Superintendent of the Institution as applicable.
- .4 User Representative: means the person designated in this Section.
- .5 "Perimeter" means the fenced or walled area of the Institution that restrains the movement of the inmates.
- .6 Contractor's Personnel: means all members of Contractor's work force, all members of Subcontractors' and Sub-subcontractors' work forces, and all other persons who require access to the facility for performance of the Work.
- .7 "Contraband" means:
 - .1 An intoxicant, including alcoholic beverages, drugs and narcotics.
 - .2 Tobacco or associated tobacco products.
 - .3 An igniting device, lighter or matches.
 - .4 A weapon or a component thereof, ammunition for a weapon, and anything that is designed to kill, injure or disable a person or that is altered so as to be capable of killing, injuring or disabling a person, when possessed without prior authorization.
 - .5 An explosive or a bomb or a component thereof.
 - .6 Currency over \$25.00 when possessed by an inmate without prior authorization.
 - .7 Any item not described in paragraphs 1.2.1.1 to 1.2.1.6 that could jeopardize the security of a Penitentiary or the safety of persons, when that item is possessed without prior authorization.

1.3 USER REPRESENTATIVE

- .1 The facility's contact person with respect to requirements of this Section and all other facets of the Work, which directly or indirectly affect the operation of the facility, will be:

Name: William Nicholls

Position (company): Project Officer (Correctional Services Canada)

E-mail: William.Nicholls@csc-scc.gc.ca

or any other person whom the Director of the facility may designate from time to time. This person is called the "User Representative" for the purposes of this Contract. If the User Representative is changed, the Contractor will be notified accordingly.

- .2 The User Representative is **not** a representative of the Departmental Representative.
- .3 The Contractor's contact and all communication shall, in the first instance, be with the Departmental Representative who will in turn communicate with the User Representative.

- .4 The Contractor may communicate directly with the User Representative **only** if:
 - .1 a concern arises which affects the operation of the facility, and
 - .2 such concern requires prompt attention, and
 - .3 the Departmental Representative cannot be contacted.
- .5 Acceptance of any instructions given by the User Representative under circumstances indicated above, shall be at the Contractor's discretion and at his own risk.
- .6 Notwithstanding the foregoing, in the event of an emergency involving security or safety, the Contractor shall comply immediately with all instructions given by the User Representative.

1.4 PRE-CONSTRUCTION BRIEFING

- .1 The Contractor and all Contractor's Personnel shall allow a minimum of three hours for a pre-construction briefing by the Departmental Representative and the User's Representative.
- .2 Only those persons who have attended a pre-construction briefing are permitted to commence work in the facility.

1.5 ENTRY AND IDENTIFICATION

- .1 Upon each entry to the site, Contractor's Personnel shall contact appropriate facility staff and identify themselves.
- .2 Entrance may entail issuance of identification cards or badges, notation in a log book or other security procedures.
- .3 Identification badges, if issued, must be worn at all times while on site.

1.6 SECURITY AND SAFETY REGULATIONS

- .1 Comply with all security and safety regulations in force at the facility, at the Contractor's cost.
- .2 Be aware of and comply with the facility's standing orders in case of fire and other emergencies.
- .3 Contractor's Personnel shall confine themselves to their particular duties and areas of work and shall not converse nor fraternize with facility inhabitants.

1.7 VEHICLE ACCESS AND PARKING

- .1 Restrict construction traffic to access routes designated by the Departmental Representative. Obtain the Departmental Representative's permission before using alternative routes.
- .2 Place directional signs along designated traffic route, to the Departmental Representative's satisfaction.
- .3 Restrict loading and unloading operations to areas designated by the Departmental Representative.
- .4 Restrict parking for Contractor's Personnel to areas designated by the Departmental Representative.
- .5 Maintain parking areas in good condition during construction period. After completion of Work, restore parking areas to condition equal to that at start of the Work.

1.8 VEHICLE OPERATION AND SECURITY

- .1 Observe posted speed limits and other traffic control signs on facility grounds.
- .2 Do not leave any vehicle running and unattended, regardless of how long the operator intends to be absent from the vehicle.
- .3 Do not leave keys in any unattended vehicle. Secure vehicles left unattended.
- .4 Do not park vehicles in fire lanes or access areas unless absolutely necessary for the purpose of carrying out the Work.

- .5 Secure vehicles left on site after normal working hours or overnight. Leave in designated parking area only.
- .6 Secure tools, ladders, materials etc. when left in or on vehicles. Secure tools out of sight, not in passenger compartment of vehicle.

1.9 BARRIERS

- .1 Enclose and secure work area with barriers. Locate barriers as designated by the Departmental Representative.
- .2 Ensure work area gates and accesses are locked and secured at end of each workday.

1.10 KEY CONTROL

- .1 Contractor's Personnel will be held personally responsible and accountable for key control.
- .2 All security keys, including padlock keys, switch box keys and other keys must be accounted for at all times.
- .3 Each person authorized to be in possession of keys must retain possession of such keys at all times while on site. Unauthorized exchanges of keys among other Contractor's Personnel, Departmental Representative's personnel or facility staff is not permitted.
- .4 Keys must never be given to a facility inhabitant or left in an area where a facility inhabitant could have access to a key.

1.11 TOOLS, EQUIPMENT AND MATERIAL CONTROL

- .1 Contractor's Personnel will be personally responsible and accountable for tools carried onto the site, upon entry and upon departure each workday, and upon completion of the Work.
- .2 Tools carried into an inhabited secure area must be accounted for, upon entry to and upon departure from such areas.
- .3 All tools must be permanently marked with the Departmental Representative's name.
- .4 The Departmental Representative may request that an inventory be provided of a tradesman's personal tools and may inspect such tools at any time to confirm count.
- .5 Maintain visual control of, and closely monitor use and location of, tools, equipment and materials at all times. Keep tools in immediate work area.
- .6 Do not leave tools and equipment unattended at any time without being shut off and properly secured.
- .7 Leave tools, equipment and materials in a secure storage area or otherwise secured to the Departmental Representative's satisfaction when not in use during the workday and at the completion of each workday.
- .8 Tools that present a high security risk, such as saws, hammers, chisels, screw drivers, power nail drivers, crowbars, etc., must be removed from work areas upon the completion of each workday.
- .9 Use of explosive actuated fastening devices is prohibited.
- .10 Do not deposit or allow to accumulate outside confines of work area, unused and waste material, rubbish, and debris, including nails, screws, etc. Remove material so deposited from site immediately.

1.12 PROCEDURES IN EVENT OF LOSS

- .1 If a key, tool, piece of equipment or item of personal property is lost or missing, or there is an unexplained material shortage, take the following action immediately:
 - .1 Notify appropriate facility staff or User Representative and advise them of the loss. Do not attempt to search for the lost item(s) prior to this notification.

- .2 Provide facility staff with as much detail about the lost item as possible, including where it was lost and for how long it has been missing.
- .3 Account for all other keys, tools, equipment and materials.

1.13 SHIPMENTS

- .1 All shipments of project material, equipment and tools shall be addressed in the Contractor's name to avoid confusion with the Institution's own shipments. The Contractor must have his/her own employees on site to receive any deliveries or shipments. CSC staff will NOT accept receipt of deliveries or shipments of any material, equipment or tools.

1.14 TELEPHONES

- .1 There will be no installation of telephones, Facsimile machines and computers with Internet connections permitted within the perimeter of the Institution unless prior approval of the Director is received.
- .2 The Director will ensure that approved telephones, facsimile machine and computers with internet connections are located where they are not accessible to inmates. All computers will have an approved password protection that will stop an internet connection to unauthorized personnel.
- .3 Wireless cellular and digital telephones, including but not limited to devices for telephone messaging, pagers, BlackBerries, telephone used as 2-way radios, are not permitted within the Institution unless approved by the Director. If wireless cellular telephones are permitted, the user will not permit their use by any inmate.
- .4 The Director may approve but limit the use of two-way radios.

1.15 WORK HOURS

- .1 Normal work hours within the Institution are: Monday to Friday 07:30 a.m. to 4:00 p.m.
- .2 Regular Business hours at the Drumheller Institution are from 08:00 to 16:00
- .3 Special arrangements with the Institution's CPM (Chief of Plant Maintenance) will be required for overnight work.
- .4 Work will not be permitted during weekends and statutory holidays without the permission of the Director. A minimum of seven days advance notice will be required to obtain the required permission. In case of emergencies or other special circumstances, this advance notice may be waived by the Director.

1.16 OVERTIME WORK AND OVERNIGHT WORK

- .1 No overnight or weekend work will be allowed without permission of the Director. Give a minimum forty-eight (48) hours advance notice when overnight or weekend work on the construction project is necessary and approved.
- .2 When overnight work, weekend, or statutory holiday work is required and approved by the Director, extra staff members may be posted by the Director or his/her designate, to maintain the security surveillance.
- .3 For overnight work as described in this specification for replacement of circuit breakers, feeders and distribution panels, extra security staff, if required, will be paid for by the Departmental Representative.

1.17 PRESCRIPTION DRUGS

- .1 Employees of the contractor who are required to take prescription drugs during the workday shall obtain approval of the director to bring a one day supply only into the Institution.

1.18 CONTRABAND

- .1 Weapons, ammunition, explosives, alcoholic beverages, drugs and narcotics are prohibited on institutional property.
- .2 Discovery of contraband on the construction site and the identification of the person(s) responsible for the contraband shall be reported immediately to the director
- .3 Contractors shall be vigilant with both their staff and the staff of their sub-contractors and suppliers that the discovery of contraband may result in cancellation of the security clearance of the affected employee. Serious infractions may result in the removal of the company from the institution for the duration of the construction.
- .4 Presence of arms and ammunition in vehicles of contractors, sub-contractors and suppliers or employees of these will result in the immediate cancellation of security clearances for the driver of the vehicle.

1.19 CONTACT WITH INMATES

- .1 Unless specifically authorized, it is forbidden inmates to come into contact with inmates, to talk with them, to receive objects from them or to give them objects. Any employee doing any of the above will be removed from the site and his/her security clearance revoked.
- .2 It is forbidden to take pictures of inmates, of CSC staff members or of any part of the institution other than those required as part of this contract.

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 REFERENCE STANDARDS**

- .1 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations
- .2 Province of Alberta
 - .1 Occupational Health and Safety Act, R.S.A. – Latest Edition.

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 two (2) copies of Contractor's authorized representative's work site health and safety inspection reports to Departmental Representative weekly.
- .4 Submit copies of reports or directions issued by Federal, Provincial and Territorial health and safety inspectors.
- .5 Submit copies of incident and accident reports.
- .6 Departmental Representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within 10 days after receipt of plan. Revise plan as appropriate and resubmit plan to Departmental Representative within 10 days after receipt of comments from Departmental Representative.
- .7 Departmental Representative's review of Contractor's final Health and Safety plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction Health and Safety.
- .8 Medical Surveillance: where prescribed by legislation, regulation or safety program, submit certification of medical surveillance for site personnel prior to commencement of Work, and submit additional certifications for any new site personnel to Departmental Representative.
- .9 On-site Contingency and Emergency Response Plan: address standard operating procedures to be implemented during emergency situations.

1.3 FILING OF NOTICE

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

1.4 SAFETY ASSESSMENT

- .1 Perform site specific safety hazard assessment related to project.
- .2 Safety plan must include any applicable Health and Safety Requirements for work places as Dictated by Federal, Provincial, or Territorial Governments concerning COVID-19

1.5 MEETINGS

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

1.6 REGULATORY REQUIREMENTS

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

1.7 GENERAL REQUIREMENTS

- .1 Develop written site-specific Health and Safety Plan based on hazard assessment prior to beginning site Work and continue to implement, maintain, and enforce plan until final demobilization from site. Health and Safety Plan must address project specifications.
- .2 Departmental Representative may respond in writing, where deficiencies or concerns are noted and may request re-submission with correction of deficiencies or concerns.
- .3 COVID-19 working protocols are expected to be in place throughout the duration of the project. The Contractor will be required to ensure that all workers, subcontractors, and deliveries adhere to the Provincial and Federal Health and Safety Regulations and guidelines related to COVID-19. This includes Public Health Orders issued by the Provincial Minister or the Provincial Chief Medical Officer of Health.

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 Contractor will be responsible and assume the role Prime Contractor as described in the Alberta Occupational Health and Safety Act.
- .3 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

1.9 COMPLIANCE REQUIREMENTS

- .1 Comply with Occupational Health and Safety Act, General Safety Regulation, Alberta Reg.
- .2 Comply with Canada Labour Code, Canada Occupational Safety and Health Regulations.

1.10 UNFORSEEN HAZARDS

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

1.11 POSTING OF DOCUMENTS

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

1.12 CORRECTION OF NON-COMPLIANCE

- .1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by Departmental Representative.
- .2 Provide Departmental Representative with written report of action taken to correct non-compliance of health and safety issues identified.

Drumheller Institution – 50 Bed Unit – Slab Repair

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

1.13 BLASTING

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

1.14 POWDER ACTUATED DEVICES

- .1 Use powder actuated devices only after receipt of written permission from Departmental Representative.

1.15 WORK STOPPAGE

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

Part 2 Products**2.1 NOT USED**

- .1 Not used.

Part 3 Execution**3.1 NOT USED**

- .1 Not used.

END OF SECTION

Part 1 General**1.1 SUMMARY**

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

1.2 RELATED REQUIREMENTS

- .1 Section 02 41 19.16 - Selective Interior Demolition
- .2 Section 22 05 05 - Selective Demolition for Plumbing
- .3 Section 23 05 05 - Selective Demolition for HVAC
- .4 Section 26 05 05 - Selective Demolition for Electrical

1.3 REFERENCES TO REGULATORY REQUIREMENTS

- .1 Department of Justice Canada (Jus)
 - .1 SOR/2018-196 Prohibition of Asbestos and Products Containing Asbestos Regulations.
- .2 Perform Work in accordance with 2015 National Building Code of Canada (NBC) including amendments up to tender closing date and other codes of provincial or local application provided that in case of conflict or discrepancy, more stringent requirements apply.
- .3 Specific design and performance requirements listed in specifications or indicated on Drawings may exceed minimum requirements established by referenced Building Code; these requirements will govern over the minimum requirements listed in Building Code
 - .1 Meet or exceed requirements of:
 - .1 Contract documents.
 - .2 Specified standards, codes and referenced documents.

1.4 HAZARDOUS MATERIAL DISCOVERY

- .1 Mould: stop work immediately when material resembling mould is encountered during demolition work. Notify Departmental Representative.

1.5 BUILDING SMOKING ENVIRONMENT

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

1.6 QUALITY ASSURANCE

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

Part 2 Products**2.1 NOT USED**

- .1 Not Used.

2.2 EASEMENTS AND NOTICES

- .1 Departmental Representative will obtain permanent easements and rights of servitude that may be required for performance of Work.
- .2 Constructor shall give notices required by regulatory requirements.

2.3 PERMITS

- .1 Development Permit: Departmental Representative has applied for, obtained, and paid for development permit.
- .2 Building Permit:
 - .1 Constructor shall apply for, obtain, and pay for building permit on behalf of Departmental Representative, and other permits required for Work and its various parts.
- .3 Occupancy Permits:
 - .1 Constructor shall apply for, obtain, and pay for occupancy permits, including partial occupancy permits where required by authority having jurisdiction.
 - .2 Representative will issue appropriate instructions to Constructor for correction to Work where Contract Document deficiencies are required to be corrected in order to obtain occupancy permits, including partial occupancy permits.
 - .3 Constructor shall correct deficiencies in accordance with Representative Departmental Representative's instructions. Where deficiency is not corrected, Departmental Representative reserves the right to make correction and charge Constructor for costs incurred.
 - .4 Constructor shall turn occupancy permits over to Departmental Representative.

Part 3 Execution**3.1 NOT USED**

- .1 Not Used.

END OF SECTION

Part 1 General**1.1 REFERENCE STANDARDS**

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

1.2 INSPECTION

- .1 Refer to CCDC 2, GC 2.3.
- .2 Allow Departmental Representative access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.
- .3 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.
- .4 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.
- .5 Departmental Representative will order part of Work to be examined if Work is suspected to be not in accordance with Contract Documents.

1.3 INDEPENDENT INSPECTION AGENCIES

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

1.4 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.

1.5 PROCEDURES

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

1.6 REJECTED WORK

- .1 Refer to CCDC, GC 2.4.
- .2 Remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by Departmental Representative as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.
- .3 Make good other Contractor's work damaged by such removals or replacements promptly.
- .4 If in opinion of Departmental Representative it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, Departmental Representative 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.

1.7 REPORTS

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

1.8 TESTS AND MIX DESIGNS

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

1.9 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 as specified in specific Section.
- .3 Prepare mock-ups for Departmental Representative's review with reasonable promptness and in orderly sequence, to not cause delays in Work.
- .4 Failure to prepare mock-ups in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.
- .5 If requested, Departmental Representative will assist in preparing schedule fixing dates for preparation.
- .6 Mock-ups may remain as part of Work.

1.10 MILL TESTS

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

1.11 EQUIPMENT AND SYSTEMS

- .1 Submit adjustment and balancing reports for mechanical and electrical 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 QUALIFICATIONS OF SURVEYOR**

- .1 Qualified registered land surveyor, licensed to practice in Alberta, acceptable to Departmental Representative.

1.2 SURVEY REFERENCE POINTS

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

1.3 SURVEY REQUIREMENTS

- .1 Establish one permanent benchmark on Site, referenced to established benchmarks 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 topsoil placement and landscaping features.
- .4 Stake slopes and berms.
- .5 Establish pipe inverts and manhole 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 the Work and notify the Departmental Representative of the findings.

1.5 LOCATION OF EQUIPMENT AND FIXTURES

- .1 Location of equipment, fixtures and outlets indicated or specified are to be considered as approximate.
- .2 Locate equipment, fixtures and distribution systems to provide minimum interference and maximum usable space and in accordance with the Manufacturer's Recommendations for safety, access and maintenance.

- .3 Inform the Departmental Representative of impending installation and obtain approval for precise location.
- .4 Submit field drawings to indicate relative positions of various services and equipment when requested by the Departmental Representative.

1.6 RECORDS

- .1 Maintain a complete, accurate log of control and survey Work progress.
- .2 On completion of foundations and major Site improvements, prepare a certified survey showing dimensions, locations, angles and elevations of the Work.
- .3 Record locations of retained, re-routed, and abandoned service lines.

1.7 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit name and address of Surveyor to the Departmental Representative.
- .2 On request of the Departmental Representative, submit documentation to verify accuracy of the field engineering Work.
- .3 Submit certificate signed by surveyor certifying and noting those elevations and locations of completed Work that conform and do not conform to the Contract Documents.

Part 2 Products

- .1 Not used.

Part 3 Execution

- .1 Not used.

END OF SECTION

Part 1 General**1.1 SUBMITTALS**

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit one copy of complete Operation and Maintenance Manual, in draft form, prepared by personnel experienced in the maintenance and operation of described products.
- .3 Draft copy will be returned after review and final inspection of Work with the Departmental Representative's comments.
- .4 Revise the content of the documents as required prior to final submittal.
- .5 Four weeks prior to Substantial Performance of the Work, submit to the Departmental Representative six final paper copies of the Operating and Maintenance (O&M) Manuals and one electronic copy (PDF) in SI Units.
- .6 Ensure spare parts, maintenance materials and special tools provided are new, undamaged or defective, and of the same quality and manufacture as the products provided in Work.
- .7 Furnish evidence, if requested, for type, source and quality of the products provided.
- .8 Defective products will be rejected, notwithstanding acceptance in previous inspections.

1.2 FORMAT

- .1 Organize data as an instructional manual.
- .2 Provide a sufficient number of binders so that the maximum finished thickness of each binder does NOT exceed 100 mm. Binders shall be:
 - .1 215 x 280 mm hard covered, three-hole extension type catalogue binders with a 75 mm spine bound with heavy weight fabricord, hot stamped in silver lettering front and spine. Acropress, Cerlox or similar light weight or special hole binders are not acceptable.
 - .2 Embossed with a permanent title on the cover, wording to be reviewed by Departmental Representative.
- .3 When multiple binders are used, correlate the data into related consistent groupings. Identify contents of each binder on the spine.
- .4 Covers shall be used to identify each binder with type or printed title "Operation and Maintenance Manual"; list date, title of project, Departmental Representative, Contractor and Departmental Representative, and identify subject matter of contents.
- .5 Arrange content by systems, under Section numbers and sequence of Table of Contents.
- .6 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.

- .7 The text shall be manufacturer's printed data, or typewritten data.
- .8 Drawings shall be provided with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
- .9 Provide 1:1 scaled CAD files in dwg format on flash drive.
- .10 Provide one electronic copy (on flash drive) of the entire manual.

1.3 CONTENTS - EACH VOLUME

- .1 Each Volume shall include:
 - .1 Title
 - .2 Date of submission; names
 - .3 Addresses and telephone numbers of the Departmental Representative and Contractor with the names of responsible parties
 - .4 Table of contents
 - .5 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. Drawings larger than 210 mm x 300 mm (A4) shall be contained in plastic pouch. Provide a separate panel for each drawing.
- .5 Typewritten Text: as required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 01 45 00 - Quality Control.

1.4 AS-BUILTS AND SAMPLES

- .1 Maintain, in addition to the requirements in the General Conditions, at Site for Departmental Representative one record copy of:
 - .1 Contract Drawings
 - .2 Specifications
 - .3 Addenda
 - .4 Change Orders and other modifications to Contract
 - .5 Reviewed Shop Drawings, product data, and samples

- .6 Field test records
- .7 Inspection certificates
- .8 Manufacturer's certificates
- .2 Store record documents and samples in the field office apart from documents used for construction. Provide files, racks, and secure storage.
- .3 Label record documents and file in accordance with Section number listings in the List of Contents of this Project Manual. Label each document "PROJECT RECORD" in neat, large, printed letters.
- .4 Maintain record documents in clean, dry and legible condition. Do not use record documents for construction purposes.
- .5 Keep record documents and samples available for inspection by the Departmental Representative.

1.5 RECORDING ACTUAL SITE CONDITIONS

- .1 Record information on set of Issued for Construction drawings.
- .2 Provide felt tip marking pens, maintaining separate colours for each major system, for recording information.
- .3 Record information concurrently with the construction progress. Do not conceal Work until required information is recorded.
- .4 Contract Drawings and Shop Drawings: mark each item to record actual construction, including:
 - .1 Measured depths of elements of foundation in relation to finish first floor datum
 - .2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - .3 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.
 - .4 Field changes of dimension and detail.
 - .5 Changes made by change orders.
 - .6 Details not on original Contract Drawings.
 - .7 References to related Shop Drawings and modifications.
- .5 Specifications: mark each item to record actual construction, including:
 - .1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.
 - .2 Changes made by Addenda and change orders.

- .6 Other Documents: maintain manufacturer's certifications, inspection certifications, and field test records as required by individual Specifications Sections.

1.6 EQUIPMENT AND SYSTEMS

- .1 Each Item of Equipment and Each System: include the description of the unit or system, and component parts. Give function, normal operation characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.
- .2 Panel board circuit directories: provide electrical service characteristics, controls, and communications.
- .3 Include installed colour coded wiring diagrams.
- .4 Operating Procedures: include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.
- .5 Maintenance Requirements: include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- .6 Provide a servicing and lubrication schedule, and a list of lubricants required.
- .7 Include Manufacturer's printed O&M instructions.
- .8 Include the sequence of operation by the controls Manufacturer.
- .9 Provide original Manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- .10 Provide installed control diagrams by the controls Manufacturer.
- .11 Provide the Contractor's co-ordination drawings, with installed colour coded piping diagrams.
- .12 Provide charts of valve tag numbers, with the location and function of each valve, keyed to flow and control diagrams.
- .13 Provide a list of original Manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- .14 Include test and balancing reports as specified in Section 01 45 00 - Quality Control and Section 23 05 93 Testing, adjusting and balancing for HVAC.
- .15 Additional requirements: as specified in individual Specification Sections.

1.7 MATERIALS AND FINISHES

- .1 Building Products, Applied Materials, and Finishes: include product data, with catalogue number, size, composition, and colour and texture designations. Provide information for re-ordering custom manufactured products.

- .2 Instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- .3 Moisture protection and Weather-exposed Products: include the Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- .4 Additional Requirements: as specified in individual Specifications Sections.

1.8 SPARE PARTS

- .1 Provide spare parts, in quantities specified in individual Specification Sections.
- .2 Provide items of the same manufacture and quality as items in the Work.
- .3 Deliver to site; place and store.
- .4 Receive and catalogue items. Submit inventory listing to the Departmental Representative. Include approved listings in O&M Manual.
- .5 Obtain receipt for delivered products and submit prior to final payment.

1.9 MAINTENANCE MATERIALS

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

1.10 SPECIAL TOOLS

- .1 Provide special tools, in quantities specified in individual Specification Section.
- .2 Provide items with tags identifying their associated function and equipment.
- .3 Deliver to site; place and store.
- .4 Receive and catalogue items. Submit inventory listing to the Departmental Representative. Include approved listings in the O&M Manual.

1.11 STORAGE, HANDLING AND PROTECTION

- .1 Store spare parts, maintenance materials, and special tools in manner to prevent damage or deterioration.
- .2 Store in original and undamaged condition with manufacturer's seal and labels intact.

- .3 Store components subject to damage from weather in weatherproof enclosures.
- .4 Store paints and freezable materials in a heated and ventilated room.
- .5 Remove and replace damaged products at own expense and to satisfaction of Departmental Representative.

1.12 WARRANTIES AND BONDS

- .1 Develop warranty management plan to contain information relevant to Warranties.
- .2 Submit warranty management plan, thirty (30) days before planned pre-warranty conference, to Departmental Representative approval.
- .3 Warranty management plan to include required actions and documents to assure that the Departmental Representative receives warranties to which it is entitled.
- .4 Provide the 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 the construction phase, to the Departmental Representative for approval prior to each monthly pay estimate.
- .6 Assemble approved information in binder and submit upon acceptance of work. Organize the binder as follows:
 - .1 Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing.
 - .2 List Subcontractor, Supplier, and Manufacturer, with name, address, and telephone number of responsible principals.
 - .3 Obtain warranties and bonds, executed in duplicate by Subcontractors, Suppliers, and Manufacturers, within ten (10) days after completion of the 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 Conduct a joint one year warranty inspection, measured from the time of acceptance, by the Departmental Representative.
- .8 Include information contained in the warranty management plan as follows:
 - .1 Roles and responsibilities of personnel associated with the warranty process, including points of contact and telephone numbers within the organizations of Contractors, Subcontractors, Manufacturers or Suppliers involved.

- .2 Provide a list for each warranted equipment, item, feature of construction or system indicating:
 - .1 Name of item
 - .2 Model and serial numbers
 - .3 Location where installed
 - .4 Names 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 date and duration of the warranty period
 - .9 Summary of maintenance procedures required to continue warranty in force
 - .10 Cross-references to specific pertinent O&M 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
- .3 Contractor's plans for attendance at one year post-construction warranty inspections.
- .4 Procedure and status of tagging equipment covered by extended warranties.
- .5 Post copies of instructions near selected pieces of equipment where operation is critical for warranty and/or safety reasons.
- .9 Respond in a timely manner to verbal or written notification of required construction warranty repair work.
- .10 Written verification will follow verbal instructions. Failure to respond will be cause for PCA to proceed with action against the Contractor.

1.13 PRE-WARRANTY CONFERENCE

- .1 Meet with the Departmental Representative, to develop an understanding of the requirements of this Section. Schedule a meeting prior to contract completion, and at time designated by the Departmental Representative.
- .2 The Departmental Representative will establish communication procedures for:

- .1 Notification of construction warranty defects
- .2 Determine priorities for type of defect
- .3 Determine reasonable time for response
- .3 Provide name, telephone number and address of licensed and bonded company that is authorized to initiate and pursue construction warranty work action.
- .4 Ensure contact is located within local service area of warranted construction, is continuously available, and is responsive to inquiries for warranty work action.

1.14 WARRANTY TAGS

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

Part 2 PRODUCTS

- .1 Not used.

Part 3 EXECUTION

- .1 Not used.

END OF SECTION

Part 1 General**1.1 REFERENCE STANDARDS****1.2 PROJECT CLEANLINESS**

- .1 Maintain Work in tidy condition, free from accumulation of waste products and debris, other than that caused by 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, unless approved by Departmental Representative.
- .3 Clear snow and ice from access to Work, remove from site or bank/pile snow in designated areas only as directed by Departmental Representative.
- .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 19 - Waste Management and Disposal.
- .6 Dispose of waste materials and debris off site in accordance with applicable local regulations.
- .7 Clean areas prior to start of finishing work, and maintain areas free of dust, debris and other contaminants during finishing operations.
- .8 Store volatile waste in covered metal containers, and remove from premises at end of each working day.
- .9 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.
- .10 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.
- .11 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

1.3 FINAL CLEANING

- .1 When Work is Substantially Performed remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.
- .2 Remove waste products and debris other than that caused by other contractors, and leave Work clean and suitable for occupancy.
- .3 Prior to final review remove surplus products, tools, construction machinery and equipment.
- .4 Remove waste materials from site at regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site.
- .5 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .6 Clean and polish glass, mirrors, hardware, wall tile, stainless steel, chrome, porcelain enamel, baked enamel, plastic laminate, and mechanical and electrical fixtures. Replace broken, scratched or disfigured glass.

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- .7 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, walls, and floors.
- .8 Clean lighting reflectors, lenses, and other lighting surfaces.
- .9 Vacuum clean and dust building interiors, behind grilles, louvres and screens.
- .10 Wax, seal, shampoo or prepare floor finishes, as recommended by manufacturer.
- .11 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.
- .12 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.
- .13 Remove dirt and other disfiguration from exterior surfaces.
- .14 Clean and sweep roofs, gutters, areaways, and sunken wells.
- .15 Sweep and wash clean paved areas.
- .16 Clean equipment and fixtures to sanitary condition; clean or replace filters of mechanical equipment.
- .17 Clean roofs, downspouts, and drainage systems.
- .18 Remove debris and surplus materials from crawl areas and other accessible concealed spaces.
- .19 Remove snow and ice from access to Work areas.

1.4 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for recycling and reuse in accordance with Section 01 74 19- Waste Management and Disposal.

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 This Section includes requirements for management of construction waste and disposal, which forms the Contractor's commitment to reduce and divert waste materials from landfill and includes the following:
 - .1 Preparation of a Draft Construction Waste Management (CWM) Plan that will be used to track the success of the CWM Plan against actual waste diversion from landfill.
 - .2 Preparation of a CWM Plan that provides guidance on a logical progression of tasks and procedures to be followed in a pollution prevention program to reduce or eliminate the generation of waste, the loss of natural resources, and process emissions through source reduction, reuse, recycling, and reclamation.
 - .3 Preparation of monthly progress reports indicating cumulative totals representing progress towards achieving diversion and reduction goals of waste materials away from landfill and identifying any special programs, landfill options or alternatives to landfill used during construction.
 - .4 Preparation of a CWM Report containing detailed information indicating total waste produced by the project, types of waste material and quantity of each material, and total waste diverted and diversion rates indicated as a percentage of the total waste produced.
- .2 Departmental Representative has established that this project shall generate the least amount of waste possible and that processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors be employed by the Contractor .

1.2 REFERENCE STANDARDS

- .1 American Society for Testing and Materials (ASTM):
 - .1 ASTM E1609 01, Standard Guide for Development and Implementation of a Pollution Prevention Program
- .2 Recycling Certification Institute (RCI):
 - .1 RCI Certification Construction and Demolition Materials Recycling

1.3 DEFINITIONS

- .1 Clean Waste: Untreated and unpainted; not contaminated with oils, solvents, sealants or similar materials.
- .2 Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, re modeling, repair and demolition.
- .3 Hazardous: Exhibiting the characteristics of hazardous substances including properties such as ignitability, corrosiveness, toxicity or reactivity.
- .4 Non-hazardous: Exhibiting none of the characteristics of hazardous substances, including properties such as ignitability, corrosiveness, toxicity, or reactivity.
- .5 Non-toxic: Not poisonous to humans either immediately or after a long period of exposure.

- .6 Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.
- .7 Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.
- .8 Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form; recycling does not include burning, incinerating, or thermally destroying waste.
- .9 Return: To give back reusable items or unused products to vendors for credit.
- .10 Reuse: To reuse a construction waste material in some manner on the project site.
- .11 Salvage: To remove a waste material from the project site to another site for resale or reuse by others.
- .12 Sediment: Soil and other debris that has been eroded and transported by storm or well production run off water.
- .13 Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.
- .14 Toxic: Poisonous to humans either immediately or after a long period of exposure.
- .15 Trash: Any product or material unable to be reused, returned, recycled, or salvaged.
- .16 Volatile Organic Compounds (VOC's): Chemical compounds common in and emitted by many building products over time through outgassing:
 - .1 Solvents in paints and other coatings;
 - .2 Wood preservatives; strippers and household cleaners;
 - .3 Adhesives in particleboard, fiberboard, and some plywood; and foam insulation.
 - .4 When released, VOC's can contribute to the formation of smog and can cause respiratory tract problems, headaches, eye irritations, nausea, damage to the liver, kidneys, and central nervous system, and possibly cancer.
- .17 Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.
- .18 Construction Waste Management (CWM) Plan: A project related plan for the collection, transportation, and disposal of the waste generated at the construction site; the purpose of the plan is to ultimately reduce the amount of material being landfilled.

1.4 ADMINISTRATIVE REQUIREMENTS

- .1 Coordination: Coordinate waste management requirements with all Divisions of the Work for the project, and ensure that requirements of the CWM Plan are followed.
- .2 Preconstruction Meeting: Arrange a pre-construction meeting in accordance with Section 01 31 19 – Project Meetings before starting any Work of the Contract attended by the Departmental Representative, Contractor, and affected Subcontractor's to discuss the Contractor's CWM Plan and to develop mutual understanding of the requirements for a consistent policy towards waste reduction and recycling.

1.5 SUBMITTALS

- .1 Provide required information in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Action Submittals: Provide the following submittals before starting any work of this Section:

- .1 Draft CWM Plan: Submit to Departmental Representative a preliminary analysis of anticipated site generated waste by listing a minimum of five (5) construction or demolition waste streams that have potential to generate the most volume of material indicating methods that will be used to divert construction waste from landfill and source reduction strategies; Departmental Representative will provide commentary before development of Contractor's Construction Waste Management Plan.
- .2 CWM Plan: Submit a CWM Plan for this project prior to any waste removal from site and that includes the following information:
 - .1 Material Streams: Analysis of the proposed jobsite waste being generated, including material types and quantities forming a part of identified material streams in the Draft CWM Plan; materials removed from site destined for alternative daily cover at landfill sites and land clearing debris cannot be considered as contributing to waste diversion and will be included as a component of the total waste generated for the site.
 - .2 Recycling Haulers and Markets: Investigate local haulers and markets for recyclable materials, and incorporate into CWM Plan.
 - .3 Alternative Waste Disposal: Prepare a listing of each material proposed to be salvaged, reused, recycled or composted during the course of the project, and the proposed local market for each material.
 - .4 Landfill Materials: Identify materials that cannot be recycled, reused or composted and provide explanation or justification; energy will be considered as a viable alternative diversion strategy for these materials where facilities exist.
 - .5 Landfill Options: The name of the landfill where trash will be disposed of; landfill materials will form a part of the total waste generated by the project.
 - .6 Materials Handling Procedures: A description of the means by which any recycled waste materials will be protected from contamination, and a description of the means to be employed in recycling the above materials consistent with requirements for acceptance by designated facilities.
 - .7 Transportation: A description of the means of transportation of the recyclable materials whether materials will be site separated and self-hauled to designated centres, or whether mixed materials will be collected by a waste hauler and removed from the site, and destination of materials.

1.6 PROJECT CLOSEOUT SUBMISSIONS

- .1 Record Documentation: Submit as constructed information in accordance with Section 01 78 00 – Closeout Submittals as follows:
 - .1 Construction Waste Management (CWM) Report: Submit a CWM Report for this project that includes the following information:
 - .1 Accounting: Submit information indicating total waste produced by the project.
 - .2 Composition: Submit information indicating types of waste material and quantity of each material.
 - .3 Diversion Rate: Submit information indicating total waste diverted from landfill as a percentage of the total waste produced by the project.
 - .4 Diversion and Transportation Documentation: Submit copies of transportation documents or shipping manifests indicating weights of

- materials, and other evidence of disposal indicating final location of waste diverted from landfill and waste sent to landfill.
- .5 Alternative Daily Cover (ADC): Submit quantities of material that were used as ADC at landfill sites, and that form a part of the total waste generated by the project.
 - .6 Multiple Waste Hauling: Compile all information into a single CWM Report where multiple waste hauling and diversion strategies were used for the project.
 - .7 Photographs: Submit photographs of waste diversion facilities documenting location and signage describing usage of waste separation containers.

1.7 QUALITY ASSURANCE

- .1 Resources for development of CWM Plan: The following sources may be useful in developing the Draft CWM Plan:
 - .1 Recycling Haulers and Markets: Investigate local haulers and markets for recyclable materials, and incorporate into CWM Plan.
 - .2 Waste-to-Energy Systems: Investigate local waste-to-energy incentives where systems for diverting materials from landfill for reuse or recycling are not available.
- .2 Certifications: Provide proof of the following during the course of the Work:
 - .1 Compliance Certification: Provide proof that recycling centre is third party verified and is listed as a Certified Facility through the registration and certification requirements of the Recycling Certification Institute.

1.8 DELIVERY, STORAGE AND HANDLING

- .1 Storage Requirements: Implement a recycling/reuse program that includes separate collection of waste materials as appropriate to the project waste and the available recycling and reuse programs in the project area.
- .2 Handling Requirements: Clean materials that are contaminated before placing in collection containers and ensure that waste destined for landfill does not get mixed in with recycled materials:
 - .1 Deliver materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to recycling process.
 - .2 Arrange for collection by or delivery to the appropriate recycling or reuse facility.
- .3 Hazardous Waste and Hazardous Materials: Handle in accordance with applicable Municipal, Provincial and Federal regulations.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution**3.1 CWM PLAN IMPLEMENTATION**

- .1 Management: Contractor is responsible for designating an onsite party or parties responsible for instructing workers and overseeing and documenting results of the CWM Plan for the project.
- .2 Distribution: Distribute copies of the CWM Plan to the job site foreman, each Subcontractor, and Departmental Representative and other site personnel as required to maintain the CWM Plan.
- .3 Instruction: Provide onsite instruction of appropriate separation, handling, and recycling, salvage, reuse, composting and return methods being used for the project to Subcontractor's at appropriate stages of the project.
- .4 Separation Facilities: Lay out and label a specific area to facilitate separation of materials for potential recycling, salvage, reuse, composting and return:
 - .1 Recycling and waste bin areas are to be kept neat and clean and clearly marked in order to avoid contamination of materials.
 - .2 Hazardous wastes shall be separated, stored, and disposed of in accordance with applicable Municipal, Provincial and Federal regulations.
- .5 Progressive Documentation: Submit a monthly summary of waste generated by the project to ensure that waste diversion goals are on track with project requirements:
 - .1 Submission of waste summary can coincide with application for progress payment, or similar milestone event as agreed upon between the Departmental Representative and Contractor.
 - .2 Monthly waste summary shall contain the following information:
 - .1 The amount in tonnes or m³ and location of material landfilled,
 - .2 The amount in tonnes or m³ and location of materials diverted from landfill, and
 - .3 Indication of progress based on total waste generated by the project with materials diverted from landfill as a percentage.

3.2 SUBCONTRACTOR'S RESPONSIBILITY

- .1 Subcontractors shall cooperate fully with the Contractor to implement the CWM Plan.
- .2 Failure to cooperate may result in the Departmental Representative not achieving their environmental goals, and may result in penalties being assessed by the Contractor to the responsible Subcontractor's.

END OF SECTION

1. General**1.1 DESCRIPTION**

- .1 Work to be performed under this section includes the following:
 - .1 Remove and dispose of existing construction at the Drumheller Institutions 50 Bed Living Unit building as shown on the drawings and as required to facilitate the Work of this Contract.
 - .2 All surface damaged by construction work shall be restored to like new pre-construction condition.

1.2 REFERENCE STANDARDS

- .1 The Alberta Building Code and the Alberta Occupational Health and Safety Act.
- .2 Demolition of electrical equipment shall include terminating wiring and equipment in a safe condition which meets the Canadian Electrical Code.

1.3 MEASUREMENT AND PAYMENT

- .1 There will be no separate payment for this item. Costs associated with this Section shall be included in the Bid Price.

2.0 Products

- .1 Not applicable.

3.0 Execution**3.1 PREPARATION**

- .1 Inspect site and verify extent and location of items designated for removal, disposal and items to remain.
- .2 Locate and protect utilities. Preserve active utilities traversing site in operating condition.
- .3 Notify and obtain approval of utility companies before starting demolition.

3.2 GENERAL

- .1 At end of each day's work, leave work in safe condition so that no part is in danger of toppling or falling.
- .2 Demolish to minimize dusting.
- .3 Do not burn materials on site.
- .4 Remove and dispose of demolished materials except where noted otherwise and in accordance with authorities having jurisdiction.

- .5 Remove contaminated or dangerous materials as defined by authorities having jurisdiction, relating to environmental protection, from site and dispose of in safe manner to minimize danger at site or during disposal.
- .6 Deliver items to be salvaged by the Departmental Representative to a site designated by the Engineer.
- .7 Dispose of non-hazardous materials in an approved landfill in accordance with landfill regulations.
- .8 Hazardous materials shall be disposed of in a landfill designated for the materials.

3.3 SEQUENCES OF OPERATION

- .1 Refer to Section 01016 Work Sequence and Tie-Ins.
- .2 Where existing equipment must be demolished prior to completion of the new system, provide temporary systems until the new equipment is complete.

3.4 RESTORATION

- .1 Grout all unused holes in floors.
- .2 Restore areas and existing works affected by demolition work to new condition.

3.5 CLEANUP

- .1 Upon completion of work, remove debris and leave work site clean.

END OF SECTION

Part 1 General**1.1 SUMMARY**

- .1 This Section includes requirements for careful removal and salvage, and reconditioning of building components identified for storage on site and subsequent reinstallation forming a part of Project.

1.2 DEFINITIONS

- .1 Remove and Salvage: Detach items from existing construction and deliver them to Departmental Representative.
- .2 Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.

1.3 ADMINISTRATIVE REQUIREMENTS

- .1 Coordination Existing Salvaged Work: Coordinate with Departmental Representative for confirmation of materials, components, and items of equipment identified for removal and salvage from their present existing locations and as follows:
 - .1 Items that are turned over to Departmental Representative.
 - .2 On-site storage locations
 - .3 Confirmation of items that are renovated or refurbished ready for reinstallation as a part of Work.
 - .4 Confirmation of items that Departmental Representative will not re use, but will retain as follows:
 - .1 Departmental Representative will pick-up salvaged items from a designated location on site.
 - .2 Transport salvaged items to Departmental Representative's designated storage facility.
 - .3 Constructor is responsible for loading and handling identified salvaged items using their own forces and equipment.

Part 2 Products**2.1 SALVAGED ITEMS**

- .1 Confirm with Departmental Representative items that appear salvageable prior to disposal.

2.2 REMOVED AND REINSTALLED ITEMS

- .1 As indicated on drawings.

Part 3 Execution**3.1 SALVAGE AND REMOVED AND REINSTALLED**

- .1 Remove and handle items from site to minimize damage and to ensure that usability is maintained.

- .2 Clean, decontaminate, or remediate hazardous substances (lead based paint, asbestos dust, PCB residue, and similar substances) from materials so they are safe for reuse.
- .3 Place salvaged materials on palettes or wrap in protective film to ensure that loose pieces and projections do not cause injury to personnel, and that items remain as complete units.
- .4 Store items to be reinstalled a in secure, weather tight enclosure on site.
- .5 Clean items of construction or building debris, or materials that are not a part of salvaged work before delivering to Departmental Representative.

END OF SECTION

Part 1 General**1.1 RELATED REQUIREMENTS**

- .1 Section 03 30 00: Cast-in-place Concrete.

1.2 PRICE AND PAYMENT PROCEDURES

- .1 Measurement and Payment:
 - .1 No measurement made under this Section.
 - .1 Include reinforcement costs in items of concrete work in Section 03 30 00 - Cast-In-Place Concrete.

1.3 REFERENCE STANDARDS

- .1 American Concrete Institute (ACI)
 - .1 SP-66-04, ACI Detailing Manual 2004.
- .2 ASTM International (ASTM)
 - .1 ASTM A1064/A1064M-17, Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
- .3 CSA Group (CSA)
 - .1 CSA A23.1-14/A23.2-14, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
 - .2 CAN/CSA A23.3-14, Design of Concrete Structures.
 - .3 CSA G30.18-09(R2014), Carbon Steel Bars for Concrete Reinforcement.
 - .4 CSA G40.20/G40.21-13(R2014), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .5 CSA W186-M1990(R2016), Welding of Reinforcing Bars in Reinforced Concrete Construction.
- .4 Reinforcing Steel Institute of Canada (RSIC)
 - .1 RSIC-2004, Reinforcing Steel Manual of Standard Practice.

1.4 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-installation Meetings: in accordance with Section 01 31 19 - Project Meetings, convene pre-installation meeting one week prior to beginning concrete works.
 - .1 Ensure key personnel, site supervisor, Departmental Representative and specialty contractor - finishing, forming attend.
 - .1 Verify project requirements.

1.5 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 proprietary materials used in Cast-In-Place Concrete and additives and include product characteristics, performance criteria, physical size, finish, and limitations.

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- .2 Submit 2 copies of WHMIS Safety Data Sheet (SDS) in accordance with Section 01 35 29.06 - Health and Safety Requirements.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Alberta, Canada.
 - .1 Prepare reinforcement drawings in accordance with RSIC Manual of Standard Practice and SP-66.
 - .2 Indicate placing of reinforcement and detail lap lengths and bar development lengths to CAN/CSA A23.3 as a Class B Tension splice.
 - .3 Indicate position and size of openings in slabs and walls. Coordinate with trades requiring openings.
- .4 Sustainable Design Submittals:
 - .1 Construction Waste Management:
 - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.
 - .2 Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating percentage of construction wastes recycled or salvaged.
- .5 Quality Assurance Submittals:
 - .1 Submit in accordance with Section 01 45 00 - Quality Control and as described in PART 2 - SOURCE QUALITY CONTROL.
 - .2 Mill Test Report: upon request, submit to Departmental Representative certified copy of mill test report of reinforcing steel, minimum 4 weeks prior to beginning reinforcing work.
 - .3 Upon request submit in writing to Departmental Representative proposed source of reinforcement material.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instruction.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Replace defective or damaged materials with new.
- .4 Develop Construction Waste Management Plan.

Part 2 Products**2.1 MATERIALS**

- .1 Substitute different size bars only if permitted in writing by Departmental Representative.
- .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.

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- .4 Deformed steel wire for concrete reinforcement: to ASTM A1064/A1064M.
- .5 Chairs, bolsters, bar supports, spacers: to CSA A23.1/A23.2.
- .6 Tie wire: 1.5 mm diameter annealed wire.
- .7 Mechanical splices: subject to approval of Departmental Representative.
- .8 Plain round bars: to CSA G40.20/G40.21.

2.2 FABRICATION

- .1 Fabricate reinforcing steel in accordance with CSA A23.1/A23.2, SP-66, and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada.
- .2 Obtain Departmental Representative's written approval for locations of reinforcement splices other than those shown on placing drawings.
- .3 Upon approval of Departmental Representative, 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 Departmental Representative 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 Departmental Representative of proposed source of supplied material.

Part 3 Execution**3.1 FIELD BENDING**

- .1 Do not field bend or field weld reinforcement except where indicated or authorized by Departmental Representative.
- .2 When field bending authorized, bend without heat, applying slow and steady pressure.
- .3 Replace bars, which develop cracks or splits.

3.2 PLACING REINFORCEMENT

- .1 Cutting or puncturing vapour retarder is not permitted; repair damage and reseal vapour retarder before placing concrete.
- .2 Place reinforcing steel as indicated on placing drawings and in accordance with CSA A23.1/A23.2.
- .3 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 Apply thick even film of mineral lubricating grease when paint is dry.
- .4 Prior to placing concrete, obtain Departmental Representative's approval of reinforcing material and placement.
- .5 Maintain cover to reinforcement during concrete pour.

3.3 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 Reinforcing steel and welded wire fabric.
- .2 Inspection and testing of reinforcing and reinforcing materials carried out by testing laboratory designated by Departmental Representative for review to CSA A23.1/A23.2.
 - .1 Ensure testing laboratory certified to CSA A283.
- .3 Ensure test results distributed for discussion at pre-pouring concrete meeting between testing laboratory and Departmental Representative.
- .4 Inspection or testing by Departmental Representative not to augment or replace Contractor quality control nor relieve Contractor of contractual responsibility.

3.4 CLEANING

- .1 Progress Cleaning: clean in accordance with standard procedure and related sections
 - .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 standard procedure and related section Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General**1.1 RELATED REQUIREMENTS**

- .1 Section 03 20 00: Concrete Reinforcement.

1.2 PRICE AND PAYMENT PROCEDURES

- .1 Measurement and Payment:
 - .1 Measurement Procedures: in accordance with Section 01 29 00 - Payment Procedures.
 - .2 Cast-in-place concrete not measured but paid for as fixed price item.
 - .3 Supply and installation of anchor bolts, nuts and washers and bolt grouting not measured but considered incidental to work.

1.3 REFERENCE STANDARDS

- .1 ASTM International (ASTM)
 - .1 ASTM C260/C260M-10a(2016), Standard Specification for Air-Entraining Admixtures for Concrete.
 - .2 ASTM C309-11, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
 - .3 ASTM C494/C494M-16, Standard Specification for Chemical Admixtures for Concrete.
 - .4 ASTM D1751-04(2013)e1, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-51.34-M86, Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
- .3 CSA Group (CSA)
 - .1 CSA A23.1/A23.2-14, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CSA A283-06-R2016, Qualification Code for Concrete Testing Laboratories.
 - .3 CSA A3000-13, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005),

1.4 ABBREVIATIONS AND ACRONYMS

- .1 Portland Cement: hydraulic cement, blended hydraulic cement (XXb - b denotes blended) and Portland-limestone cement types:
 - .1 GU, GUb and GUL - General use cement.
- .2 Fly ash types:
 - .1 F - with CaO content maximum 8%.
 - .2 CI - with CaO content 15 to 20%.
 - .3 CH - with CaO minimum 20%.
- .3 GGBFS - Ground, granulated blast-furnace slag.

1.5 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-installation Meetings: in accordance with Section 01 31 19 - Project Meetings, convene pre-installation meeting one week prior to beginning concrete works.
 - .1 Ensure key personnel, site supervisor, Departmental Representative, and specialty contractor – (finishing) attend.
 - .1 Verify project requirements.

1.6 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for proprietary materials used in Cast-In-Place Concrete and additives and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit 2 copies of WHMIS SDS in accordance with Section 01 35 29.06 - Health and Safety Requirements.
- .3 Site Quality Control Submittals:
 - .1 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.
 - .2 Concrete hauling time: provide for review by Departmental Representative deviations exceeding maximum allowable time of 120 minutes for concrete delivered to site of Work and discharged after batching.
 - .3 Samples returned for inclusion into work.

1.7 QUALITY ASSURANCE

- .1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.
- .2 Provide Departmental Representative, 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 meet specified requirements.
- .3 At least 4 weeks prior to beginning Work, inform Departmental Representative of source of fly ash.
 - .1 Changing source of fly ash without written approval of Departmental Representative is prohibited.
- .4 Minimum 4 weeks prior to starting concrete work, provide proposed quality control procedures for review by Departmental Representative on following items:
 - .1 Hot weather concrete.
 - .2 Cold weather concrete.
 - .3 Curing.
 - .4 Finishes.
- .5 Quality Control Plan: provide written report to Departmental Representative verifying compliance that concrete in place meets performance requirements of concrete as established in PART 2 - PRODUCTS.

1.8 DELIVERY, STORAGE AND HANDLING

- .1 Delivery and Acceptance Requirements:
- .2 Concrete hauling time: deliver to site of Work and discharged within 120 minutes maximum after batching.
 - .1 Modifying maximum time limit without receipt of prior written agreement from Departmental Representative and concrete producer as described in CSA A23.1/A23.2. is prohibited.
 - .2 Deviations submitted for review by Departmental Representative.
 - .3 Concrete delivery: ensure continuous concrete delivery from plant meets CSA A23.1/A23.2.

1.9 SITE CONDITIONS

- .1 Placing concrete during rain or weather events that could damage concrete is prohibited.
- .2 Protect newly placed concrete from rain or weather events in accordance with CSA A23.1/A23.2.
- .3 Cold weather protection:
 - .1 Maintain protection equipment, in readiness on Site.
 - .2 Use such equipment when ambient temperature below 5°C, or when temperature may fall below 5°C before concrete cured.
 - .3 Placing concrete upon or against surface at temperature below 5°C is prohibited.
- .4 Hot weather protection:
 - .1 Protect concrete from direct sunlight when ambient temperature above 27°C.
 - .2 Prevent forms of getting too hot before concrete placed. Apply accepted methods of cooling not to affect concrete adversely.
- .5 Protect from drying.

Part 2 Products**2.1 DESIGN CRITERIA**

- .1 Alternative 1 - Performance: to CSA A23.1/A23.2, and as described in MIXES of PART 2 - PRODUCTS.

2.2 PERFORMANCE CRITERIA

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

2.3 MATERIALS

- .1 Portland Cement: Normal Portland Cement in accordance with CSA A3000, Type GU.
- .2 Blended hydraulic cement: Type GUB to CSA A3001.
- .3 Supplementary cementing materials: with minimum 20% Type F fly ash replacement, by mass of total cementitious materials to CSA A3001.
- .4 Water: to CSA A23.1.
- .5 Aggregates: to CSA A23.1/A23.2.

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- .6 Admixtures:
 - .1 Air entraining admixture: to ASTM C260.
 - .2 Chemical admixture: to ASTM C494. Departmental Representative to approve accelerating or set retarding admixtures during cold and hot weather placing.
- .7 Curing compound: to CSA A23.1/A23.2 and ASTM C309.

2.4 MIXES

- .1 Alternative 1 - Performance Method for specifying concrete: to meet Departmental Representative performance criteria to CSA A23.1/A23.2.
 - .1 Ensure concrete supplier meets performance criteria as established below and provide verification of compliance as in Quality Control Plan.
 - .2 Provide concrete mix to meet following plastic state requirements:
 - .1 Workability: free of surface blemishes, loss of mortar, and segregation.
 - .3 Provide concrete mix to meet following hard state requirements:
 - .1 Durability and class of exposure: N.
 - .2 Compressive strength at 28 day age: 30 MPa minimum.
 - .3 Aggregate size 20 mm maximum.

Part 3 Execution**3.1 PREPARATION**

- .1 Obtain Departmental Representative's written approval before placing concrete.
 - .1 Provide 48 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 facilitate placing with minimum of re-handling, and without damage to existing structure or Work.
- .4 Pumping of concrete permitted only after approval of equipment and mix.
- .5 Disturbing reinforcement and inserts during concrete placement is prohibited.
- .6 Prior to placing of concrete obtain Departmental Representative's approval of proposed method for protection of concrete during placing and curing.
- .7 Protect previous Work from staining.
- .8 Clean and remove stains prior to application for concrete finishes.
- .9 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, workability, air content, temperature and test samples taken.
- .10 In locations where new concrete dowelled to existing work, drill holes in existing concrete.
 - .1 Place steel dowels of deformed steel reinforcing bars and pack solidly with epoxy grout to anchor and hold dowels in positions as indicated.
- .11 Do not place load upon new concrete until authorized by Departmental Representative.

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 in writing by Departmental Representative.
 - .2 Where approved by Departmental Representative, 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 reviewed by Departmental Representative.
 - .4 Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain written approval of modifications from Departmental Representative 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 coordination 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 Departmental Representative.
 - .1 Drilled holes to manufacturers' recommendations.
 - .3 Protect anchor bolt holes from water accumulations, snow and ice build-ups.
 - .4 Set bolts and fill holes with epoxy grout.
 - .5 Locate anchor bolts used in connection with expansion shoes, rollers and rockers with due regard to ambient temperature at time of erection.
- .4 Grout under base plates and machinery 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.
 - .1 Cooperate with any trade applying finishes to concrete surfaces and provide surfaces which will ensure adequate bond. Provide chases and reglets where required.
 - .2 Use procedures as reviewed by Departmental Representative or those noted in CSA A23.1/A23.2 to remove excess bleed water. Ensure surface not damaged.
 - .3 Use curing compounds compatible with applied finish on concrete surfaces. Provide written declaration of compatibility of compounds used.
 - .4 Powered steel trowel finish for: interior exposed slabs, slabs which receive resilient flooring, carpet, epoxy-based finishes, thin-set tiles, etc. and future floors. Do not trowel air entrained concrete.
 - .5 Rub exposed sharp edges of concrete with carborundum to produce 3 mm minimum radius edges unless otherwise indicated.

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- .6 Joint fillers:
 - .1 Furnish filler for each joint in single piece for depth and width required for joint, unless otherwise authorized by Departmental Representative.
 - .2 When more than one piece 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.

3.3 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 carried out by testing laboratory designated by Departmental Representative for review to CSA A23.1/A23.2.
 - .1 Ensure testing laboratory certified to CSA A283.
- .3 Ensure test results are distributed for discussion at pre-pouring concrete meeting between testing laboratory and Departmental Representative.
- .4 Contractor will take additional test cylinders during cold weather concreting. Cure cylinders on job site under same conditions as concrete which they represent.
- .5 Inspection or testing by Departmental Representative not to augment or replace Contractor quality control nor relieve Contractor of contractual responsibility.

3.4 CLEANING

- .1 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.
 - .1 Provide appropriate area on job site where concrete trucks and be safely washed.
 - .2 Disposal of unused admixtures and additive materials into sewer systems, into lakes, streams, onto ground or in other location to pose health or environmental hazard is prohibited.
 - .3 Prevent admixtures and additive materials from entering drinking water supplies or streams.
 - .4 Using appropriate safety precautions, collect liquid or solidify liquid with inert, noncombustible material and remove for disposal.
 - .5 Dispose of waste in accordance with applicable local, Provincial/Territorial and National regulations.

END OF SECTION

1. General**1.1 SUMMARY**

- .1 The work in this Section includes furnishing and installing all masonry brick veneer including masonry units, mortar and grout materials, and all accessories necessary for a complete installation.

1.2 SUBMITTALS

- .1 Shop Drawings:
 - .1 Brick: Manufacturer's product information.
 - .2 Mix designs for mortar and grout.
 - .3 Samples:
 - .1 Two full-size units from brick manufacturer for each different exposed masonry unit required showing full range of exposed color, texture, and dimensions to be expected in completed construction.
 - .2 Include size variation data verifying that actual range of sizes for brick falls within ASTM C 216 dimension tolerances for brick where modular dimensioning is indicated.
 - .4 Engineer shall determine acceptability of brick for use based on color, pattern, texture, and shade variation.
 - .5 Colored masonry mortar samples for each color required showing the full range of colors expected in the finished construction. Label samples to indicate type and amount of colorant used. Match existing brick mortar on the building indicated above.
 - .6 Accessories embedded in the masonry.
- .2 Quality Control Submittals:
 - .1 Installer Experience: Provide certification for installers including a minimum of five (5) years' experience on commercial facilities installing brick masonry.
 - .2 Experience record of mortar color pigment proposed for use.
 - .3 Manufacturer's certificate of compliance for the masonry units specified herein.
 - .4 Procedures for protecting finished work against freezing for the first 48 hours after installation.
 - .5 Method and materials for cleaning exposed surfaces.

1.3 QUALITY ASSURANCE

- .1 Regulatory Requirements: For masonry construction shall meet the requirements of the Uniform Building Code, the edition of which is required by the local jurisdiction, and as supplemented by these Specifications.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Storage and Protection:
 - .1 Protect brick materials from mud splatters and staining.

1.5 REFERENCES

- .1 The following is a list of standards which may be referenced in this Section:
 - .1 American Society for Testing and Materials (ASTM):
 - .1 C 144, Standard Specification for Aggregate for Masonry Mortar.
 - .2 C 150, Standard Specification for Portland Cement.
 - .3 C 207, Standard Specification for Hydrated Lime for Masonry Purposes.
 - .4 C 216, Standard Specification for Facing Brick (Solid Masonry Units Made from Clay or Shale).
 - .5 C 270, Standard Specification for Mortar for Unit Masonry.
 - .6 C 404, Standard Specification for Aggregates for Masonry Grout.
 - .7 C 476, Standard Specification for Grout for Masonry.
 - .8 C 652, Standard Specification for Hollow Brick (Hollow Masonry Units Made from Clay or Shale).
 - .9 C 91, Standard Specification for Masonry Cement.
 - .10 D 994, Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type).

1.6 ENVIRONMENTAL REQUIREMENTS

- .1 Temperature: Do not lay masonry when the ambient temperature is below 32°F on a rising temperature or below 40°F on a falling temperature, or when there is a probability of such conditions occurring within 48 hours, unless approval of the Engineer is obtained. In such case, make special provisions for heating materials and protecting the finished Work. Protect masonry against freezing for a minimum of 48 hours after being laid. Protect the tops of walls at all times. Cover with waterproof paper when rain or snow is imminent and Work is discontinued.

- .2 Humidity: Protect masonry construction from direct exposure to wind and sun when erected in an ambient air temperature of 99°F (37°C) in the shade with relative humidity less than 50%.

2.0 Products

2.1 MASONRY UNITS

- .1 Facing Brick Color, Texture, and Pattern: As selected by Engineer to match existing, from manufacturer's selection of options.
- .2 Facing Brick: ASTM C 216, Grade SW, Type FBX. Minimum compressive strength for individual brick: 2,500 psi; size: 2-1/4 inches by 4 inches by 8 inches Nominal. Actual: 2-1/4 inches by 3-5/8 inches by 7-5/8 inches.

2.2 MORTAR AND GROUT MATERIALS

- .1 Masonry Cement: ASTM C 91, low alkali content (0.03% maximum).
- .2 Portland Cement: ASTM C 150, Type I, low alkali content (0.60% maximum).
- .3 Lime: ASTM C 207, Type S.
- .4 Mortar: Premixed Type N or mortar mixed using components and proportions following manufactured masonry manufacturer's installation instructions. Comply with CAN/CSA A179.
 - .1 Integral Color: Masonry Grout, STPS.
 - .2 No antifreeze liquid, salts, or other substances are allowed to lower the freezing point. No calcium chloride is allowed in the mortar.
 - .3 Tuck-Pointing Mortar: Prehydrated Type N, one part portland cement, one part Type S hydrated lime, and 6 parts sand, by volume.
 - .4 Amount of admixture and method of introducing admixture in accordance with manufacturer's recommendations.
- .5 Sand: ASTM C 144, in addition not less than 5% passes the No. 100 sieve.
- .6 Water: Fresh, clean, and free of deleterious acids, alkalies, chlorides, and organic materials.

3.0 Execution

3.1 EXAMINATION

- .1 Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other specific conditions, and other conditions affecting performance of masonry veneer.
- .2 Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- .1 Provide or cut special shapes for corners and other areas as shown or as required. Match color and texture of standard units.
- .2 Cut masonry units with motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide continuous pattern and to fit adjoining construction. Use full-size units without cutting where possible.
- .3 Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry at existing building on site.

3.3 MORTAR PREPARATION

- .1 Place 1/2 the water and aggregate in the operating mixer; add cement; add the remaining aggregate and water and mix for at least 2 minutes. Add lime and continue mixing as long as needed to secure a uniform mass, but no less than 3 minutes after the addition of lime. Time the addition of admixture in strict accordance with the manufacturer's instructions and the procedure used for adding it to the mix shall provide good dispersion.
- .2 Mix mortar in machine with mixing drums clean and free of debris and dried mortar. Use mortar before the initial setting of the cement has taken place. Do not retemper mortar in which the cement has started to set.
- .3 Retemper mortarboards by adding water within a basin formed with the mortar and the mortar reworked into the water. Dashing or pouring water over mortar and retempering of harsh, non-plastic mortar is not permitted.
- .4 Where color tinting of mortar is required, add sufficient lime-proof color-fast mineral pigment to the mortar.

3.4 BRICK INSTALLATION

- .1 General: Do not install cracked, broken, or chipped masonry units exceeding ASTM C 216 allowances.
 - .1 Thoroughly wet all brick just before laying except in freezing weather where bricks are laid dry.
 - .2 Prewetting may also be omitted if the brick at the time of laying has a rate of absorption not exceeding 0.025 ounce of water per square-inch of surface after being placed in 1/8-inch of water for one minute.
 - .3 Coordinate installation with walls and other construction. Use masonry saws to cut and fit exposed units. Lay brick plumb, true to line, with level courses accurately spaced, and do not furrow bed joints.
 - .4 Finish horizontal run by racking back in each course; toothing not permitted. Adjust all units to final position while mortar is soft and plastic. If units are displaced after mortar has stiffened, remove, clean joints and units of mortar, and relay with fresh mortar.

- .5 Bond unexposed units in a wythe by lapping a minimum of 2 inches. Adjust shelf angles to keep Work level at proper elevation. Provide pressure relieving joints by placing a continuous 1/8-inch foam neoprene pad under the shelf angle.
 - .1 When joining fresh masonry to set or partially set masonry:
 - .2 Remove loose brick and mortar.
 - .3 Clean and lightly wet exposed surface of set masonry prior to laying fresh masonry.
- .2 Mortar Beds: Lay brick with full mortar coverage on horizontal and vertical joints. Rock closures into place with head joints thrown against two adjacent bricks in-place. Do not pound comers or jambs to fit stretcher units after setting in-place. Where adjustment to corners or jambs must be made after mortar has started to set, remove mortar and replace with fresh mortar.
- .3 Horizontal and Vertical Face Joints:
 - .1 Nominal Thickness: 3/8-inch.
 - .2 Construct uniform joints.
 - .3 Shove vertical joints tight.
 - .4 Tool joints concave in exposed surfaces when thumbprint hard using jointing tool.
 - .5 Concave tool exterior joints below grade.
 - .6 Flush cut all joints not tooled.
 - .7 Fill horizontal joints between top of masonry partition and underside of concrete with mortar.

3.5 LINTELS

- .1 Install lintels, angle and plate supports. Centre over opening width.

3.6 CONTROL JOINTS AND EXPANSION JOINTS

- .1 Provide control joints in brick veneer where indicated.
- .2 Construct expansion joints as indicated. Masonry reinforcing and wall flashing shall not continue across expansion joints.

3.7 CAVITY VENTS/WEEP HOLES

- .1 Install weep holes in brick veneer at 600 mm on centres horizontally above through-wall membrane flashing on steel angle lintels and at bottom of walls. Keep weep holes free of debris and mortar, with weep hole protection.

- .2 Install cavity vents in at 600 mm on centres horizontally below lintels, window/louvre sills, and at top of walls
- .3 Leave 3 mm space below shelf angles to allow for movement.

3.8 CLEANING

- .1 Remove mortar stains with clear water as Work progresses. Upon completion, clean all exposed surfaces with an approved method, removing all stains.
- .2 Cleaning Agents:
 - .1 Proprietary Cleaner: Manufacturer's standard-strength, general-purpose cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry surfaces of type indicated below without discoloring or damaging masonry surfaces; expressly approved for intended use by manufacturer of masonry units being cleaned.
- .3 Clean exposed unglazed masonry with stiff brush and clear water. If cleaning by water does not produce satisfactory results, apply cleaning agent to sample wall area of 20 square feet in location acceptable to the Engineer. Do not proceed with cleaning until sample area is acceptable to the Engineer.
- .4 Follow manufacturer's recommendations for use of cleaning agents.
- .5 Application:
 - .1 Thoroughly wet surface of masonry on which no efflorescence appears before using cleaning agent.
 - .2 Scrub with acceptable cleaning agent.
 - .3 Immediately rinse with clear water.
 - .4 Work small sections at a time.
 - .5 Work from top to bottom.
 - .6 Protect metal materials which may corrode when masonry is cleaned with acid solution.
 - .7 Remove efflorescence in accordance with brick manufacturer's recommendations.
- .6 Leave Work area and surrounding surfaces clean and free of mortar spots, droppings, and broken masonry.

END OF SECTION

Part 1 General**1.1 SUMMARY**

- .1 Supply all labour, materials, equipment, services and perform all operations required to complete all rough carpentry work to the full intent of the drawings and as herein specified.

1.2 RELATED REQUIREMENTS

- .1 Section 06 20 00: Finish Carpentry
- .2 Section 07 21 16: Blanket Insulation and Vapour Barrier
- .3 Section 07 25 00: Weather Barriers
- .4 Section 09 21 16: Gypsum Wallboard
- .5 Section 09 90 00: Painting

1.3 DELIVERY, STORAGE, HANDLING AND PROTECTION

- .1 Co-ordinate deliveries to comply with construction schedule and arrange ahead for off-the-ground, under cover storage location. Do not load any area beyond the design limits.
- .2 Materials shall be carefully checked, unloaded, stored and handled to prevent damage. Protect materials with suitable non-staining waterproof coverings.
- .3 Do not store seasoned materials under conditions that will cause their moisture content to increase.
- .4 Protect edges and corners of sheet materials from damage during handling and storage.
- .5 Store preservative-treated materials under cover, off the ground and protected from moisture.

Part 2 Products**2.1 MATERIALS**

- .1 Framing Lumber:
 - .1 Lumber for structural components shall be of species and grade specified, well seasoned, processed and stamped at same mill with appropriate grade markings. Conform to requirements of Standard Grading Rules for Canadian Lumber of National Lumber Grades Authority the (NLGA) with latest supplements, approved by the Canadian Lumber Standards Administrative Board.
- .2 Framing, Furring, Strapping, Blocking:
 - .1 Spruce, 122c, "Standard" light framing, except as otherwise specified.

.3 Plywood Sheathing:

- .1 Shall be 3/4" thick and/or thickness as indicated on drawings, exterior grade at exterior locations, Douglas Fir plywood, veneer core, Select Sheathing - Tight Face, unsanded, "B" faces and conforming to CSA 0121-08.

.4 Rough Hardware:

- .1 Provide rough hardware such as nails, spikes, staples, H-clips, bolts, nuts, washers, screws, clips, strap iron and including hardware for temporary enclosures. Nails for plywood shall be annular or spiral type, all other nails shall be spiral type. All nails, spikes and staples shall conform to CSA B111. All rough hardware shall be galvanized unless otherwise noted. Galvanizing shall conform to CAN/CSA-G164.

.5 All Other Materials and Hardware:

- .1 Shall be as noted on drawings.

2.2 PRESSURE PRESERVATIVE TREATED MATERIALS

- .1 Pressure Preservative Treated Lumber: Lumber graded and stamped in accordance with applicable grading rules and standards of associations or agencies approved to grade lumber by Canadian Lumber Standards Accreditation Board in accordance with CAN/CSA O80 Series -08.

- .1 Species: pine or spruce-pine
- .2 Grade: No.2 or better structural posts and lumber, pieces may be grade stamped or shipment certified by letter of compliance.
- .3 Grading authority: NLGA, paragraph 131CC
- .4 Material having twisted grain or structural defects affecting integrity of lumber will not be acceptable for this project.
- .5 Use only material with radius edges, minimum 6 mm.
- .6 Kiln dry lumber materials to 8% moisture content or less.

- .2 Pressure Preservative Treated Plywood: Treated in accordance with CAN/CSA O80 Series -08 using water-borne preservative to obtain minimum net retention of 4 kg/m³ of wood. Plywood or laminated materials shall be manufactured with exterior grade adhesives. After treatment, plywood shall be kiln dried to moisture content of 8% or less.

Part 3 Execution

3.1 INSTALLATION-GENERAL

- .1 Consult with and co-operate with other Sections in advance and build-in or make provisions for installation of other work.
- .2 Provide and fit in place all furring, strapping, battens, nailers, sleepers, grounds and blocking required to provide adequate properly placed fixing for all wood finishes, fitments and as required for the work of other trades.

- .3 Blocking, strapping and other rough carpentry indicated shall not be regarded as complete or exact. Provide all rough carpentry work required, whether specifically shown or not. Grounds shall be of a thickness to provide for application of finishes. Room side surfaces of grounds shall be plumb and in true plane throughout.
- .4 All nails shall be long enough so that at least half their length penetrate in to the second member. Splitting of wood members shall be minimized by staggering the nails in the direction of the grain and by keeping nails well in from edges.
- .5 Blocking shall be through-bolted to structure.
- .6 Anchor rough bucks to concrete or masonry with 3/8" diameter expansion bolts and shields or Drummond and Reeves security buck anchors, minimum three per jamb.

3.2 WOOD BLOCKING, CANTS AND NAILERS

- .1 Provide wood blocking, cants and nailers, where shown to be required as detailed. Bolt securely in place. Block under cants same thickness as installed roof insulation.
- .2 Check mechanical, electrical, architectural drawings and provide all blocking, cants, nailers etc. required. Leave work ready for built-up bituminous roofing and prefinished sheet metal flashings.

3.3 PLYWOOD PANELS

- .1 Provide plywood panels required for electrical/telephone mounting of equipment and in other locations as indicated on drawings.

3.4 PRESSURE PRESERVATIVE TREADED WOOD INSTALLATION

- .1 Comply with AWP A M4.
- .2 Re-treat surfaces exposed by cutting, trimming or boring with liberal brush application of preservative before installation. Allow first coating to fully soak into grain before applying second coating in accordance with manufacturer's instructions.
- .3 Remove with fine sandpaper, chemical deposits on treated wood to receive applied finish.
- .4 Use only hot-dipped galvanized, corrosion-resistant nail or screw fasteners. Staples are not acceptable for installation of preservative treated materials.
- .5 Use water-borne preservative treated wood for:
 - .1 Wood in contact with masonry or concrete,
 - .2 Wood within 450 mm of grade,
 - .3 Wood decking and fence boards,
 - .4 Wood in contact with flashings,
 - .5 Wood in contact with waterproofing membranes, confirm compatibility with membrane manufacturer prior to application.

.6 Use oil-borne preservative treated wood for:

- .1 Wood in contact with the ground,
- .2 Wood in contact with freshwater,
- .3 Landscaping timbers,
- .4 Retaining walls,
- .5 Piers or docks,
- .6 Pilings,
- .7 Bases of utility poles,
- .8 Bases of fence posts.

END OF SECTION

Part 1 General**1.1 SUMMARY**

- .1 Supply all labour, materials, equipment, services and perform all operations required to complete all finish carpentry installation including but not limited to the following:
 - .1 Site fabricated and installed shelving.
 - .2 Hardwood & Softwood
 - .3 Trim and accessories

1.2 RELATED REQUIREMENTS

- .1 Section 06 10 00: Rough Carpentry
- .2 Section 07 92 00: Joint Sealants
- .3 Section 08 11 13: Steel Doors and Frames
- .4 Section 08 51 13: Aluminum Windows
- .5 Section 08 70 00: Door Hardware
- .6 Section 09 21 16: Gypsum Wallboard
- .7 Section 09 90 00: Painting
- .8 Section 10 28 13: Washroom Accessories

1.3 QUALITY ASSURANCE

- .1 Contractor executing work of this section shall have a minimum of five (5) years continuous Canadian experience in successful manufacture/fabrication and installation of work of type and quality shown and specified. Submit proof of experience upon Departmental Representative's request.
- .2 Follow applicable requirements of The Architectural Woodwork Manufacturer's Association of Canada (AWMAC) Standard for Millwork latest edition, including supplements and modifications.

1.4 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00.
 - .1 Submit manufacturer's instructions, printed product literature, data sheets and catalogue pages for specified products. Include product characteristics, performance criteria, dimensions and profiles, finish and limitations on use.
 - .2 Submit two (2) copies of WHMIS MSDS.
- .2 Shop Drawings:
 - .1 Prepare and submit shop drawings in general accordance with AWMAC AWS manual.

- .2 Indicate profiles and dimensions, assembly techniques, jointing, methods of fastening, terminations and other related details.
- .3 Indicate materials, thicknesses, finishes and hardware.
- .4 Include schedule or key plan.
- .5 Show profiles, elevations and details at scales recommended by AWMAC AWS.
- .6 Where necessary, show location and type of blocking and backing required within supporting assemblies.

1.5 ADMINISTRATIVE REQUIREMENTS

- .1 Coordination: Coordinate sizes and locations of framing, blocking, furring, and reinforcements provided by work that is specified in other Sections is complete before starting work of this Section.

1.6 DELIVERY, STORAGE, HANDLING & PROTECTION

- .1 Do not permit delivery of work of this section to site until area is sufficiently dry so that woodwork will not be damage by excessive changes in moisture content.
- .2 Coordinate deliveries to comply with construction schedules and arrange ahead for under cover storage location.
- .3 Materials shall be carefully checked, unloaded, stored and handled to prevent damage. Protect material with suitable non-staining waterproof coverings.
- .4 Store material in original, undamaged containers or wrappings.
- .5 Unsatisfactory materials shall be promptly removed from the site.
- .6 Adequately protect the structure and work of other sections during delivery, storage, handling and execution of the work of this section.
- .7 Provide tools, plant and other equipment required for the proper execution of the work of this section.

1.7 SITE CONDITIONS

- .1 Site Measurements: Verify dimensions by site measurements before fabrication and indicate measurements on Shop Drawings where casework is indicated to fit walls and other construction; coordinate fabrication schedule with construction progress to avoid delaying the Work; locate concealed framing, blocking, and reinforcements that support woodwork by site measurements before being enclosed and indicate measurements on Shop Drawings.

- .2 Established Dimensions: Establish dimensions and proceed with fabricating casework without confirmed site measurements where site measurements cannot be made without delaying the Work; coordinate with the construction to ensure that actual dimensions correspond to established dimensions; allow for trimming and fitting.
- .3 Ambient Conditions: Maintain area or room in which casework is being installed at a uniform temperature and humidity for 24 hours prior to, during and after installation in accordance with AWS for relative humidity and moisture content; provide additional lighting to maintain a minimum of 430 lx on surfaces and areas where casework is being installed.

1.8 WARRANTY

- .1 Warrant plastic laminate work of this Section against defects in materials and workmanship in accordance with General Conditions but for an extended period of two (2) years and agree to repair or replace faulty materials or work which appears during warranty period, without cost to PCA. Defects shall include but not be limited to, opening of joints, cracking, shrinkage, warpage, delamination of plastic laminate.

Part 2 Products

2.1 MATERIALS

- .1 Hardwood lumber: oak, birch, ash, maple or other species, as indicated on drawings and conforms to requirements of AWMAC Custom Grade and NHLA Select Grade, kiln-dried to moisture content recommended for location of the Work.
- .2 Panel Materials:
 - .1 Plywood: Douglas fir veneer core plywood, 19mm (3/4") thick or thickness as indicated on drawings, Select Sheathing-Tight Face, good two sides, sanded "B" faces and conforms to CSA 0121.
 - .2 Particleboard: ANSI A208.1, 700 kg/m³ density.
 - .3 Medium density fibreboard (MDF): ANSI A208.2, density minimum 750 kg/m³, moisture resistant; standard of acceptance: Premier Plus MR MDF by Medex.
- .3 Douglas fir plywood (DFP): to CSA O121, standard construction.
- .4 Canadian softwood plywood (CSP): to CSA O151, standard construction.
- .5 Low density fibreboard: to CSA-A247M.
- .6 Glue: CSA 0112, Type 1. Water-resistant urea-formaldehyde resin glue.
- .7 Rough Hardware:

- .1 Provide required rough hardware to frame and fix all finished carpentry and include for expansion shields, nails, spikes, screws, bolts, anchors, clips, plates, washers, rods, wires, wall brackets, chrome finishing trim, and other ironmongery which may be required. All wood screws shall be drill thread screws except at chipboard where self-tapping screws shall be used. All rough hardware shall be galvanized unless otherwise noted.

- .8 Removed and Reinstall Items:

- .1 As indicated on drawings.

2.2 FABRICATION AND WORKMANSHIP

- .1 Work shall be executed by skilled carpenters under the supervision of a competent carpentry foreman. All items shall be shop assembled, insofar as is practical. Unless indicated otherwise comply with AWMAC Custom Grade requirements.
- .2 Make thorough examination of drawings and details, check anchorage, interfacing with work of other sections and other factors influencing the installation of the work, and be fully cognizant of requirements.
- .3 Finished woodwork shall be free from bruises, blemishes, mineral marks, knots, shakes and other defects and shall be selected for uniformity of colour, grain and texture.
- .4 Be responsible for methods of construction and for ensuring that materials are rigidly and securely attached and will not be loosened by the work of other sections.
- .5 Fabricate the work in a manner which will permit expansion and contraction of the materials without visible open joints.
- .6 Mitre exposed corners; no end grain shall be visible in completed installation.
- .7 Provide solid wood edging at exposed plywood edges.
- .8 Provide wood mouldings and wainscot to profiles as indicated on drawings.
- .9 Jointing of shop assembled work shall be by means of mortise and tenons, dowels, stub tenons, dovetails, dadoes, lock joints as applicable for the jointing condition.
- .10 Accurately cut, mitre, fit and frame work together to produce tight hairline joints, rigidly secured together in a permanent manner using glue, blind screw fixing or nails. Use concealed glue blocks for additional strength where possible.
- .11 Finished woodwork shall be in one piece wherever possible and all trim shall be in long lengths. Where jointing is necessary in the length, the joints between pieces shall be scarfed, glued and properly fastened. The material being jointed shall match reasonably well for grain and colour where natural finish is specified. Joints between lengths where paint finish is to be applied may be finger jointed in lieu of scarfing. Trim shall be accurately cut and mitred at all corners, glued and properly fastened.

- .12 Machine dressed work shall be properly machine using sharp cutters, the finished work shall be free from drag, feathers, slivers or roughness of any kind. Remove machine marks by sanding.
- .13 Finished woodwork shall be carefully hand sanded after installation to remove roughness and planer marks. Sanding shall be done with the grain of the wood and finished with fine grit paper to leave a smooth scratch-free surface suitable to receive the paint or natural finishes to be applied over as specified in Section 09 90 00.
- .14 Nail heads in the finished surfaces shall be set with straight shank nail sets. Screw and bolt heads in finished surfaces shall be let into the work and capped with edge grain wood caps dressed and finished flush.
- .15 Provide cutouts for sinks, fixtures, fittings, inserts, outlet boxes, services, other mechanical and electrical items and appliances. Round corners, and chamfer edges. Where items for cutouts butt to underside or back of finished surface, finish exposed edge to match face. Where item covers cutout, and at all concealed cut edges of core material, apply uniform coating of seal to cut edges.
- .16 The finished work shall be of a high quality, with all corners having exact angles to ensure no swerve or twisting. All bends, crimps or angle parts shall be produced by professional equipment and tools for this purpose and if long runs or repeats are required, such shall be produced in the shop, or have proper equipment on site.

2.3 MOISTURE CONTENT

- .1 Moisture content of interior woodwork shall be between 8% and 12%.

2.4 FINISHES

- .1 Finishes to be selected by Departmental Representative.
- .2 Apply stain to items where scheduled, indicated or as directed Departmental Representative, providing uniform required stain colour(s).
- .3 Provide finishes as indicated on drawings and scheduled, in accordance with requirements of Section 09 90 00.

Part 3 Execution

3.1 EXAMINATION

- .1 Inspect available spaces and check surfaces over which the work of this section is dependent for any irregularities detrimental to the application and performance of the work. Notify Departmental Representative in writing of all conditions which are at variance with those on the Contract Documents and/or detrimental to the proper and timely installation of the work of this section. The decision regarding correct measures shall be obtained from the Departmental Representative prior to proceeding with the affected work.

- .2 Check humidity in building with moisture reading instruments if doubt exists that building is sufficiently dry and ready to receive millwork. Do not proceed until unsatisfactory conditions are corrected.

- .3 Commencement of work indicates acceptance of surfaces and conditions.

3.2 INSTALLATION - GENERAL

- .1 Provide and fit in place all furring, strapping, battens, grounds and blocking required to provide adequate properly placed fixing for all finish carpentry work and as required for the work of other sections.
- .2 Refer to drawings and coordinate with drywall, the painting and floor covering sections to establish sequence of installation or execution of each others' work. Pay particular attention to areas where materials are supplied by others and installed under this Contract.
- .3 All nails where their use is permitted, shall be long enough so that at least half their length penetrates into the second member. Splitting of wood members shall be minimized by staggering the nails in the direction of the grain and by keeping nails well in from edges.
- .4 Unless otherwise permitted by Departmental Representative, fasten finish carpentry components in concealed manner.
- .5 Plastic laminate work shall be free of cracks and chipped or broken edges. Replace damaged components.
- .6 Fitments shall be installed level, plumb and true and complete in all respects.
- .7 Fit small scribe moulds of same material as fitment to hide voids at junction of fitment to fitment and fitment to walls, partitions, ceilings, furrings.
- .8 Provide and install all pass-through doors, cable entry plugs, computer paper feed slot guides, casters, wall mounted standards with brackets and accessories as indicated on drawings, secure, plumb, level and true to line to adjacent surfaces and items.

3.3 PRIMING

- .1 Immediately in instances where primed work is cut (as for fitting), a coat of primer shall be applied to the resulting raw surfaces.

3.4 INSTALLATION - CABINET HARDWARE

- .1 Install cabinet hardware in shop wherever possible.
- .2 Install cabinet hardware secure, plumb, level, true to line, and in accordance with hardware manufacturer's instructions.
- .3 Cut and fit to finish carpentry and millwork for proper installation and operation of cabinet hardware.

- .4 Size cutouts so that hardware item completely covers cutouts.
- .5 Adjust and lubricate cabinet hardware as required for smooth and efficient operation without binding.

3.5 INSTALLATION - FINISHING HARDWARE

- .1 Take delivery of all finishing hardware and install. Inspect each item as received.
- .2 Set, fit and adjust hardware according to manufacturer's directions at heights directed by Departmental Representative. Hardware shall operate freely. Protect installed hardware from damage and paint spotting.
- .3 Install all hardware for hollow metal doors including hinges. Prepare wood doors for installation with required bevels, clearances and mortices for hardware. Install wood doors, door grilles and all applicable hardware.
- .4 Pre-drill kickplates and doors before attachment of plates. Apply with water-resistant adhesive and countersunk stainless steel screws.

3.6 INSTALLATION - WASHROOM SIGNAGE

- .1 Install all washroom signs at proper locations indicated on the drawings or as directed by the Departmental Representative in accordance with sign manufacturer's installation directions.

3.7 CLEANING

- .1 Progress Cleaning: Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.

3.8 TOUCHUP AND PROTECTION

- .1 Fill and retouch all nicks, chips and scratches in factory finishes and substrate materials to AWS standards. Replace damaged items that cannot be repaired to AWS standards.
- .2 Protect installed products and components from damage during construction.
- .3 Repair damage to adjacent materials caused by finish carpentry installation.
- .4 Leave work to be site finished ready for finishing.

END OF SECTION

Part 1 General**1.1 SECTION INCLUDES**

- .1 Custom plastic laminated (PLAM) Casework.
- .2 Custom shop-fabricated wood veneer, plastic laminate, and lacquered wall paneling.
- .3 Countertops.
- .4 Cabinet hardware.
- .5 Shelving.

1.2 ADMINISTRATIVE REQUIREMENTS

- .1 Coordination:
 - .1 Coordinate with other work having a direct bearing on work of this Section.
 - .2 Coordinate the work with mechanical, electrical and electrical rough-in, installation of associated and adjacent components.
 - .3 Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other sections to ensure that cabinets can be supported and installed as indicated.
 - .4 Coordinate metal reinforcement by Section 09 21 16 with mounting requirements and wall cleats for wood paneling, base and upper cabinets and accessories.
- .2 Pre-installation Meeting:
 - .1 Schedule a pre-installation meeting at the Site one (1) week before starting work of this Section.
 - .2 Require attendance of the Engineer, Installer, Manufacturer and other parties directly affected by the work of this Section.
 - .3 Review preparation and installation procedures, coordination and scheduling required with related work, referenced installation standards, manufacturer's installation instructions and warranty requirements.
 - .4 Prepare and distribute minutes of meeting to Departmental Representative and participating parties.

1.3 SUBMITTALS FOR INFORMATION

- .1 Qualifications Data: For Fabricator and Installer.
- .2 Installation Data: Provide application instructions.
- .3 Inspection reports.

1.4 QUALITY ASSURANCE

- .1 Perform work in accordance with Architectural Woodwork Institute (AWI), Architectural Woodwork Manufacturers Association of Canada (AWMAC) and Woodwork Institute's (WI) North American Architectural Woodwork Standards (NAAWS), Premium Grade.
- .2 Installer Qualifications: Company specializing in fabricating Products specified in this section with minimum five (5) years' documented experience.

1.5 DELIVERY, STORAGE, AND PROTECTION

- .1 Protect units from moisture damage.

1.6 ENVIRONMENTAL REQUIREMENTS

- .1 During and after installation of work of this section, maintain the same temperature and humidity conditions in building spaces as will occur after occupancy.

Part 2 Products**2.1 REMOVE AND REINSTALL ITEMS**

- .1 As indicated on drawings.

2.2 ACCESSORIES AND AUXILIARY MATERIALS

- .1 Adhesive: Type recommended by NAAWS to suit application.
- .2 Fasteners: Size and type to suit application.
- .3 Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; nickel plated finish in concealed locations and stainless steel finish in exposed locations.
- .4 Concealed Joint Fasteners: Threaded steel.
- .5 Tape: Aluminum foil, insulating and heat dissipating tape. Use butyl tape for isolating wood from masonry or cementitious materials.

2.3 FABRICATION

- .1 When necessary to cut and fit on site, provide materials with ample allowance for site cutting and scribing.

Part 3 Execution**3.1 EXAMINATION**

- .1 Verify existing conditions before starting work.
- .2 Verify adequacy of backing and support framing.

- .3 Verify location and sizes of utility rough-in associated with work of this section.

3.2 INSTALLATION

- .1 Install Work in accordance with NAAWS Premium Grade.
- .2 Set and secure casework in place; rigid, plumb, and level. Provide anchoring to conform to seismic requirements.
- .3 Use fixture attachments in concealed locations for wall mounted components.
- .4 Use concealed joint fasteners to align and secure adjoining cabinet units and counter tops.
- .5 Carefully scribe casework abutting other components, with maximum gaps of 1 mm. Do not use additional overlay trim for this purpose.
- .6 Secure cabinet counter bases to floor using appropriate angles and anchorages.
- .7 Countersink anchorage devices at exposed locations. Conceal with solid wood plugs of species to match surrounding wood; finish flush with surrounding surfaces.
- .8 Isolate wood members in contact with masonry or cementitious construction with butyl tape.
- .9 At junctions of counter and back splash and at junctions of cabinets and adjacent wall finishes, apply small bead of clear silicone sealant.

3.3 ADJUSTING

- .1 Test installed work for rigidity and ability to support loads.
- .2 Adjust moving or operating parts to function smoothly and correctly.

3.4 CLEANING

- .1 Clean installed work.
- .2 Clean casework, counters, shelves, hardware, fittings, and fixtures.

END OF SECTION

Part 1 General**1.1 SUMMARY**

.1 Supply and install the following as indicated in this Section:

- .1 Glass Fibre Batt Insulation
- .2 Mineral Fibre Batt Insulation
- .3 Foamed-In-Place Insulation
- .4 Vapour Barrier

1.2 RELATED REQUIREMENTS

.1 Section 09 21 16: Gypsum Wallboard

1.3 REFERENCE STANDARDS

- .1 Conform to latest etc etc
- .2 Underwriters Laboratories of Canada (ULC):
 - .1 CAN/ULC S702-09-AM1, Standard for Thermal Insulation Mineral Fibre for Buildings
 - .2 CAN/ULC S114-05, Standard Method of Test for Determination of Non-Combustibility in Building Materials
 - .3 CAN/ULC S102-10, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies
- .3 Canadian General Standards Board (CGSB):
 - .1 CAN/CGSB-51.10-92, Mineral Fibre Board Thermal Insulation
 - .2 CAN/CGSB-51.34-M86, Vapour Barrier, Polyethylene Sheet for Use in Building Construction

1.4 SUBMITTALS

- .1 Provide submittals in accordance with the General Conditions and Section 01 33 00.
- .2 Affidavits:
 - .1 In lieu of samples and inspection procedures when required by CGSB Standards, submit affidavits, if requested, that materials supplied under these requirements meet CGSB Standards.

.3 Safety Data Sheets:

- .1 Submit WHMIS safety data sheets for inclusion with project record documents. Keep one copy of WHMIS safety data sheets on site for reference by workers.

1.5 DELIVERY, STORAGE, HANDLING AND PROTECTION

- .1 Handle and store material in accordance with the manufacturer's recommendations.
- .2 Materials shall be delivered to Site in their original packages and containers bearing the manufacturer's labels intact and clearly visible.
- .3 Store materials in dry, watertight areas and protect to prevent damage by other trades.
- .4 Do not expose rigid insulation board to sunlight after installation. Protect it with black polyethylene or tarpaulin cover as recommended by manufacturer if permanent covering is not completed within twenty-four (24) hours.

Part 2 Products

2.1 MATERIALS

.1 Glass Fibre Batt Insulation:

- .1 Unfaced, preformed glass fibre batt insulation in accordance with CAN/ULC S702-09, Type 1; having a nominal RSI of 0.55/25 mm, thickness as required to meet design insulation values indicated on drawings or as required to fill insulated spaces where not indicated; formaldehyde free, manufactured using recycled glass.

.2 Basis of Design Materials:

- .1 Owens-Corning Canada Inc., Pink Fiber Glass Insulation
- .2 CertainTeed Sustainable Insulation
- .3 Johns-Manville Formaldehyde Free Fibreglass Insulation

.2 Foamed-In-Place Insulation:

- .1 Two-component polyurethane froth/spray kit, UL Class I (flame spread of 25 or less), Great Stuff by Dow Building Solutions Inc., or approved equal.

.3 Vapour Barrier:

- .1 6 mils thick clear polyethylene sheet conforming to CAN/CGSB-51.34.

.4 Polyethylene Adhesive Tape:

- .1 Scotch Brand No.483 manufactured by 3M Company.

Part 3 Execution**3.1 PREPARATION**

- .1 All materials and methods used in application shall be in strict accordance with the printed instructions of the manufacturer.
- .2 Remove stains, defective work or materials when directed by the Engineer and replace with approved work and materials at no cost to PCA.
- .3 Clean all surfaces of dust, dirt and projecting surfaces prior to the application of insulation.
- .4 Do not install insulation when ambient air and surface temperatures are below 4 deg C (40 deg F) or more than 38 deg C (100 deg F). The temperature shall be maintained in the building during and after installation as necessary by the above requirement and as directed for curing of the adhesive. Obtain approval prior to proceeding with application of adhesive and insulation.

3.2 INSTALLATION

- .1 Install insulation to maintain continuity of thermal protection to building elements and spaces.
- .2 Cut insulation to fit around electrical boxes, pipes, ducts, openings, corners and all protruding obstructions occurring on the surface to be insulated and seal with adhesive.
- .3 Keep insulation minimum of 75 mm (3") away from heat emitting devices.
- .4 Trim and cut insulation neatly to fit spaces. Butt joints tightly, offsetting vertical joints. In multiple layer application, offset both vertical and horizontal joints.
- .5 Install batt insulation in locations and thicknesses shown. Seal joints to prevent transfer of moisture.
- .6 Apply foamed-in-place insulation at exterior walls, around penetrations through walls and where indicated. Apply foamed-in-place insulation with suitable equipment in accordance with the manufacturer's written instructions. Fill all joints completely, leaving no voids or gaps and trim excess material.
- .7 Install continuous vapour barrier, overlapping adjacent surfaces including self-joints a minimum of 50 mm (2") and seal with specified tape. Applications to form a complete vapour seal.

END OF SECTION

1 General

1.1 SUMMARY

- .1 This Section includes requirements for supply and installation of self-adhered air and vapour membranes that prevent exfiltration and infiltration between interior and exterior of building through wall and roof transition construction.

1.2 RELATED REQUIREMENTS

- .1 Section 06 10 00: Rough Carpentry
- .2 Section 09 21 16: Gypsum Wallboard

1.3 REFERENCE STANDARDS

- .1 American Society for Testing of Materials (ASTM):
 - .1 ASTM E96/E96M-10, Standard Test Methods for Water Vapour Transmission of Materials
 - .2 ASTM E2178-11, Standard Test Method for Air Permeance of Building Materials

1.4 ADMINISTRATIVE REQUIREMENTS

- .1 Coordination: Coordinate interface of membranes specified in this Section with adjacent systems to ensure continuity of system and that junctions between various components are effectively sealed; verify with manufacturers and installers for installation procedures of materials incorporated into air and vapour membrane elements including membranes, transitions, coatings and sealants and continuity with roofing membrane.

1.5 SUBMITTALS

- .1 Provide submittals in accordance with the General Conditions and Section 01 33 00.
- .2 Action Submittals:
 - .1 Product Data: Submit manufacturer's product literature, and installation instructions required for complete and proper installation of air and vapour retarder elements including membranes, primers, fasteners, proprietary application equipment, etc.
 - .2 Samples: Submit representative sample of air and vapour membrane minimum 305 mm x 305 mm (12" x 12") with factory applied identification clearly visible.
- .3 Safety Data Sheets:
 - .1 Submit WHMIS safety data sheets for inclusion with project record documents. Keep one copy of WHMIS safety data sheets on site for reference by workers.

1.6 QUALITY ASSURANCE

- .1 Qualifications: Provide proof of qualifications when requested by Departmental Representative:
 - .1 Manufacturer: Obtain air and vapour membrane materials through one source from a single manufacturer or using materials from a secondary source that are acceptable to the manufacturer.
 - .2 Installer: Use an installation company that is acceptable to the manufacturer, using workers who are trained and approved by the membrane manufacturer having experience with projects of similar complexity and area.

1.7 ENVIRONMENTAL CONDITIONS

- .1 Air and vapour barrier is not to be applied to surfaces that are either wet, oily, frosted, dirty or contaminated in any way.
- .2 Ambient Conditions: Apply air and vapour membrane to substrate surfaces that are within manufacturer's installation temperature threshold range accounting for wind cooling and apparent temperature when actual temperature is approaching manufacturer's minimum temperature threshold.
- .3 Air and vapour barrier is not to be applied over lightweight cast-in-place concrete containing high moisture or certain curing compounds. Cast-in-place concrete should be cured for a minimum of two weeks prior to application of air barrier membrane.

1.8 DELIVERY, STORAGE, HANDLING AND PROTECTION

- .1 Coordinate deliveries with construction schedule and arrange for proper storage areas.
- .2 All materials are to be stored in a clean, dry and protected area in their original containers sealed and undamaged. Manufacturer's labels are to be easily visible and undamaged.
- .3 Care and precaution are to be exercised by the applicator so as not to damage the work of other trades. Applicator is responsible to take all necessary precautions to protect work of other trades during application.
- .4 In addition to the above, store modified bituminous sheet type air and vapour barrier membrane as follows:
 - .1 Store rolls of membrane on end, in vertical position without leaning with selvage end up.
 - .2 Store materials away from direct heat or open flame.
 - .3 For installation in cold weather, store rolls of membrane in heated storage trailer for minimum of 24 hours with the temperature kept at 21 deg C and remove for application with as little exposure as possible to low ambient temperatures.
- .5 Provide portable fire extinguishers within easy access of torching applications.

1.9 WARRANTY

- .1 Manufacturer's Warranty: Submit manufacturer's warranty stating that air and vapour membranes and accessories are free of defects and are manufactured to meet manufacturer's published physical properties and material specifications as of the date of product delivery.
- .2 Installer's Warranty: Submit installers warranty stating that air and vapour membranes and accessories are installed in accordance with manufacturer's recommendations and that membrane, transitions and through-wall flashing membranes, primers, mastics, adhesives and sealants are sourced from one manufacturer.

2 Products**2.1 MANUFACTURERS**

- .1 Basis-of-Design products are named in this Section; form the basis-of-design materials for the project; additional manufacturers offering similar products may be incorporated into the work of this Section provided they meet the performance requirements established by the named products and provided they submit requests a minimum of five (5) days in advance of Bid Closing.
- .2 Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - .1 Henry Company
 - .2 Soprema Inc.
 - .3 Tremco

2.2 MATERIALS

- .1 Self adhering SBS modified bitumen reinforced membrane; having low temperature formulation appropriate for installation requirements; tested in accordance with ASTM E96 and ASTM E2178, and having the following nominal properties:
 - .1 Low Temperature Flexibility: Less than -10°C
 - .2 Basis of Design Products:
 - .1 Blueskin SA by Henry Company
 - .2 Sopraseal Stick 1100-T by Soprema Inc.
 - .3 ExoAir 110LT by Tremco
- .2 Primer: Solvent based, synthetic rubber adhesive type, quick setting, solvent based, roller consistency type primer.
 - .1 Basis of Design Product: Blueskin Primer by Henry Company.

- .3 Air Barrier Sealant: High solids, rubber asphalt caulking and sealing compound.
 - .1 Basis of Design Product: 570-05 Polybitume Sealing Compound by Henry Company.
- .4 Through Wall Flashing Membrane: 40 mils (1 mm) thick x width to suit, strips of self-adhering, SBS rubberized asphalt laminated to a cross-laminated, high density polyethylene film with a siliconized release liner.
 - .1 Basis of Design Product: Blueskin TWF by Henry Company
- .5 Packing Insulation: Loose, glass fibre or mineral fibre insulation, 1.0 lb/cu.ft. density, and conforming to CAN/CGSB-51.11.

3 Execution

3.1 EXAMINATION

- .1 Ensure that surfaces to receive air barrier membrane are dry, firm, suitable for bond, and free from dust, dirt, loose material, projections, ice, frost, slick, grease, oil or other matter detrimental to bond of sheet type air barrier membrane.
- .2 Report surfaces left unacceptable by other trades in writing to the Departmental Representative before commencing installation.
- .3 Co-ordinate work of this section with the work of other sections.
- .4 Commencement of work of this section implies acceptance of surfaces and conditions.

3.2 PREPARATION

- .1 Prepare surfaces in accordance with manufacturer's written requirements for type of substrate; free from voids, spalled areas, loose aggregates or sharp points; clean surfaces to remove contaminants that could affect bond such as grease or wax, dust, dirt and debris.
- .2 Apply primer to substrates when required by manufacturer at rate recommended by manufacturer; cover primed substrates on same day, reapply primer when work cannot be completed on the same day.

3.3 INSTALLATION

- .1 Install air and vapour barrier membranes in accordance with manufacturer's written requirements, using appropriate equipment and skilled workers and as follows:
 - .1 Transition Membranes: Connect air and vapour membranes to adjacent assemblies having pre-installed transition membranes; install transition membranes where required to maintain continuity of building envelope.
 - .2 Through Wall and Flexible Flashings: Install flexible membranes where required to maintain flow direction to divert water away from face of building envelope.

- .2 Separate air and vapour barrier membranes from incompatible materials, and provide manufacturer's recommended transition materials required to maintain continuity of building envelope.
- .3 Cut and tightly seal air and vapour barrier membrane around penetrations and protrusions to provide a continuous air barrier.
- .4 Lap joints in air and vapour barrier membrane minimum of 75 mm (3").
- .5 Where masonry anchors and supports pass through air and vapour barrier membrane, ensure continuity of air and vapour barrier membrane by applying air barrier mastic all around/over masonry anchors.
- .6 Prior to masonry being installed by section 04 20 00, inspect air and vapour barrier membrane for punctures, misaligned seams and fishmouths. Apply additional layer of air and vapour barrier membrane over damaged/affected areas, extending membrane minimum of 152 mm (6") beyond damage in all directions.

3.4 SITE QUALITY CONTROL

- .1 Allow access for review and inspection and testing of installed air and vapour barrier membrane, and repair of deficiencies before placement of insulation materials.
- .2 Manufacturer's Site Services: Arrange for air and vapour barrier membrane manufacturer's technical personnel to review building envelope during installation.
- .3 Departmental Representative reserves the right to engage a testing firm to perform air and vapour barrier membrane testing to confirm performance of installed membranes and insulation systems in accordance with Section 01 45 00; testing will be performed when the building mechanical systems are balanced and operating; when building is occupied and climatic conditions are suitable for infrared thermographic scan of the building.
- .4 Cooperate with testing agency; repair or replace air and vapour barrier membrane as directed by testing agency, at no additional cost to the Departmental Representative.

3.5 CLEANING AND PROTECTION

- .1 Protection: Protect membrane from damage where membrane is exposed for prolonged time using opaque plastic sheets or tarpaulins or as recommended by manufacturer; protect membrane from penetrations and damage by subsequent Work; assign payment for repairs to responsible parties; make repairs in accordance with manufacturer's written instructions using original installers.
- .2 Cleaning: Remove masking materials, debris, excess materials and equipment from site at completion of the work; conduct ongoing daily cleaning as directed by the Contractor; clean stains, drips or spills of coatings, sealants, mastic or primers visible on finished surfaces.

END OF SECTION

Part 1 General**1.1 SUMMARY**

- .1 This Section specifies specific construction consisting of any device intended to close off an opening or penetration during a fire and/or materials that fill an opening in a wall or floor assembly where penetration is by cables, cable trays, conduits, ducts, pipes and any penetrate through termination device, such as electrical outlet boxes along with their means of support through the wall or the floor opening.
- .2 Manufacturer's site services and site quality control.

1.2 RELATED REQUIREMENTS

- .1 Coordinate with Work of other Sections having a direct bearing on Work of this Section.

1.3 REFERENCE STANDARDS

- .1 Underwriters Laboratories of Canada (ULC):
 - .1 CAN/ULC S115, Standard Method of Fire Tests and Firestop Systems

1.4 PERFORMANCE REQUIREMENTS

- .1 Materials, accessories and application procedures listed by ULC, CUL, WHI (Intertek/Warnock Hershey) or OPL (Omega Point Laboratories), or tested in accordance with CAN/ULC-S115 to comply with building code requirements.
- .2 Fire-Resistive Joint Systems:
 - .1 Generally, use listed assembly types F, FT, FH or FTH, as applicable.
 - .2 Joints at Exterior Curtain-Wall/Floor Intersections: Use joint systems tested at a positive pressure differential of 2.49 per ASTM E2307.
- .3 Firestopping Materials: CAN/ULC-S115 and ASTM E2307, and to achieve fire ratings indicated.
- .4 Surface Burning of Exposed Materials: CAN/ULC-S102 with a minimum flame spread/smoke developed rating of 25/50.
- .5 Engineering Judgment: Where there is no specific third party tested and classified firestop system available for a particular firestop configuration, provide an Engineering Judgment acceptable to the authority having jurisdiction.

1.5 SUBMITTALS FOR REVIEW

- .1 Provide submittals in accordance with Section 01 33 00.
- .2 Product Data: Provide data on product characteristics, performance and limitation criteria, and indicating construction details accurately illustrating the Work. Include descriptions sufficient for identification at Site.

- .3 System Design Listings: Submit system design listings including design designations, locations and illustrations, from a qualified testing and inspection agency applicable, to each firestop configuration.
 - .1 Where Site conditions require modification to a qualified testing agency's illustration for a particular firestopping system condition, submit illustration, with modifications marked, approved by firestopping manufacturer's fire-protection engineer as an engineering judgment or equivalent fire resistance rated assembly.
- .4 Firestop System Engineering Judgments: When required for acceptance by the authority having jurisdiction, Firestop System Engineering Judgment submissions shall:
 - .1 Clearly indicate that the recommended firestop system is an engineering judgment;
 - .2 Identify the job name, project location and firm which the engineering judgment is issued to.
 - .3 Be prepared, stamped and signed by a Professional Engineer specializing in fire protection registered in the province of Alberta.
 - .4 Be presented in appropriately descriptive written form with or without detail drawings where appropriate;
 - .5 Reference tested system(s) which the engineering judgment is based on;
 - .6 Include clear directions for the installation of the recommended firestop system;
 - .7 Include dates of issue and authorization signature as well as the issuer's name, address and telephone number;
- .5 Samples:
 - .1 Submit samples of each type of firestop and smoke seal material and accessory.

1.6 SUBMITTALS FOR INFORMATION

- .1 Qualifications Data: For manufacturer and installer.
- .2 Installation Data: Manufacturer's special preparation and installation requirements.
- .3 Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- .4 Delegated Design Submittals: Design firestopping assemblies required by the Contract Documents to withstand fire ratings indicated and in accordance with the Alberta Building Code.

- .1 Provide manufacturer's standard listings where site conditions match standard assembly listing.
- .2 Provide manufacturers engineered judgement with acceptance by authorities having jurisdiction, signed and sealed by the manufacturer's fire protection engineer where assembly does not match standard assembly listing.
- .5 Manufacturer's Field Reports: Indicate environmental conditions under which fireproofing materials were installed. Compatibility and Adhesion Test Reports: From manufacturer indicating the following:
 - .1 Materials have been tested for bond with substrates.
 - .2 Materials have been verified by manufacturer to be compatible with substrate.
 - .3 Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

1.7 QUALITY ASSURANCE

- .1 Applicator shall be licensed by the manufacturer of fireproofing materials.
- .2 Submit manufacturer's certification that materials meet or exceed specified requirements.
- .3 Maintain flame and temperature ratings equal to surrounding materials.
- .4 Single Responsibility: Perform work using single applicator having undivided responsibility for entire Project, including coordination with plumbing, mechanical and electrical installations.
- .5 Single Source Responsibility: Obtain firestop systems for each type of penetration and construction situation from a single primary firestop systems manufacturer.

1.8 DELIVERY, STORAGE, HANDLING AND PROTECTION

- .1 Deliver materials in original, unopened packages bearing name of manufacturer and product identification.
- .2 Store materials off ground, under cover, and away from damp surfaces.

1.9 SITE CONDITIONS

- .1 Conform to manufacturer's recommended temperatures, relative humidity, and substrate moisture content for application and curing of sealants including special conditions governing use.
- .2 Provide ventilation to manufacturer's instructions in areas to receive solvent cured materials.

Part 2 Products**2.1 MATERIALS**

- .1 Select exposed firestopping products in walls and ceilings, capable of receiving specified paints.
- .2 Do not use cementitious or rigid seals for:
 - .1 Re-entry penetrations.
 - .2 Penetrations in sound and vibration control assemblies.
- .3 Provide firestopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by the firestopping manufacturer based on testing and field experience.
- .4 Provide components for each firestopping system that are needed to install fill material. Use only components specified by the firestopping manufacturer and approved by the qualified testing agency for the designated fire-resistance - rated systems.
- .5 Provide a round fire-rated cable management device whenever cables penetrate fire rated walls, where frequent cable changes and additions may occur. The fire-rated cable management device shall consist of a corrugated steel tube with zinc coating, contain an inner plastic housing, intumescent material rings, and inner fabric smoke seal membrane. The length of the sleeve shall be 315 mm (12.4 in). The fire-rated cable management device shall contain integrated intumescent firestop wrap strip materials sufficient to maintain the hourly rating of the barrier being penetrated. The fire-rated cable management device shall contain a smoke seal fabric membrane or intumescent firestop plugs sufficient to achieve the L-Rating requirements of the barrier type. Install device per the manufacturer's published installation instructions.
- .6 Penetrations in Fire Resistance Rated Walls: Provide firestopping with ratings determined in accordance with CAN/ULC-S115-11
 - .1 F-Rating: Not less than the fire-resistance rating of the wall construction being penetrated.
- .7 Penetrations in Horizontal Assemblies: Provide firestopping with ratings determined in accordance with CAN/ULC-S115-11.
 - .1 F-Rating: Minimum of 1-hour rating, but not less than the fire-resistance rating of the floor construction being penetrated.
 - .2 T-Rating: when penetrant is located outside of a wall cavity, minimum of 1-hour rating, but not less than the fire-resistance rating of the floor construction being penetrated.
 - .3 W-Rating: Class 1 rating in accordance with water leakage test per UL 1479.

- .8 Penetrations in Smoke Barriers: Provide firestopping with ratings determined in accordance with UL 1479 or ASTM E 814.
 - .1 L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at both ambient and elevated temperatures.
- .9 Mold Resistance: Provide penetration firestopping with mold and mildew resistance rating of 0 as determined by ASTM G21.
- .10 Rain and water resistance: provide perimeter joint sealant tested in accordance with ASTM D 6904 with less than 1 hour tack free time as tested in accordance with ASTM C 679.

2.2 MANUFACTURERS

- .1 Subject to compliance with requirements provide products of one of the following manufacturers:
 - .1 3M Fire Protection Products.
 - .2 Hilti Canada Ltd.
 - .3 Specified Technologies Inc.
 - .4 Tremco Inc.

2.3 MATERIALS

- .1 Exposed firestopping:
 - .1 Pourable (self-levelling) grade for openings in floors and other horizontal surfaces.
 - .2 Nonsag grade for openings in vertical and sloped surfaces unless indicated firestopping limits use of nonsag grade for both opening conditions.
- .2 Formulated Compound of Incombustible Fibres: Formulated compound mixed with incombustible non-asbestos fibres.
- .3 Fibre Stuffing: Minimum 64 kg/m³ mineral or ceramic fibre stuffing insulation.
- .4 Mechanical Device with Fillers: Mechanical device with incombustible fillers or silicone elastomer covered with sheet stainless steel jacket, joined with collars, penetration sealed with flanged stops.
- .5 Intumescent Putty: Intumescent putty compound which expands on exposure to surface heat gain, nonhardening dielectric, water-resistant, containing no solvents, inorganic fibres, or silicone compounds.

- .6 Firestop Pillows: Formed mineral fibre pillows, reusable heat-expanding cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows from being easily removed.
- .7 Composite Sheet: Intumescent rigid panels consisting of aluminum foil faced elastomeric sheet bonded to galvanized steel sheet.

2.4 ACCESSORIES

- .1 Provide components for each firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components recommended by firestopping manufacturer in accordance with tested assembly being installed, and acceptable to authorities having jurisdiction.
- .2 Primer: Type recommended by firestopping manufacturer for specific substrate surfaces.
- .3 Dam Material: Permanent:
 - .1 Mineral fibreboard.
 - .2 Mineral fibre matting.
 - .3 Alumina silicate fire board.
 - .4 Sealants used in combination with other forming, damming and backing materials to prevent leakage of fill materials in liquid state.
 - .5 Fillers for sealants.
- .4 Installation Accessories: Clips, collars, fasteners, temporary stops or dams, and other devices required to position and retain materials in place.
- .5 Water: Potable, clean and free from injurious amounts of deleterious substances.

Part 3 Execution

3.1 EXAMINATION

- .1 Verify existing conditions before starting work.
- .2 Verify opening configurations, penetrating items, substrates, and other conditions affecting performance of firestopping are ready to receive the work of this Section.
- .3 Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- .1 Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter which may affect bond of firestopping material.

- .2 Remove incompatible materials which may affect bond.
- .3 Install backing and damming materials to arrest liquid material leakage.
- .4 Mask adjacent surfaces to protect from spillage and over coating; immediately remove material from adjacent surfaces.

3.3 APPLICATION

- .1 Apply primer and materials to manufacturer's written instructions, approved tested assemblies and details.
- .2 Provide materials to maintain the fire separations in the project as indicated on the drawings.
- .3 Install material at walls or partition openings which contain penetrating sleeves, piping, ductwork, conduit and other items, requiring firestopping.
- .4 Apply firestopping material in sufficient thickness to achieve rating and to uniform density and texture.
- .5 Tool or trowel exposed surfaces to a uniform finish.
- .6 Compress fibred material to achieve a density of 25-40 percent of its uncompressed density required for listed system.
- .7 Place material in layers to ensure homogenous density, filling cavities and spaces. Place sealant to completely seal junctions with adjacent dissimilar materials.
- .8 Place intumescent coating in sufficient coats to achieve rating required.
- .9 Remove dam material after firestopping material has cured. Dam material to remain.
- .10 Provide identification labels as specified.
- .11 In non-fire rated construction indicated to prevent smoke movement, tightly pack voids of service penetrations and around openings with mineral wool insulation and sealant.

3.4 IDENTIFICATION

- .1 Identify through-penetration firestop systems with pressure-sensitive, self-adhesive, preprinted vinyl labels. Attach labels permanently to surfaces of penetrated construction on both sides of each firestop system installation where labels will be visible to anyone seeking to remove penetrating items or firestop systems. Include the following information on labels:
 - .1 The words: "Warning: Through-Penetration Firestop System - Do Not Disturb" in 10mm high minimum letters
 - .2 Contractor's name, address and telephone number.
 - .3 Designation of applicable testing and inspection agency.

- .4 Date of installation.
- .5 Manufacturer's name for firestop materials.

3.5 MANUFACTURER'S SITE SERVICES

- .1 Require site attendance of firestopping product manufacturer during installation of the Work. Schedule manufacturer's review of work procedures at stages listed:
 - .1 Pre-installation Meeting: 1 review at Site and meeting with authorized Installers.
 - .2 Installation: 3 reviews at Site: 1 at commencement of Work; 1 at 50% completion of Work; 1 upon completion of Work.
- .2 Submit manufacturer's written reports to Engineer describing:
 - .1 The scope of work requested.
 - .2 Date, time and location.
 - .3 Procedures performed.
 - .4 Observed or detected non-compliances or inconsistencies with manufacturers' recommended instructions.
 - .5 Limitations or disclaimers regarding the procedures performed.
 - .6 Obtain reports within three days of review and submit immediately to Engineer.
 - .7 Monitor and report installation procedures and unacceptable conditions.
 - .8 Inspect and review materials and workmanship including storage, handling and protection. Advise Engineer and Departmental Representative 48 hours in advance of inspections.
 - .9 Correct identified defects or irregularities.
- .3 Remove and replace unacceptable firestopping assemblies.

3.6 CLEANING

- .1 Clean installed work.
- .2 Clean adjacent surfaces of firestopping materials.

3.7 PROTECTION OF FINISHED WORK

- .1 Protect installed work.
- .2 Protect adjacent surfaces from damage by material installation.

3.8 SCHEDULE

- .1 Firestop the following conditions and as indicated:
 - .1 Penetrations through fire-resistance—rated construction.
 - .2 Tops of fire-resistance—rated walls.
 - .3 Intersections of fire-resistance—rated walls and non-fire rated walls.
 - .4 Control joints in fire-resistance—rated construction.
 - .5 Joints at exterior wall/floor intersections.
 - .6 Openings and sleeves installed for future use through fire-resistance—rated separations.
 - .7 Non—fire-rate construction to prevent smoke movement. Pack void space at all service penetrations and other openings with either tightly packed Rock Wool insulation, or sealant, or a combination of both. The sealant need not be rated.
- .2 Service Penetrations shall include but not limited to:
 - .1 Mechanical Pipe Penetrations
 - .2 Mechanical Damper Joints: Top only in floor dampers
 - .3 Electrical Service Penetrations: Bus duct, etc.
 - .4 Electrical Outlet Boxes: Receptacles, switches etc., in fire-rated GWB only.

END OF SECTION

Part 1 General**1.1 SUMMARY**

- .1 Sealants and joint backing.
- .2 Acoustic sealants.
- .3 Compressible seals.
- .4 Site quality control and manufacturer's site services.

1.2 RELATED REQUIREMENTS

- .1 Coordinate with Work of other Sections having a direct bearing on Work of this Section.

1.3 REFERENCE STANDARDS

- .1 American Society for Testing and Materials (ASTM):
 - .1 ASTM C509, Standard Specifications for Elastomeric Cellular Performed Gasket and Sealing Material
 - .2 ASTM C510, Standard Test Method for Staining and Color Change of Single- or Multicomponent Joint Sealants.
 - .3 ASTM C920, Standard Specification for Elastomeric Joint Sealants.
 - .4 ASTM C1021, Standard Practice for Laboratories Engaged in Testing of Building Sealants.
 - .5 ASTM C1184, Standard Specification for Structural Silicone Sealants.
 - .6 ASTM C1193, Standard Guide for Use of Joint Sealants.
 - .7 ASTM C1248, Standard Test Method for Staining of Porous Substrate by Joint Sealants.
 - .8 ASTM C1330, Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants.
 - .9 ASTM D5893/D5893M, Standard Specification for Cold Applied, Single Component, Chemically Curing Silicone Joint Sealant for Portland Cement Concrete Pavements.

1.4 SUBMITTALS

- .1 Provide submittals in accordance with the General Conditions and Section 01 33 00.
- .2 Action Submittals: Provide the following submittals before starting any work of this Section:
 - .1 Manufacturer's Data: Submit manufacturer's literature describing each material to be used in the work of this Section. Literature shall contain a statement that the material complies with the specified standard.
 - .2 Structural Sealant Joint Design: Provide calculations for structural bite, dead load support, glue-line thickness, shear, and other parameters. Include confirmation that design data provided by Departmental Representative have been reviewed and approved by sealant manufacturer.
 - .3 Samples: Submit for approval and colour selection sample of each type of compound, recommended primers and joint filler or fillers proposed to be used.
- .3 Submittals for Information:
 - .1 Qualifications Data: For Manufacturer and Installer.
 - .2 Installation Data: Manufacturer's special installation requirements.
 - .1 Indicate special procedures, surface preparation, perimeter conditions requiring special attention, and field quality control testing.
 - .3 Field reports.
 - .1 Site quality control report identifying procedures for site testing and verification.
 - .2 Manufacturer's site service report identifying materials have been installed in accordance with manufacturer's recommendations.

1.5 QUALITY ASSURANCE

- .1 Applicator qualifications:
 - .1 Execute Work by applicators trained and approved by the manufacturer and having 5 years proven experience.
- .2 Independent inspection and testing agency:
 - .1 Qualification: In accordance with ASTM C1021.
 - .2 Conduct field inspection and testing of sealant with the manufacturer's representative for a minimum of 5% of joints, including mixing of materials, joint preparation, priming, joint profile and thickness, application, adhesion, cohesion, and tooling.

- .3 Prepare and submit inspection and test report results after each inspection. Include confirmation by the manufacturer that installation has been satisfactorily completed.
- .3 Manufacturer's representative:
 - .1 Review Site conditions, joint design, and installer's qualifications. Report unsatisfactory conditions to Departmental Representative.
 - .2 Check container labels, inspect preparation of substrate materials and review installation procedures 48 hours in advance of installation, and randomly test installed Work.
- .4 Mock-up:
 - .1 Construct mock-up for each type of sealant to show location, size, shape, colours, and depth of joints complete with bond breaker, joint backing, primer, and sealant. Accepted mock-up may become part of finished Work.
 - .2 Remove mock-ups that do not form part of Work from Site during final cleanup, or when directed by Departmental Representative.
 - .3 Allow 48 hours for Departmental Representative to review mock-up before proceeding with sealant Work.
- .5 Pre-installation meetings:
 - .1 Schedule meeting 7 days in advance of sealant installation.
 - .2 Include Departmental Representative, sealant manufacturer's representative, independent inspection and testing agency engaged by Contractor, and parties who are directly affected by the Work of this Section.
 - .3 Verify Contract requirements, substrate conditions, joint conditions and profile, weather conditions, and the manufacturer's installation instructions.
 - .4 Within 72 hours following the pre-installation meeting, prepare a pre-installation meeting report and issue to all parties in attendance.
 - .1 Clearly indicate the recommendations made during the pre-installation meeting, the required actions, and by whom.

1.6 SITE CONDITIONS

- .1 Apply sealants only to completely dry surfaces, and at air, substrate and material temperatures above minimum established by manufacturer's written specifications.

1.7 DELIVERY, STORAGE HANDLING AND PROTECTION

- .1 Deliver all materials to the jobsite in their original, unopened containers, with all labels intact.
- .2 Receive and store materials as recommended by Manufacturer.

- .3 Maintain containers and labels in undamaged condition.

1.8 WARRANTY

- .1 Provide a five (5) year warranty to include coverage for failure to meet specified requirements.
 - .1 Include coverage for installed sealants and accessories which fail to achieve air tight seal, water tight seal, and exhibit loss of adhesion or cohesion, or do not cure.
- .2 Provide manufacturer's twenty-year material warranty for installed silicone sealant.

Part 2 Products

2.1 MATERIALS – INTERIOR SEALANTS

- .1 Non-Traffic Locations:
 - .1 Silicone Sealant: Single component, conforming to ASTM C920 Type S, Grade NS, use NT.
 - .2 Product: Subject to compliance with requirements of this Section provide one of the following products:
 - .1 'Spectrem 3' by Tremco Sealants.
 - .2 'DOWSIL 795' by Dow Corning.
- .2 Non-Traffic Locations requiring Paintable Sealant:
 - .1 Latex Joint Sealant, Paintable: Acrylic latex or siliconized acrylic latex, ASTM C834, Type OP Grade NF; single component, non-sagging, non-staining, non-bleeding.
 - .2 Product: Subject to compliance with requirements of this Section provide one of the following products:
 - .1 'Tremflex 834' by Tremco Sealants.
 - .2 'Sonolac' by BASF Building Systems.
 - .3 'AC-20+ Silicone' by Pecora Corporation.
- .3 Traffic Locations:
 - .1 Polyurethane Sealant: Single component, self-levelling, conforming to ASTM C920, Type S Grade P, Use T, class 25.
 - .2 Product: Subject to compliance with requirements of this Section provide one of the following products:
 - .1 Sikaflex 1CSL by Sika Canada Inc.
 - .2 Sonolastic SL-1 by BASF Building Systems.

- .3 Urexpan NR-201 by Pecora Corporation.
 - .4 Vulkem 45 by Tremco Sealants.
 - .5 Novalink SL Self-leveling sealant by Chemlink Advanced Architectural Products.
- .4 Control Joints in Ceramic Tile and Hard Surfaces in Kitchens and Toilet Rooms, and around Plumbing Fixtures:
- .1 Silicone Sealant: ASTM C920, Type S, Grade NS, Class 25, Uses NT; G and O, single component, non-sagging, non-staining, mildew resistant; formulated with fungicide; colour as selected.
 - .2 Product: Subject to compliance with requirements of this Section provide one of the following products:
 - .1 Tremsil 200 Silicone Sealant by Tremco Sealants.
 - .2 786 Sealant by Dow Corning for all applications except floors.
 - .3 Tub, Tile Ceramic Silicone Sealant by Dow Corning.
- .5 Control Joints in Ceramic Tile Floors NOT in Kitchens and Toilet Rooms:
- .1 Polyurethane Sealant: Multi component, chemically curing, self-levelling, colour as selected.
 - .2 Product: Subject to compliance with requirements of this Section provide one of the following products:
 - .1 THC 900/901 by Tremco Sealants.
 - .2 Dymeric 240FC by Tremco Sealants.
- .6 Immersible locations and aquatic areas: Subject to compliance with requirements of this Section provide one of the following products, as applicable:
- .1 Epoxy Sealant: Multi component, 100 percent solids epoxy, 6H hardness, colour grey.
 - .1 Product:
 - .1 Devmat 142 HB by AkzoNobel.
 - .2 Polyurethane sealant: Single component, chemically curing, self-levelling or non-sag as applicable.
 - .1 Product:
 - .1 Sikaflex 1a by Sika Canada Inc.
 - .2 Vulkem 921 by Cadeco
 - .3 Submerged Joints in Pool Tanks: Two component, premium grade, non-sag sealant: polysulphide, self-levelling.
 - .1 Product:
 - .1 Sikaflex 2C with 'Sika Primer 202' by Sika Canada Inc.

- .2 Deck-o-Seal Gun Grade with 'P/G Primer' by W.R. Meadows, Inc.

- .4 Colour: To be selected by Departmental Representative from manufacturer's standard range.

2.2 EXTERIOR SEALANTS

- .1 Exterior Joints to Perimeters of Openings: Select one of the following to suit requirements of condition indicated.
 - .1 Silicone Sealant: Single component, 100 percent silicone rubber, medium modulus, moisture-curing, non-sagging, non-staining, non-bleeding; colours as selected; ASTM C920, Grade NS, Class 50 and complying with the following:
 - .1 SWRI Certificate of Validation.
 - .2 Modulus at 50% Extension, ASTM C1135: Maximum 55 psi.
 - .3 Elongation Capability, ASTM D412: Minimum 235 percent.
 - .4 Stain Free Performance, ASTM C1248: No staining.
 - .5 Shore A Hardness: Range 15 to 35.
 - .6 Product: Subject to compliance with requirements of this Section provide one of the following products:
 - .1 791 by Dow Corning at paint-finished metal surfaces.
 - .2 795 by Dow Corning for anodic-finished metal surfaces.
 - .3 Silpruf SCS2700 LM or 'Silpruf SCS2000' by GE under licence by Momentive Performance Materials Inc.
 - .4 Spectrum 2 by Tremco
 - .2 Silicone Sealant: Single component, 100 percent silicone rubber, low modulus, moisture-curing, non-sagging, non-staining, non-bleeding; colours as selected; ASTM C920, Grade NS, Class 100/50 and complying with the following:
 - .1 SWRI Certificate of Validation.
 - .2 Modulus at 50% Extension, ASTM C1135: Maximum 25 psi.
 - .3 Stain Free Performance, ASTM C1248: No staining.
 - .4 Shore A Hardness Range: 15 to 20.
 - .5 Product: Subject to compliance with requirements of this Section provide one of the following products:
 - .1 790 by Dow Corning.
 - .2 Silpruf LM SCS2700 by GE under licence by Momentive Performance Materials Inc.
 - .3 Spectrum 1 by Tremco.

- .2 Traffic Locations: Horizontal expansion joints in concrete walks and pavements.
 - .1 Polyurethane Sealant: Single component, self-levelling, conforming to ASTM C920, Type S Grade P, Use T, class 25.
 - .1 Product: Subject to compliance with requirements of this Section provide one of the following products:
 - .1 Sikaflex 1CSL by Sika Canada Inc.
 - .2 Sonolastic SL-1 by BASF Building Systems.
 - .3 Urexpan NR-201 by Pecora.
 - .4 Vulkem 45 by Tremco.
 - .5 Novalink SL by Chemlink Advanced Architectural Products.
- .3 Exterior Compressible Seal:
 - .1 Silicone pre-coated, preformed, pre-compressed, self-expanding, binary sealant system of expanding polyurethane foam impregnated with water based, stabilized, polymer modified acrylic with factory applied silicone coated bellows, complete with field applied liquid silicone corner bead in matching colour, depth of seal as recommended by manufacturer.
 - .1 Colorseal by Emseal Corporation, standard colour.
- .4 Structural Silicone Sealant: ASTM C920, Type S, Grade NS, Class 25, non-sagging, non-staining, fungus-resistant, non-bleeding; neutral curing; VOC content less than 100 g/l; compatible with system components; 138 kPa minimum tensile strength; specifically formulated and tested for use as structural sealant and approved by structural-sealant manufacturer for use in assemblies indicated.
 - .1 Colour: To match adjacent substrate/ material.
 - .2 Product: Subject to compliance with requirements of this Section provide one of the following products:
 - .1 795 by Dow Corning;
 - .2 UltraGlaze SSG4000 or UltraGlaze SSG4000AC by GE under licence by Momentive Performance Materials Inc.
 - .3 Proglaze SSG by Tremco.

2.3 MATERIALS – SEALANTS

- .1 Type A:
 - .1 Single component, non-sag, non-paintable, silicone joint sealant, in accordance with ASTM C920, Type S, Grade NS, minimum Class 25, and non-staining when tested in accordance with ASTM C510 or ASTM C1248.
 - .2 Colour: To match adjacent substrate/ material.
 - .3 Manufacturer's Products:

- .1 Dow Corning Contractors Weatherproofing Sealant (CWS) by Dow Corning Corp.
 - .2 Tremsil 400 by Tremco Sealants (Canada) Ltd., division of RPM Company.
 - .3 Sikasil-N plus by Sika Canada Inc.
 - .4 GE Silocone SWS by Momentive Performance Materials.
 - .5 Pecora PCS by Pecora Corporation.
- .2 Type B:
- .1 Silicone joint sealant, in accordance with ASTM D5893/D5893M and non-staining when tested in accordance with ASTM C510 or ASTM C1248.
 - .2 Colour: To match adjacent substrate/ material.
 - .3 Manufacturer's Products:
 - .1 Dow Corning Contractors Concrete Sealant (CCS) by Dow Corning Corp.
 - .2 Spectrum 900 SL by Tremco (Canada) Ltd., division of RPM Company.
 - .3 SikaSil 728 SL by Sika Canada Inc.
 - .4 Tosseal 817 by Momentive Performance Materials.
 - .5 300SL by Pecora Corporation.
- .3 Type C:
- .1 Anti-microbial (mildew-resistant), non-paintable, silicone joint sealant, in accordance with ASTM C920, Type S, Grade NS, minimum Class 25, and non-staining when tested in accordance with ASTM C510 or ASTM C1248.
 - .2 Colour: Clear/translucent.
 - .3 Manufacturer's Products:
 - .1 Dow Corning 786 Silicone Sealant by Dow Corning Corp.
 - .2 Tremsil 200 Silicone Sealant (with Fungicide) by Tremco (Canada) Ltd., division of RPM Company.
 - .3 Sikasil-GP by Sika Canada Inc.
 - .4 GE SCS1700 Sanitary by Momentive Performance Materials.
 - .5 898NST by Pecora Corporation.
- .4 Type D:
- .1 Silicone joint sealant, in accordance with ASTM C920, Type S, Grade NS, minimum Class 50, and non-staining when tested in accordance with

ASTM C510 or ASTM C1248. Suitable for structural glazing in accordance with ASTM C1184.

- .2 Colour: To match adjacent substrate/ material.
- .3 Manufacturer's Products:
 - .1 Dow Corning 795 Silicone Building Sealant by Dow Corning Corp.
 - .2 Spectrem 2 by Tremco (Canada) Ltd., division of RPM Company.
 - .3 Sikasil WS-295 by Sika Canada Inc.
 - .4 GE SCS2000 SilPruf Sealant by Momentive Performance Materials.
 - .5 Pecora 895NST by Pecora Corporation.
- .5 Type E:
 - .1 Silicone joint sealant, in accordance with ASTM C920, Type S, Grade NS, minimum Class +100/-50, and non-staining when tested in accordance with ASTM C510 or ASTM C1248.
 - .2 Colour: To match adjacent substrate/ material.
 - .3 Manufacturer's Products:
 - .1 Dow Corning 790 Silicone Building Sealant by Dow Corning Corp.
 - .2 Spectrem 1 by Tremco (Canada) Ltd., division of RPM Company.
 - .3 SikaSil WS-290 by Sika Canada Inc.
 - .4 GE SCS2700 SilPruf LM by Momentive Performance Materials.
 - .5 Pecora 890NST by Pecora Corporation.
- .6 Type F:
 - .1 Low dirt pick-up, silicone joint sealant, in accordance with ASTM C920, Type S, Grade NS, minimum Class 50, and non-staining when tested in accordance with ASTM C510 or ASTM C1248.
 - .2 Colour: To match adjacent substrate/ material.
 - .3 Manufacturer's Products:
 - .1 Dow Corning 756 SMS Building Sealant by Dow Corning Corp.
 - .2 Spectrem 3 by Tremco (Canada) Ltd., division of RPM Company.
 - .3 SikaSil WS-295 by Sika Canada Inc.
 - .4 GE SCS9000 Silpruf NB by Momentive Performance Materials.
 - .5 Pecora 864NST by Pecora Corporation.
- .7 Type G:

- .1 Silicone joint sealant, in accordance with ASTM C920, Type S, Grade NS, minimum Class 50, and non-staining in accordance with ASTM C510 or ASTM C1248. General purpose type.
- .2 Colour: To match adjacent substrate/ material.
- .3 Manufacturer's Products:
 - .1 Dow Corning Contractors Weatherproofing Sealant (CWS) by Dow Corning Corp.
 - .2 Tremsil 200 Silicone Sealant (without Fungicide) by Tremco (Canada) Ltd., division of RPM Company.
 - .3 SikaSil WS-295 by Sika Canada Inc.
 - .4 GE SCS 1000 Contractors by Momentive Performance Materials.
 - .5 Pecora PCS by Pecora Corporation.
- .8 Firestopping and Smoke Seals:
 - .1 Refer to Section 07 84 00.

2.4 COMPRESSIBLE SEAL

- .1 Exterior Compressible seal:
- .2 Silicone pre-coated, preformed, pre-compressed, self-expanding, binary sealant system of expanding polyurethane foam impregnated with water based, stabilized, polymer modified acrylic with factory applied silicone coated bellows, complete with field applied liquid silicone corner bead in matching colour, depth of seal as recommended by manufacturer.
 - .1 Colorseal by Emseal Corporation, standard colour.
- .3 Acoustic compressible seals:
 - .1 Preformed Foam Joint Sealant: Manufacturer's standard. Preformed, pre-compressed, open-cell foam sealant manufactured from urethane foam. Factory produce in precompressed sizes in roll or stick form to fit joint widths indicated.
 - .2 Acoustic compressible seals: coated on 2 sides for joints between opaque surfaces, coated on 3 sides for compression against clear surfaces.
 - .3 Product:
 - .1 At opaque materials: Quietjoint SHH by Emseal Joint Systems, or approved equivalent.
 - .2 At clear materials: Quietjoint SHG by Emseal Joint Systems, or approved equivalent.

2.5 ACOUSTIC SEALANT

- .1 ASTM E90, Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements
- .2 Product: Subject to compliance with requirements of this Section provide one of the following products:
 - .1 CP-506 by Hilti.
 - .2 Sheetrock Acoustical Sealant by USG.
 - .3 AC-20 FTR or AIS-919 by Pecora; product as recommended by manufacturer for application indicated.
- .3 Accessories: As recommended by manufacture to achieve minimum STC rating listed.

2.6 ACCESSORIES

- .1 Primers:
 - .1 Type recommended by sealant manufacturer for substrate, to promote adhesion and to prevent staining of adjacent surfaces for conditions encountered.
- .2 Joint backing:
 - .1 Extruded, round, solid section, skinned surface, closed cell, soft polyethylene foam gasket stock, compatible with primer and sealant materials.
 - .2 30% to 50% oversized.
 - .3 Shore A hardness of 20, tensile strength 140 kPa to 200 kPa, in accordance with ASTM C1330.
 - .4 Bond breaker type surface.
- .3 Bond breaker tape:
 - .1 Polyethylene tape or other plastic tape recommended by sealant manufacturer to prevent sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint.
 - .2 Provide self-adhesive, pressure sensitive tape where applicable.
 - .3 Do not use material impregnated with oil, bitumen, non-curing polymer or similar deleterious material.
- .4 Cleaning agents:
 - .1 Recommended by sealant manufacturer.

- .2 Free of oily residues or other substances capable of staining or harming joint substrates and adjacent surfaces.
- .5 Masking tape:
 - .1 Non-staining, non-absorbent material compatible with joint sealants and surfaces adjacent to joints.

Part 3 Execution

3.1 INSPECTION

- .1 Verify at site that joints and surfaces conditions provided will not adversely affect execution, performance or quality of completed work.
- .2 Ensure masonry and concrete have cured 28 days minimum.
- .3 Ascertain that sealers and coatings applied to substrates are compatible with sealant used and that full bond of the sealant and substrate is attained. Request samples of the sealed or coated substrate from their fabricators for testing of compatibility and adhesion, if necessary.
- .4 Verify that specified recommended environmental conditions are present before commencing work.
- .5 Defective work resulting from application to unsatisfactory joint conditions will be considered the responsibility of those performing the work of this section.
- .6 Do not start work of this Section until conditions are satisfactory.

3.2 PREPARATION

- .1 Clean joint surfaces using joint cleaner as necessary, to remove dust, paint, loose mortar, and other foreign matter and dry joint surfaces.
- .2 Remove dust, silt, scale and coatings from ferrous metals by wire brush, grinding or sandblasting.
- .3 Remove oil, grease and other coatings from non-ferrous metals with approved cleaning solvent.
- .4 Ensure surfaces are free of frost, rust, lacquers, laitance, release agents, moisture or other matter which might adversely affect adhesion of sealant.
- .5 Examine joint sizes and correct as required to allow for anticipated movement and to achieve proper width/depth ratio per manufacturer's written recommendations for specified sealant.
- .6 Support joint filler on horizontal traffic surfaces against vertical movement which might result from traffic loads or foot traffic.
- .7 Prepare surfaces as recommended by sealant manufacturer.

- .8 Fully remove existing sealant scheduled to be removed and replaced with new sealant, in areas indicated on the Drawings.
 - .1 Follow manufacturers procedures for removal of existing sealant and test areas for adhesion of new sealant. Provide the Departmental Representative with field report identifying results of adhesion testing.
- .9 Install joint backing material or apply bond breaker tape to achieve correct joint depth and prevent three-sided adhesion.
- .10 To protect adjacent surfaces, mask adjacent surfaces with tape prior to priming and/or sealing.
- .11 Prime sides of joints using two cloth method in accordance with manufacturer's directions immediately prior to sealing.
- .12 Before any sealing is commenced, a test of the material shall be made for indications of staining, poor adhesion or other undesirable effects.
- .13 Seal joints in surfaces to be painted before painting. Where surfaces to be sealed are prime painted in shop before sealing, check to make sure prime paint is compatible with primer and sealant. If incompatible inform Departmental Representative, consult the manufacturer, and change primer and sealant to approved compatible types.
- .14 Check form release agent used on concrete for compatibility with primer and sealant. If incompatible inform Departmental Representative and change primer and sealant to approved compatible types or clean concrete to Departmental Representative's approval.

3.3 INSTALLATION

- .1 Perform Work in accordance with manufacturer's recommendations for Products and applications indicated, unless more stringent requirements apply.
- .2 Use Products without additives or adulteration. Use one manufacturer's Product for each location in accordance with Sealant Location Schedule at end of this section.
- .3 Perform Work in accordance with ASTM C1193, and ASTM C919 for Acoustic Sealant.
- .4 Joint backing:
 - .1 Install joint backing to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - .1 Depth of recess: Maintain 2:1 joint width to depth ratio.
 - .2 Where recess is less than specified depth, cut back surface of recess to specified depth.
 - .2 Do not leave gaps between ends of joint backings.

- .3 Do not stretch, twist, puncture, or tear joint backings.
- .4 Remove absorbent joint backings that have become wet before sealant application and replace with dry materials.
- .5 Support joint backing on horizontal surfaces against vertical movement which might result from pedestrian or vehicular traffic loads.
- .5 Install bond breaker tape between sealant and back of joints where joint backing is not used.
- .6 Apply sealant immediately after adjoining Work is in condition to receive sealant Work and as follows:
 - .1 Apply sealant in a continuous bead using gun with correctly sized nozzle. Use sufficient pressure to completely fill joint recess.
 - .2 Ensure sealant has full, direct uniform contact with, and adhesion to, side surfaces of recess. Superficial pointing with skin bead is not acceptable.
- .7 Tooling:
 - .1 Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified to form smooth, uniform sealant bead, free from ridges, wrinkles, sags, air pockets, embedded impurities, dirt, stains, or other defects.
 - .2 At recesses in angular surfaces, finish sealant with flat profile, flush with face of material at each side.
 - .3 At recesses in flush surfaces, finish sealant with concave face and flush with face of material at each side.
- .8 Immediately remove excess sealant and droppings.
- .9 Ensure sealant bead is uniform in colour.
- .10 Cure in accordance with the sealant manufacturer's recommendations. Do not cover up sealants until proper curing has taken place.
- .11 Remove defective sealant and reapply.

3.4 SITE QUALITY CONTROL

- .1 Joint Sealants: Perform adhesion tests on exterior sealants in accordance with manufacturer's written instructions and ASTM C1193, Method A – Field-Applied Sealant Joint Hand Pull Tab.
 - .1 Perform test no later than 21 days after installation at a rate of one test every 300 m of installed sealant.

- .2 Structural Sealant: Perform adhesion tests on exterior sealants in accordance with manufacturer's written instructions and ASTM C1401, Method B – Hand-Pull Tab (Non-destructive).
 - .1 Perform five tests for first 300 m of applied silicone sealant and one test for each 300 m seal thereafter or perform one test per floor per building elevation minimum.
 - .2 For sealant applied between dissimilar materials, test both sides of joint.
- .3 Remove sealants failing adhesion test, clean substrates, reinstall sealants and perform retesting.
- .4 Maintain test log and submit report to Departmental Representative indicating tests, locations, dates, results, and remedial actions.
- .5 Maintain record of conditions and temperatures during application.

3.5 MANUFACTURER'S SITE SERVICES

- .1 Require site attendance of each sealant manufacturers, during installation of the Work. Start sealant application in presence of manufacturer's technical representative.
- .2 Monitor and report installation procedures and unacceptable conditions.

3.6 CLEANING

- .1 Clean surfaces adjacent to joints. Immediately remove sealant smears or other soiling resulting from application of sealants.
- .2 Remove masking tape and other residue.
- .3 Do not mar or damage finishes on materials adjacent to joints. Repair or replace marred or damaged materials.

3.7 PROTECTION

- .1 Protect joint sealants:
 - .1 During and after curing period from contact with contaminating substrates.
 - .2 From damages by construction operations or other causes.
- .2 If damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated sealants immediately.

3.8 SEALANT LOCATIONS SCHEDULE

Type A	Above grade level, vertical applications
	<ul style="list-style-type: none"> - General perimeter caulking (window, doors and frames, louver frames, shelf angles, thresholds, bedding of mullions, precast and tilt-up panels). - Vertical expansion, control, lap joints application.

- Painted metals.
- Mullion joints.
- Interior partition head to structure above.
- Interior metal frames joints.
- Exterior metal flashing.
- Locations not indicated on Contract Drawings and required sealant for Work.

Type B	Above grade level, horizontal applications
	<ul style="list-style-type: none"> - Horizontal expansion joints. - Saw cut horizontal joints. - Precast slab horizontal joints. - Horizontal expansion and control joints in parking garages, plazas, terraces, decks, floors, and sidewalks.
Type C	Above grade level, horizontal and vertical applications
	<ul style="list-style-type: none"> - Around sinks, urinals, and bathroom fixtures. - Tiled areas' horizontal and vertical control and expansion joints. - Between vanity and mechanical fixtures/fittings. - Between access panels and tiles. - At corners of tiled walls.
Type D	Above grade level, horizontal and vertical applications
	<ul style="list-style-type: none"> - Structural glazing, horizontal and vertical. - Structural attachment of panel systems, horizontal and vertical. - Panel stiffener applications. - Suitable for wood, vinyl, and aluminum surfaces.
Type E	Above grade level, vertical applications
	<ul style="list-style-type: none"> - Precast wall vertical expansion joints. - Precast concrete panel vertical joints.
Type F	Above grade level, horizontal and vertical applications
	<ul style="list-style-type: none"> - Required non-staining to building materials. - Expansion and control joints in concrete panels, non-staining to building materials is required. - Metal curtain wall. - Porous surface including marble, granite, stone, and concrete, where non-staining to building materials is required. - EIFS. - Exterior and interior metal panels. - Masonry, where non-staining to building materials is required.
Type G	Above grade level, both vertical and horizontal
	<ul style="list-style-type: none"> - Glazing but not structural glazing. - Conventional glazing and replacement glazing of glass and plastic. - Aluminum sheet cover for insulation on metal pipes in exterior locations.

END OF SECTION

Part 1 General**1.1 GENERAL REQUIREMENTS**

- .1 General Conditions, Supplementary Conditions and Division 01 apply to this section.

1.2 SUMMARY

- .1 This Section includes requirements for supply and installation of the following:
 - .1 Interior Steel Doors
 - .2 Interior Steel Door Frames
 - .3 Fire rated door and frame assemblies

1.3 RELATED REQUIREMENTS

- .1 Section 07 92 00: Joint Sealants
- .2 Section 08 70 00: Door Hardware
- .3 Section 09 90 00: Painting

1.4 DEFINITIONS

- .1 Opening Sizes: Standard door sizes indicated on Drawings are considered nominal dimensions, measured from frame rabbet width and height, with allowances for nominal clearances between head, jamb and door bottom in accordance with CSDMA Recommended Dimensional Standards for Commercial Steel Doors and Frames.

1.5 REFERENCES

- .1 American National Standards Institute (ANSI):
 - .1 ANSI/SDI A250.7-1997 (R2002), Nomenclature for Standard Steel Doors and Steel Frames
 - .2 ANSI/SDI A250.11-2001, Recommended Erection Instructions for Steel Frames.
- .2 American Society for Testing and Materials (ASTM):
 - .1 ASTM A653/A653M-11, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
 - .2 ASTM A879/A879M-12, Standard Specification for Steel Sheet, Zinc Coated by the Electrolytic Process for Applications Requiring Designation of the Coating Mass on Each Surface
 - .3 ASTM A924/A924M-10a, Standard Specification for General Requirements for Sheet Steel, Metallic-Coated by the Hot-Dip Process.
- .3 Canadian General Standards Board (CGSB):

- .1 CAN/CGSB 1.132-M90, Primer, Zinc Chromate, Low Moisture Sensitivity
- .2 CAN/CGSB 41-GP-19Ma-78(1984), Rigid Vinyl Extrusions for Windows and Doors
- .3 CAN/CGSB 82.5-M88, Insulated Steel Doors
- .4 Canadian Standards Association (CSA):
 - .1 CSA W59-03 (R2008), Welded Steel Construction (Metal Arc Welding)
- .5 Canadian Steel Door Manufacturers Association (CSDMA):
 - .1 Recommended Dimensional Standards for Commercial Steel Doors and Frames, 2007
 - .2 Fire Labelling Guide, 2009
- .6 National Fire Protection Association (NFPA):
 - .1 NFPA 80-2010, Fire Doors and Windows
 - .2 NFPA 252-2012, Fire Tests of Door Assemblies
- .7 Underwriters Laboratories Canada (ULC):
 - .1 CAN4 S104-M80 (R1985), Fire Tests of Door Assemblies
 - .2 CAN/ULC S105-09, Standard Specification for Fire Door Frames Meeting the Performance Required by CAN/ULC S104
 - .3 CAN4 S106-1980 (R1985), Standard Method for Fire Tests of Window and Glass Block Assemblies

1.6 SUBMITTALS

- .1 Provide in accordance with Section 01 33 00 - Submittals.

1.7 QUALITY ASSURANCE

- .1 Installer: Use installers who are experienced with the installation of hollow metal doors and frames of similar complexity and extent to that required for the Work.

1.8 DELIVERY, STORAGE AND HANDLING

- .1 Coordinate deliveries to comply with construction schedule and arrange ahead for off-the-ground, under cover storage location. Do not load any area beyond the design limits.
- .2 Adequately protect units against rust and damage during manufacture, delivery and storage.

- .3 Store materials on planks in a dry area and cover to protect from damage. Make good immediately any damage done. Clean scratches and touch-up with rust-inhibitive primer.

1.9 SITE CONDITIONS

- .1 Site Measurements: Verify actual dimensions of openings by site measurements before fabrication and indicate measurements on shop drawings; coordinate fabrication schedule with construction progress to avoid delaying the Work.
- .2 Established Measurements: Establish dimensions and proceed with fabricating doors and frames without site measurements where site measurements cannot be made without delaying the Work; coordinate construction to ensure that actual site dimensions correspond to established dimensions.

Part 2 Products

2.1 MATERIALS

- .1 Reinstall doors and frames as indicated on drawings
- .2 Anchors:
 - .1 As required to suit condition.
 - .2 Sealant: As specified in Section 07 92 00.
- .3 Materials for fire rated doors shall conform to ULC or ULI requirements.
- .4 Finishing
 - .1 Fill and sand smooth damage, abrasions, and surface blemishes to present smooth uniform surfaces.

Part 3 Execution

3.1 EXAMINATION

- .1 Examine substrates, door swing arcs, areas of installation and conditions affecting installation for compliance with requirements for manufacturer's installation tolerances and other conditions affecting Work of this Section.
- .2 Verify roughing-in for embedded and built-in anchor locations before installing frames.
- .3 Verify door and frame size, door swing and ratings with door opening number before installing frames.
- .4 Installation of hollow metal doors and frames will denote acceptance of site conditions.

3.2 INSTALLATION

- .1 Install steel doors, frames, and accessories in accordance with reviewed Shop Drawings, ANSI A250.11, CSDMA Installation Guide, manufacturer's data, and as specified in this Section.
- .2 Door Frames:
 - .1 Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set; limit of acceptable frame distortion 2 mm (1/16") out of plumb measured on face of frame, maximum twist corner to corner of 3 mm (1/8"); align horizontal lines in final assembly.
 - .2 Brace frames rigidly in position until adjacent construction is complete; install wooden spreaders at third points of frame rebate to maintain frame width, install centre brace to support head of frames 1 mm 4' and wider in accordance with ANSI A250.1; do not use temporary metal spreaders for bracing of frames.
- .3 Frame Tolerances: Install frames to tolerances listed in ANSI A250.11, and as follows:
 - .1 Squareness: Maximum 0.8 mm (1/32") measured across opening between hinge jamb and strike jamb.
 - .2 Plumbness: Maximum 0.8 mm (1/32") measured from bottom of frame to head level.
 - .3 Alignment: Maximum 0.8 mm (1/32") measured offset between face of hinge jamb and strike jamb relative to wall construction.
 - .4 Twist: Maximum 0.8 mm (1/32") measured from leading edge of outside frame rabbet to leading edge of inside frame rabbet.
- .4 Doors:
 - .1 Fit hollow metal doors accurately in frames within clearances required for proper operation; shim as necessary for proper operation.
 - .2 Install hardware in accordance with manufacturers' templates and instructions.
 - .3 Adjust operable parts for correct clearances and function.
 - .4 Install door silencers.
 - .5 Install fire rated doors within clearances specified in NFPA 80-2010.
 - .6 Install louvers and vents.
- .5 Adjusting and Cleaning

- .1 Immediately after installation, sand smooth any rusted or damaged areas of prime coat and apply touch up of air-drying primer compatible with factory-applied primer, and as follows:
 - .1 Clean exposed surfaces with soap and water to remove foreign matter before site touch-up.
 - .2 Finish exposed site welds to a smooth uniform surface and touch-up with site applied rust inhibitive primer.
 - .3 Site apply touch-up primer on exposed surfaces where zinc coating or factory applied primer has been damaged during installation or handling.

END OF SECTION

Part 1 General**1.1 RELATED REQUIREMENTS**

- .1 Section 09 21 16: Gypsum Wallboard
- .2 Section 06 10 00: Rough Carpentry

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 access door components and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by a Professional Engineer registered in the province of Alberta.
 - .2 Submit catalogue details for each type of door illustrating profiles, dimensions and methods of assembly.
- .4 Samples:
 - .1 Submit for review and acceptance of each unit.
 - .2 Samples will be returned for inclusion into work.
 - .3 Submit 1 of each type of hand entry access door.
 - .4 Submit one 300 x 300 mm corner sample of each type of body entry door.
 - .5 Low-Emitting Materials:
 - .1 Submit listing of paints and coatings used in building, showing compliance with VOC and chemical component limits or restriction requirements.

1.3 CLOSEOUT SUBMITTALS

- .1 Operation and Maintenance Data: submit operation and maintenance data for cleaning and maintenance of stainless steel finishes 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 indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect access doors from nicks, scratches, and blemishes.

- .3 Apply temporary protective coating to finished surfaces. Remove coating after installation.
 - .1 Use coatings in accordance with manufacturer's written instructions that are easily removable.
 - .2 Leave protective coating in place until final cleaning of building.
- .4 Replace defective or damaged materials with new.

Part 2 Products

2.1 ACCESS DOORS

- .1 Sizes: as follows unless indicated on the contract drawings:
 - .1 For hand entry: 300 x 300 mm minimum.
- .2 Construction: rounded safety corners, concealed hinges, keyed and lockable, anchor straps, able to open 180 degrees.
- .3 Materials:
 - .1 Tiled surfaces: stainless steel with brushed satin finish.
 - .2 Other areas: prime coated steel.
 - .1 Primer: to GS-11 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 access door installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

- .1 Installation: locate access doors within view of equipment and ensure equipment is accessible for operating, inspecting, adjusting, servicing without using special tools.
 - .1 Tiled surfaces: in accordance with Section 09 30 00 - Tiling
 - .2 Install gypsum board surfaces: in accordance with Section 09 21 16 - Gypsum Wallboard.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.

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

3.4 PROTECTION

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

END OF SECTION

Part 1 General**1.1 SUMMARY**

- .1 Provision of all labour, materials, equipment and incidental services necessary to reinstall finish hardware.

1.2 RELATED REQUIREMENTS

- .1 Coordinate with Work of other Sections having a direct bearing on Work of this Section.

1.3 REFERENCE STANDARDS

- .1 Standards:
 - .1 ANSI-A250.4 - Steel Doors and Frames Physical Endurance
 - .2 ANSI A156.1 - Butts and Hinges
 - .3 ANSI A156.3 - Exit Devices
 - .4 ANSI A156.4 - Door Controls - Door Closers
 - .5 ANSI A156.5 - Cylinders and Input Devices for Locks
 - .6 ANSI A156.5 - Auxiliary Locks and Associated Products
 - .7 ANSI A156.6 - Architectural Door Trim
 - .8 ANSI A156.7 - Template Hinge Dimensions
 - .9 ANSI A156.8 - Door Controls - Overhead Holders
 - .10 ANSI A156-10 - Power Operated Pedestrian Doors
 - .11 ANSI A156.13 - Mortise Locks and Latches
 - .12 ANSI A156.14 - Sliding and Folding Door Hardware
 - .13 ANSI A156.15 - Closer Holder Release Devices
 - .14 ANSI A156.16 - Auxiliary Hardware
 - .15 ANSI A156.18 - Material and Finishes
 - .16 ANSI A156.19 - Power Assist and Low Energy Power Operated Doors
 - .17 ANSI A156.21 - Thresholds
 - .18 ANSI A156.22 - Door Gasketing and Edge Sealing Systems
 - .19 ANSI A156.26 - Continuous Hinges
 - .20 ANSI A156.30 - High Security Cylinders
 - .21 ANSI A250.4 - Steel Doors and Frames Physical Endurance
 - .22 NFPA 80 - Standard for Fire Doors and Other Opening Protectives
- .2 CODES
 - .1 NFPA 101 - Life Safety Code
 - .2 ABC 2018 - Alberta Building Code

.3 ANSI A117.1 - Accessible and Usable Buildings and Facilities

1.4 QUALITY ASSURANCE

.1 Installers

.1 Hardware Installers must have a minimum of five (5) years' experience in installation of hardware. The Contractor shall provide verification of installer's qualification to the Engineer for approval. Installers to attend all review meetings with the Hardware Supplier and Distributor.

.2 Pre-installation Meeting

.1 Convene a pre-installation meeting for the work specified in this section. Attendees must include, as a minimum, representatives of the following:

- .1 Contractor (Site Superintendent & Project Manager)
- .2 Installation Subcontractor (Site Foreman & Project Manager)
- .3 Hardware Supplier (AHC)
- .4 Hardware Distributor (AHC and Installer)
- .5 Related Subcontractors
- .6 Departmental Representative.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Store hardware in a locked room or other secure area, accessible by only the Contractor. Storage area must contain adequate storage provision to hold all hardware off the floor (temporary shelving or wood pallets). Ensure area is kept dry and clean.

.2 Deliver and assist in unloading and sorting of hardware. All hardware must be checked in on site by the Contractor's Site Supervisor.

1.6 COORDINATION WITH OTHER TRADES

.1 Supply finish hardware to those who are to install it, complete with templates and other complete installation instructions in sufficient time to avoid delaying the progress of the work.

.2 Supply complete templates and instructions to all door and frame manufacturers for factory machining of products to receive Hardware.

1.7 INSPECTION

.1 Hardware Distributor must perform the following inspections:

- .1 Check all hardware when it has been installed and notify the Engineer of improper installation, defective materials, or products installed that were not specified. Replace defective hardware promptly.
- .2 Check all door closers after they have been installed to make sure that all adjustments such as back-checking degree have been properly made. Notify the Engineer of any closers which have not been properly adjusted.

1.8 MAINTENANCE**.1 Maintenance Service**

- .1 Following occupancy of the building by the Departmental Representative, arrange with the Departmental Representative's maintenance staff for instruction of proper use, servicing, adjusting and lubrication of all finish hardware. Submit to the Engineer a list of attendees and meeting date.

Part 2 Products**2.1 REMOVE AND REINSTALL ITEMS**

- .1 As indicated on drawings.

Part 3 Execution**3.1 EXAMINATION**

- .1 Ensure that door frames and finished floor are sufficiently plumb and level to permit proper engagement and operation of hardware.
- .2 Submit to Engineer in writing a list of deficiencies determined as part of inspection required in clauses 3.3.1 and 3.3.2, prior to installation of finished hardware.

3.2 FIELD QUALITY CONTROL

- .1 Upon completion of hardware installation, arrange with the Departmental Representative and Engineer demonstration and training in the proper operation, adjustment, and maintenance of all finish hardware supplied under this Contract.
- .2 Before completion of the Work but after finish hardware installation has been completed, submit a certificate to the Engineer stating that final inspection has been made and that all hardware has been checked for installation and operation by representatives of both the Hardware Supplier and the Hardware Distributor, and that operation and maintenance of all hardware has been fully demonstrated to the satisfaction of the Departmental Representative, and verified by Engineer.

3.3 ADJUSTING AND CLEANING

- .1 Check and make final adjustments to each operating item of hardware on each door to ensure proper operation and function.
- .2 All hardware to be left clean and free of disfigurements.
- .3 Check all locked doors against approved keying schedule.

3.4 PROTECTION

- .1 Protect hardware from damage during construction period by removing and reinstalling or where necessary, using temporary hardware to maintain finish in new condition and maintain manufacturer's warranty.

END OF SECTION

1. General**1.1 INTENT**

- .1 Gypsum board and accessories for wall and ceiling applications in the C-Store.

1.2 SUMMARY

- .1 Related Documents:
 - .1 Section 06 10 00 – Rough Carpentry
- .2 Section Includes:
 - .1 Gypsum Board
 - .2 Furring Channels
 - .3 Carrying Channels
 - .4 Gypsum Board Accessories

1.3 REFERENCES

- .1 General:
 - .1 The following document forms part of the Specifications to the extent stated. Where differences exist between codes and standards, the one affording the greatest protection shall apply. Unless otherwise noted, the referenced standard edition is the current one at the time of commencement of the Work.
- .2 American Society for Testing of Materials (ASTM):
 - .1 ASTM A653/A653M, "Steel Sheet, Zinc-Coated (Galvanized) or zinc-iron alloy coated (galvannealed) by The Hot-Dip Process, General Requirements (Metric)".
 - .2 ASTM C1396/C1396M, "Standard Specification for Gypsum Board"
 - .3 ASTM C423, "Sound Absorption and Sound Absorption Coefficient by the Reverberation Room Method".
 - .4 ASTM C475, "Joint Compound and Joint Tape for Finishing Gypsum Board".
 - .5 ASTM C645, "Non-Load (Axial) Bearing Steel Studs, Runners (track), and Rigid Furring Channels for Screw Application of Gypsum Board".
 - .6 ASTM C840, "Application and Finishing of Gypsum Board."
 - .7 ASTM C954, "Steel Drill Screws for the application of Gypsum Board or Metal Plaster Bases to steel studs from 0.84 mm (0.333 in) to 2.84 mm (0.12 in) in thickness".
 - .8 ASTM C1002, "Steel Drill Screws for the Application of Gypsum Board".
 - .9 ASTM C1186, "Standard Specification for Flat Fiber-Cement Sheets".
 - .10 ASTM E90-09, "Standard Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions".
 - .11 ASTM E413-10, "Standard Classification for Determination of Sound Transmission Class."
- .3 Province Wall and Ceiling Bureau (AWCB):
 - .1 Specifications Standards Manual, 2003, 4th Edition.
- .4 Canadian General Standards Board (CGSB):

- .1 CAN/CGSB-19.21-M87, "Sealing and Bedding Compound for Acoustical Purposes".
 - .5 Canadian Standards Association (CSA):
 - .1 CSA S136-07, Cold Formed Steel Structural Members.
 - .2 CSA W47.1-09, Certification of Companies for Fusion Welding of Steel Structures
 - .3 CSA W59-03(2008), Welded Steel Construction (Metal Arc Welding)
 - .6 Association of Wall & Ceiling Contractors (AWCC) - Specification Standards Manual.
 - .7 Shell Global Integrated Design Standards (GIDS)
 - .8 Program Execution Plan (PEP)
 - .9 AECOM Contract
 - .10 Applicable municipal, provincial and federal regulations for permitting, site operations and clean up
- 1.4 SUBMITTALS**
- .1 Submit manufacturer's product data and shop drawings for materials and prefabricated devices, providing descriptions are sufficient for identification at job site. Include manufacturer's printed instructions for installation.
- 1.5 QUALITY ASSURANCE**
- .1 Install gypsum board in accordance with AWCC except as specified otherwise herein.
 - .2 Conform to ASTM C645 for metal studs, framing.
 - .3 Workmanship to conform to The Province Wall and Ceiling Bureau Specifications Manual as a minimum.
- 1.6 DELIVERY, STORAGE AND HANDLING**
- .1 Deliver materials in undamaged, original factory wrappings with labels and seals intact, and stored on job site in a dry, weatherproof, heated area.
 - .2 Store metal furring and accessories flat and protected from moisture and damage.
 - .3 Store boards flat, in piles, without overhanging boards, protected from moisture and physical damage.
 - .4 Store materials flat, blocked off the ground in a manner to prevent kinking or permanent set.
- 1.7 SUPERIMPOSED LOADS**
- .1 Determine the superimposed loads which will be applied to suspended ceiling systems and ensure that adequate hangers are installed to safely support the additional loads in conjunction with the normal loads of the system.
- 1.8 PROJECT CONDITIONS**
- .1 Maintain room, surface and material between 13°C and 21°C for a period of at least 72 hours before and during application and continuously after.

1.9 WARRANTY

- .1 Manufacturer's Warranty: Submit, for Departmental Representative's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights Departmental Representative may have under Contract Documents.
- .2 Installer's Warranty: Submit, for Departmental Representative's acceptance, installer's standard warranty document executed by authorized company official. Installer's warranty is in addition to, and not a limitation of, other rights Departmental Representative may have under Contract Documents.

2. Products**2.1 ACCEPTABLE MANUFACTURERS**

- .1 BPB Westroc Inc.
- .2 CGC Inc.
- .3 Georgia-Pacific Canada, Inc.

2.2 MATERIAL – GYPSUM BOARD

- .1 Gypsum Wallboard: To ASTM C1396; standard rated as indicated, maximum permissible length and width; end square cut, taper edges; paper/paper faces. Thickness as indicated on Drawings, but not less than 13 mm anywhere.
 - .1 Acceptable material:
 - .1 CGC Inc., Sheetrock,
 - .2 Georgia-Pacific Canada, Inc., Toughrock Gypsum Wallboard
 - .3 BPB Westroc Inc., Westroc ProRoc Wallboard
- .2 Fire Resistant Type:
 - .1 Thickness: As indicated, 16 mm minimum.
 - .2 Long Edges: Tapered.
 - .3 Location: Where required for fire resistance rated assembly.
 - .4 Acceptable materials:
 - .1 CGC Inc., Sheetrock Firecode.
 - .2 Georgia Pacific Canada, Inc., Toughrock Fireguard
 - .3 BPB Westroc Inc. Inc., Westroc ProRoc Type X

- .3 Water-Resistant Gypsum Board: ASTM C1396, with glass mat facing on both sides and acrylic coating on one side; in maximum lengths available to minimize end-to-end butt joints
 - .1 Thickness:
 - .1 As indicated on Drawings, 13 mm minimum
 - .2 16 mm Type X for fire-resistance rated assemblies as indicated on Drawings
 - .2 Location: Washrooms and surrounding Mop Sink
 - .3 Acceptable materials:
 - .1 CGC Inc., Sheetrock Firecode.
 - .2 Georgia Pacific Canada, Inc., Toughrock Fireguard
 - .3 BPB Westroc Inc. Inc., Westroc ProRoc Type X
- .4 Abuse-Resistant Gypsum Board: ASTM C1396, with glass mat facing on both sides and acrylic coating on one side; in maximum lengths available to minimize end-to-end butt joints
 - .1 Thickness:
 - .1 As indicated on Drawings, 13 mm minimum
 - .2 Location: As indicated on drawings
 - .3 Acceptable materials:
 - .1 CGC Inc.
 - .2 Georgia Pacific Canada, Inc.
 - .3 BPB Westroc Inc.

2.3 MATERIALS – ACCESSORIES

- .1 Joint tape: To ASTM C475, perforated paper with tapered edges as recommended by gypsum board manufacturer, or glass fibre mesh tape.
- .2 Joint compound: To ASTM C475, bedding and finishing types recommended by gypsum board manufacturer; casein, vinyl or latex base.
- .3 Corner and casing beads, edge trim: To ASTM 1047, Minimum 0.455 mm metal core thickness (26 gauge) galvanized sheet steel with Z275 zinc finish to ASTM A653, type with perforated flanges, of type to be finished with joint compound.
- .4 Adhesive: Type as recommended by gypsum board manufacturers.
- .5 Tie wire: To ASTM C645, 1.519 mm (16 gauge) annealed galvanized wire with Z275 zinc finish to ASTM A653.
- .6 Hangers: To ASTM C645, 4 mm and 6 mm diameter steel rods; galvanized with Z275 zinc finish to ASTM A653.

3. Execution

3.1 EXAMINATION

- .1 Examine the substrate and conditions in which the Work is to be installed. Correct unsatisfactory substrate and conditions prior to installation.

3.2 INSPECTION

- .1 Inspect areas and surfaces and ensure all required blocking for equipment is in place before commencing gypsum board application.
- .2 Ensure all door, window frames placed and securely braced in proper location.

3.3 FURRING AND FRAMING

- .1 Frame openings and around built-in and recessed equipment, cabinets etc., on four sides. Extend furring into reveals. Maintain clearances required by respective equipment suppliers.
- .2 Secure furring to concrete or masonry with hardened nails or mechanical fasteners. Maximum spacing 610 mm alternating to opposite flanges.
- .3 Install furring level to 3.2 mm in 3.048 metres maximum, non-cumulative.

3.4 METAL ACCESSORIES

- .1 Secure corner beads rigidly at all external angles.
- .2 Install casing beads where gypsum board terminates against surface having no trim concealing the junction or where junction is not taped.
- .3 Install casing beads where gypsum board butts to window, frames or where interior partitions butt to exterior walls.
- .4 Install insulating strips continuously at edges of gypsum board and casing beads abutting metal window exterior door frames and ceilings to provide thermal break and air seal.

3.5 GYPSUM BOARD APPLICATION

- .1 Erect gypsum board and tape joints to except where specified otherwise herein.
- .2 Install gypsum board to heavier backing, from 0.84 mm to 2.84 mm in thickness, to ASTM C954.
- .3 Install gypsum board vertically, unless noted otherwise for ULC tested assemblies with all joints occurring over firm bearing. Stagger joints on opposite sides of wall. Stagger all vertical joints.
- .4 Stop gypsum board 25 mm from underside of floor/roof deck. Attach gypsum board to vertical studs, not to ceiling track, to allow for deflection.

3.6 FINISHING

- .1 Tape, fill and sand all exposed joint, edges, corners, openings and fixings, to produce an acceptable surface ready to receive surface finishes. Fill with minimum three (3) coats. Feather coats onto adjoining surfaces so that camber is maximum 0.8 mm. Finish gypsum wallboard in accordance with AWCC Wall and Ceiling Standard's Section 9.6 Part 3, Item 12.2, Levels of Finish No. 5 Refer to Section 09 91 00 for locations of various paint sheen levels.
- .2 Make the width of the skim coat not less than 300 mm over joints between tapered edges, and not less than 500 mm over joints between square edges.
- .3 Where there are fire rated assemblies, which are concealed from view tape all joints with at least 2 coats, non-sanded. Provide coverage equivalent to that provided in finished areas, from the standpoint of fire resistance.
- .4 Do not tape or fill intersections of interior partitions butting to exterior walls. Joints shall be caulked.

Drumheller Institution – 50 Bed Unit – Slab Repair

- .5 Filling and reinforcing of joints between board as substrate for ceramic tile is specified in Section 09 30 00 - Tiling.
- .6 Cement Board Walls and Ceilings:
 - .1 Joints: Three coat method.
 - .2 Internal Angles: Two coat method.
 - .3 Fasteners and Accessories: Three coat method.
 - .4 Entire Surface: One coat of purpose made compound. Let dry and sand smooth.

END OF SECTION

Part 1 General**1.1 SUMMARY**

- .1 The work in this section includes supply and installation of the following:
- .2 Tiling and bonding systems for wall and floor tile and tile cove base including:
 - .1 Porcelain
- .3 Waterproof membrane
- .4 Crack isolation membrane
- .5 Tile bonding accessories
- .6 Site quality control

1.2 RELATED REQUIREMENTS

- .1 Section 06 20 00: Finish Carpentry
- .2 Section 07 92 00: Joint Sealants
- .3 Section 09 21 16: Gypsum Wallboard

1.3 REFERENCE STANDARDS

- .1 American National Standards Institute/Ceramic Tile Institute (ANSI/CTI):
 - .1 ANSI/CTI A108.1-2011, Specification for the Installation of Ceramic Tile: Collection of 20 ANSI/CTI A108, A118 and A136 Series of Standards on Tile Installation
- .2 American Society for Testing and Materials (ASTM):
 - .1 ASTM C241/C241M-09, Standard Test Method for Abrasion Resistance of Stone Subjected to Foot Traffic
 - .2 ASTM C615/C615M-11, Standard Specification for Granite Dimension Stone
 - .3 ASTM C627-10, Standard Test Method for Evaluating Ceramic Floor Tile Installation Systems Using the Robinson-Type Floor Tester
 - .4 ASTM C920-11, Standard Specification for Elastomeric Joint Sealants
 - .5 ASTM C1028-07e1, Standard Test Method for Determining the Static Coefficient of Friction of Ceramic Tile and Other Like Surfaces by the Horizontal Dynamometer Pull-Meter Method
 - .6 ASTM C1178/C1178M-11, Standard Specification for Glass Mat Water-Resistant Gypsum Backing Panel
- .3 Canadian General Standards Board (CGSB):
 - .1 CAN/CGSB-75.1-M88, Tile, Ceramic

- .4 Terrazzo, Tile and Marble Association of Canada (TTMAC):
 - .1 2016/2017 Specification Guide 09 30 00, Tile Installation Manual
 - .2 Hard Surface Maintenance Guide

1.4 PERFORMANCE REQUIREMENTS

- .1 Tile products manufactured and tested to ISO 10545 Series and ANSI A137.1.
- .2 Surface Flatness Tolerances:
 - .1 Maximum surface tolerance: 1:800

1.5 PRE-INSTALLATION MEETING

- .1 Coordination: Close spaces to traffic during flooring installation and until time period after installation recommended in writing by manufacturer; install flooring and accessories after other finishing operations, including painting and ceiling construction have been completed.
- .2 Pre-Installation Meeting: Schedule a pre-installation meeting at Work site in accordance with requirements of Section 01 31 19 Project Meetings, to verify project requirements, substrate conditions, patterns and layouts, coordination with other Sections affected by work of this Section, manufacturer's installation instructions and manufacturer's warranty requirements.

1.6 SUBMITTALS FOR REVIEW

- .1 Submit submittals in accordance with the General Conditions and Section 01 33 00.
- .2 Product Data: For each product. Include installation instructions for using setting materials and grouts.
- .3 Shop Drawings: Plans indicating details of special fittings, expansion joints, control joints, and joint layout, graining orientation of tile, and pattern.
- .4 Samples:
 - .1 Submit sample panel of each type and colour tile, 305 mm x 305 mm (12" x 12"). Adhere to a rigid board with setting compound, grout and a dummy control joint showing sealant as specified. Identify samples by project number, date, name of sub-contractor and tile type. Tile and grout used in the building shall correspond to appearance of approved samples in all respects. Do not install tile until samples are approved.
 - .2 At Departmental Representative's request, submit samples of base, trim and fittings.

1.7 SUBMITTALS FOR INFORMATION

- .1 Installation Data: Manufacturer's special installation requirements.

.2 Tile setting material manufacturer's review report.

.3 Field test reports.

1.8 CLOSEOUT SUBMITTALS

.1 Operation and Maintenance Data: Include recommended cleaning methods, cleaning materials, stain removal methods, and polishes and waxes.

1.9 MAINTENANCE MATERIAL SUBMITTALS

.1 Provide minimum 2% of each type and colour of tile required for project for maintenance use. Store where directed.

1.10 Maintenance material same production run as installed material.

1.11 QUALITY ASSURANCE

.1 Perform work in accordance with TTMAC Specification Guide, Tile Installation Manual.

.2 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

.3 Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience.

.4 Tile Setting Material Manufacturer's Review:

.1 Prior submitting Submittals obtain tile setting manufacturer's review and approval for conformance of tile installation methods and procedures with warranty requirements.

.2 Prepare and submit report signed by the tile setting manufacturer.

.3 Review of waterproofing membrane installation, and provide required testing ensuring waterproofing membrane manufactures recommended thickness is achieved.

1.12 MOCK-UP

.1 Provide:

.1 1000 x 1000 mm mock-up of a sample installation illustrating in a cutaway fashion the wall tile and grout for the following:

.1 W/C wall and floor.

.2 Build mock-ups using personnel, materials, and methods of construction that will be used in the Work

.3 Locate where directed by Departmental Representative.

- .4 Allow for multiple iterations until mock-up approved by Departmental Representative.
- .5 Retain approved mock-ups as standard of quality for installation.

1.13 DELIVERY, STORAGE, HANDLING AND PROTECTION

- .1 Co-ordinate deliveries to comply with construction schedule and arrange ahead for off the ground, under cover storage location. Do not load any area beyond the design limits.
- .2 Materials shall be carefully checked, unloaded, stored and handled to prevent damage. Protect materials with suitable non-staining waterproof coverings.
- .3 Store material in original, undamaged containers or wrappings with manufacturer's seals and labels intact.
- .4 Restrict traffic by other trades during installation.
- .5 Provide adequate protection of completed tiled surfaces to prevent damage by other trades until final completion of this project. Minimum protection shall consist of 4 mil polyethylene sheets lapped 100 mm (4") and taped.
- .6 Heavily travelled areas shall have additional 13 mm (1/2") thick fibreboard sheet protection with taped joints over polyethylene sheet protection as specified above.

1.14 SITE CONDITIONS

- .1 Ambient Conditions: Apply tile after completion of work by other Sections is complete; to surfaces sufficiently dry, clean, firm, level, plumb and free from oil or wax or any other material deleterious to tile adhesion and as follows:
 - .1 Temperature: Maintain tile materials and substrate temperature between TTMAC recommended minimum and maximum temperature range; unless indicated otherwise by manufacturer, for 48 hours before and during installation until materials are fully set and cured; provide additional heat during winter months or at any other time when there is a risk that surface temperatures may drop below minimum recommended temperatures.
 - .2 Ventilation: Maintain adequate ventilation where Work of this Section generates toxic gases or where there is a risk of raising relative humidity to levels that could damage building finishes and assemblies.

1.15 WARRANTY

- .1 Warrant the work of this Section against defects in materials and workmanship in accordance with the General Conditions, but for a period of five (5) years, and agree to promptly make good defects which become evident during the warranty period without cost to PCA. Defects shall include but not be limited to the following; cracking, crazing, discolouration, staining, pitting, splitting and deformation of tiles and grout.

Part 2 Products**2.1 MATERIALS – CERAMIC WALL AND FLOOR TILE****.1 Floor Tiles and Bases:**

.1 Types, sizes, colours and manufacturers as indicated on drawings.

.2 Wall Tiles:

.1 Types, sizes, colours and manufacturers as indicated on drawings.

2.2 MORTAR AND GROUT MATERIALS – GENERAL

.1 Acceptable Tile Setting Materials: Subject to conformance to requirements, mortar and grout materials listed below shall be of a uniform quality for each adhesive, and grout component from a single manufacturer and each aggregate from one source or producer as follows:

.1 Laticrete International Inc.,

.2 Mapei Corporation,

.3 TEC Incorporated Building Products Group, an H.B. Fuller Company,

.4 Flextile Ltd.

.2 Setting and Grouting Materials: Conform to material standards in ANSI's Specifications for the Installation of that apply to materials and methods specified.

.1 Grout Colours: As indicated on drawings.

.3 Source limitations: All materials shall be from one manufacturer, forming a complete system.

.4 Products: Provide like products from same production run. Install products in sequence from sequentially numbered dye lots.

2.3 MORTAR AND GROUT SETTING SYSTEMS

.1 Walls with Glass-Mat, Water-Resistant Backing Board (Tile Backing Panels): TTMAC Detail 305W-2019/2021.

.2 Walls with gypsum board: TTMAC Detail 304W-2019/2021.

.3 Materials General: to ANSI A108/A118/A136.1 and TTMAC Detail indicated:

.1 Thinset Mortar:

.1 4237 latex additive and 211 Crete filler powder by Laticrete,

.2 Kerabond with Keralastic by Mapei,

.3 TA 382 Ultimate LFT by TEC, HB Fuller.

- .4 '51 Premium Wall & Floor Thin-Set Mortar with 44 Acrylic Additive' by Flextile.
- .2 Trowelable Underlayment and screed Compound:
 - .1 226/3701 mortar mix by Laticrete,
 - .2 Topcem by Mapei, or
 - .3 TA 305 Fast Set Deep Patch by TEC, HB Fuller.
 - .4 FAST-SET SCREED BY Flextile
- .3 Grout: ANSI A108/A118/A136.1:
 - .1 Standard for dry locations:
 - .1 SPECTRALOCK PRO Premium Grout by Laticrete, or
 - .2 Mapei UltracolorPlus, or
 - .3 PowerGrout by TEC, HB Fuller or
 - .4 1600 RSG by Flextile
 - .2 Epoxy Grout: Public Washrooms
 - .1 SPECTRALOCK PRO Premium Grout by Laticrete, or
 - .2 Kerapoxy by Mapei,
 - .3 AccuColour EFX by TEC, HB Fuller.
 - .4 FLEX-EPOXY 100 GROUT by Flextile
- .4 Crack suppression membrane type 1 and type 2 as required.

2.4 TILE SETTING SYSTEMS FOR WET AREAS

- .1 Materials General: to ANSI A108/A118/A136.1 and TTMAC Detail indicated:
 - .1 Scratch/Skim/ Bond Coat:
 - .1 211/4237 By Laticrete,
 - .2 Kerabond Mixed With Keralastic Additive By Mapei,
 - .3 Ta392/393 Superflex Ultra Premium Thin Set By Tec
 - .4 #51 Floor & Wall Premium Mortar Mixed #44 Acrylic Additive By Flextile
 - .2 Mortar Bed/levelling coat: For bed thicknesses over 40 mm, suspend reinforcing mesh within mortar bed.
 - .1 226/3701 Mortar Mix By Laticrete,
 - .2 Topcem With Planicrete Ac By Mapei,
 - .3 Ta305 Fast Set Deep Patch With Patch Additive By Tec,

- .4 Fast-Set Screed Or 4:1 Dry Pack With #44 Acrylic Additive By Flextile
- .3 Waterproof Membrane: ANSI A118.10
 - .1 Hydroban By Laticrete
 - .2 Aquadefense By Mapei
 - .3 Ta 316 Hydraflex By Tec, Hb Fuller
 - .4 Wp-900 Hydro-Block By Flextile
- .4 Grout: ANSI A108/A118/A136.1 Epoxy Grout:
 - .1 Spectralock Pro Premium Grout By Laticrete
 - .2 Kerapoxy By Mapei
 - .3 Accucolour Efx By Tec, Hb Fuller
 - .4 Flex-Epoxy 100 Grout By Flextile
- .5 Fibreglass reinforcing mesh and cleavage membrane, as recommended by manufacture.

2.5 ACCESSORIES

- .1 Water: Fresh, clean, potable, free from deleterious matter, acids or alkalis.
- .2 Sealant: movement and joint sealants as specified in Section 07 92 00 – Joint Sealants.
- .3 Tile Backer Board: As Specified in Section 09 21 16.
- .4 Trims:
 - .1 Straight Edge Strips: Solid brass Extruded clear satin anodized aluminum Roll formed stainless steel edge strips, 3 mm wide at top edge; height as required to suit tile installation; with integral perforated anchoring leg for setting the strip into the setting material:
 - .1 Basis-of-Design Materials: Schlüter Schiene AE
 - .2 Transition Edge Strips: Extruded mill finished clear satin anodized aluminum edge strips; height as required to suit tile installation; with integral perforated anchoring leg for setting the strip into the setting material and sloped sloped, narrow profile sloped, wide profile flat, smooth profile transition
 - .1 Basis-of-Design Materials: Schlüter Reno
 - .3 Cove Base Trims: Roll formed stainless steel inside corner, cove shaped joint profile with perforated anchoring legs for setting the corner joint into the setting material; heights as required to suit installation, complete with pre-formed outside corners, pre-formed 3-way inside corners, pre-formed 2-way inside corners, connections, and pre-formed end caps:

- .1 Basis-of-Design Materials: Schlüter Dilex
- .5 Provide fillers, primers, reinforcing fabric and all other materials and accessories as recommended by the crack suppression membrane manufacturer.
- .6 Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers and as follows:
 - .1 Job Site Cleaner: Phosphoric acid/nitric acid based cleaning solution mixed in accordance with cleaner manufacturer's recommendations and as recommended by tile manufacturer.
 - .2 Maintenance Cleaner: Non-toxic, electrolytic, biodegradable, non-ammonia containing, pH controlled cleaning solution mixed in accordance with manufacturer's recommendations.

2.6 CRACK SUPPRESSION MEMBRANE

- .1 Crack Suppression Membrane Type 1 (For non-structural cracks less than 3 mm wide). Provide one of the following, or equivalent from listed manufacturer:
 - .1 One component, water based, elastomeric type crack suppression membrane capable of spanning cracks up to 3 mm wide without failure.
 - .1 Plani/Lastic by Mapei Canada Inc., or
 - .2 WP-900 WATER PROOF & CRACK ISOLATION MEMBRANE by Flextile
 - .3 Or Departmental Representative reviewed substitution from by listed manufacturer.
 - .2 One component, liquid rubber, elastomeric type crack suppression membrane reinforced with reinforcing fabric and capable of spanning cracks up to 3 mm wide without failure.
 - .1 Laticrete 9235 Anti-Fracture Membrane by Laticrete International Inc. or
 - .2 TA 316 Hydraflex by TEC, HB Fuller.
 - .3 WP-980 WATERPROOF & CRACK ISOLATION MEMBRANE by Flextile
 - .4 Or Departmental Representative reviewed substitution from by listed manufacturer.
- .2 Crack Suppression Membrane Type 2 (For non-structural cracks 3 mm wide and greater, and all structural cracks). Provide one of the following, or equivalent from listed manufacturer:

- .1 Two component, elastomeric type crack suppression membrane reinforced with reinforcing fabric and capable of spanning cracks 3 mm wide and greater without failure.
 - .1 Planicrete W by Mapei Canada Inc., or
 - .2 Or Departmental Representative reviewed substitution from by listed manufacturer.
- .2 One component, liquid rubber, elastomeric type crack suppression membrane reinforced with reinforcing fabric and capable of spanning cracks 3 mm wide and greater without failure.
 - .1 Laticrete 9235 Anti-Fracture Membrane by Laticrete International Inc. or
 - .2 TA 316 Hydraflex by TEC, HB Fuller.
 - .3 WP-980 WATERPROOF & CRACK ISOLATION MEMBRANE by Flextile
 - .4 Or Departmental Representative reviewed substitution from by listed manufacturer.

2.7 MORTAR AND GROUT MIXING

- .1 Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- .2 Add materials, water, and additives in accurate proportions.
- .3 Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated or specified.

Part 3 Execution

3.1 EXAMINATION

- .1 Verify existing conditions before starting Work.
- .2 Verify that surfaces are ready to receive Work.
 - .1 Verify that substrates for setting tile are firm, dry, clean, free of coatings that are incompatible with tile-setting materials including curing compounds and other substances that contain soap, wax, oil, or silicone. Comply with flatness tolerances required by ANSI A108.01 for installations indicated or specified.
 - .2 Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.

- .3 Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Departmental Representative.
- .3 Verify sealants and grout are cured for manufactured recommended periods at required temperatures and relative humidity conditions, before water immersion.
- .4 Crack Suppression Membranes:
 - .1 Prepare all surfaces of non-structural and structural cracks in strict accordance with the crack suppression membrane manufacturer's written instructions.
 - .2 Prime and fill all surfaces of non-structural and structural cracks in strict accordance with the crack suppression membrane manufacturer's written instructions.
- .5 Commencement of installation shall signify complete acceptance of surfaces and conditions.

3.2 PREPARATION

- .1 Surface Preparation:
 - .1 Make backing surfaces level and true to a tolerance in plane of ± 3 mm in 2 m ($\pm 1/8$ " in 8') for walls.
 - .2 Surfaces shall be structurally sound, well fastened, clean and free from dust, oil, grease, paint, tar, wax, curing agents, primers, sealers, form release agents or any deleterious substances that may act as bond barriers.
 - .3 Backing surfaces shall be dry and fully cured. Dampness must not exceed 5% by volume.
- .2 Examine concrete substrate, repair as required to produce level, clean surface for new tile installation. Repair Work shall include levelling, filling, grinding or cutting, in accordance with Section 03 35 00.
- .3 Work of other trades that are required before new tile installation (i.e. electrical conduit installed below ceramic tile) shall be installed, complete and approved before tile installation.
- .4 Fill cracks, holes, and depressions in concrete substrates for tiling installed with thin-set mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.
- .5 Check as per ASTM F710 for Concrete Preparation for excessive moisture levels and pH of the slab.

3.3 INSTALLATION - GENERAL

- .1 Installation of the tile shall be by thin-set method, as indicated on the drawings and as specified herein;
 - .1 Install wall tile to gypsum wallboard and moisture resistant wallboard in dry areas using latex modified thin-set setting bed and latex modified wall grout in strict accordance with tile manufacturers written installation instructions as per the pre-installation conference.
- .2 Install mortar bed, tile, and grout to referenced TTMAC Manual and TTMAC systems listed.
- .3 Thoroughly clean surfaces to which tile is to be applied.
- .4 Neatly cut tile around fitments, fixtures, access panels, and the like. Splitting of tile is expressly prohibited except where no alternative is possible. Form intersections, corners and returns accurately.
- .5 Finish surfaces flat and level or, sloped and graded as required.
- .6 Joint Widths: Install tile with the following joint widths, unless indicated on drawings:
 - .1 Wall Tile: 2 mm (1/16")
 - .2 Make joints consistent width and alignment within tile area.
 - .3 Maintain 2/3 of grout joint depth free of setting material.
- .7 Joints in base shall match wall patterns. Joints shall be watertight without voids, cracks or excess grout.
- .8 Lay out tile so that fields or patterns are centred on wall areas or architectural features and so that no tile less than 1/2 size occurs.
- .9 Arrange and set recessed accessories in tile work so that they are evenly spaced, centred with joints and set true with correct projection. Rigidly install accessories.
- .10 Provide manufacturer's standard trim pieces at changes of direction and at terminations. Unless otherwise indicated provide the following corner and edge conditions:
 - .1 Internal horizontal corners: Coved.
 - .2 External vertical and horizontal corners: Bullnosed.
 - .3 Internal vertical corners and unexposed edges: Square.
- .11 Install tiles in patterns and locations as indicated on drawings.
- .12 Install wall tile full wall height unless shown otherwise.
- .13 Coordinate work of this Section with work of other Sections for items requiring to be recessed into work of this Section.

- .14 Sound tiles after setting and remove and replace tiles not fully bedded.
- .15 Re-point joints after cleaning to eliminate imperfections. Avoid scratching tile surfaces.
- .16 Finished tile work shall be clean and free of tiles which are pitted, chipped, cracked or scratched. All damaged tile shall be removed and replaced.
- .17 Where indicated on Drawings or as required, install continuous single piece metal edge trims centred under doors in closed position and other locations where tile meets other wall finishes.
- .18 Allow tile to set for a minimum of 48 hours prior to grouting.

3.4 GROUTING

- .1 Grout tiles in accordance with ANSI A108.10 and as specified herein.
- .2 Mix grouts and install in strict accordance with the manufacturer's instructions.
- .3 Excess grout shall be removed from the surface of tiles using the edge of a rubber float held at a 45 degree angle, moving it diagonally to the joints. Fill all gaps and air holes.
- .4 Do not allow grout to harden on face of tile. Refer to manufacturer's instructions for thorough removal.

3.5 CONTROL JOINTS AND SEALING

- .1 Control joints of a flexible caulking material shall be placed every 4877 mm to 6096 mm (16 'to 20') apart, directly over existing control joints and/or where indicated on drawings or as required in accordance with TTMAC Detail No. 301MJ-2019-2021, Details E, F and G, whichever is applicable. Control joints shall be placed around the floor perimeter at walls, around columns, and where tile abuts other hard materials or vertical surfaces. Saw cutting of tile after installation is prohibited. Tile shall be cut if required and installed along each side of control joints.
- .2 Expansion joints must always be placed directly over all slab expansion joints in accordance with TTMAC Detail No. 301MJ-2019-2021, Details A and B, whichever is applicable.
- .3 Locate expansion, control, contraction, and isolation joints, as indicated below, unless specifically indicated otherwise on the Drawings:
 - .1 Interior: 5 m (16') maximum: 6 mm (1/4") joint width.
 - .2 Exterior: 4 m (12') maximum: 9.5 mm (3/8") joint width.
- .4 Joints around fixtures, pipes or other fittings shall be sealed with a sealant. Refer to Section 07 92 00 for type of sealants to be used.
 - .1 Colour of sealant shall match grout as selected later by Departmental Representative.

3.6 WATERPROOFING

- .1 Install waterproofing in accordance with waterproofing manufacturer's written instructions to produce a waterproof membrane of uniform thickness bonded securely to substrate.
- .2 Do not install tile over waterproofing until waterproofing has cured and been tested to determine that it is watertight.

3.7 CLEANING AND FINISHING

- .1 Clean tiled areas after grouting has cured, using compatible solutions and methods as recommended by the manufacturer.
- .2 Remove latex-Portland cement and epoxy grout residue from tile as soon as possible.
- .3 Unglazed tile may be cleaned with acid solutions only when permitted by tile and grout manufacturer's written instructions, but no sooner than 10 days after installation.
- .4 Protect metal surfaces, cast iron, and vitreous plumbing fixtures from effects of acid cleaning.
- .5 Flush surface with clean water before and after cleaning.
- .6 Leave finished installation clean and free of cracked, chipped, broken, unbonded, or other tile deficiencies.

3.8 PROTECTION OF FINISHED WORK

- .1 Protect installed work.

END OF SECTION

Part 1 General**1.1 SUMMARY**

.1 This Section includes, but is not limited to, the following:

- .1 Linoleum resilient-sheet flooring
- .2 Resilient wall base

1.2 QUALITY ASSURANCE

.1 Contractor executing work of this Section shall have a minimum of five (5) years continuous Canadian experience in successful installation of work of type and quality shown and specified. Submit proof of experience upon Engineer or Department Representative's request.

1.3 PRE-INSTALLATION MEETING

.1 Pre-Installation Meeting: Schedule a pre-installation meeting at Work site in accordance with requirements of Section 01 31 19 Project Meetings, to verify project requirements, substrate conditions, patterns and layouts, coordination with other Sections affected by work of this Section, manufacturer's installation instructions and manufacturer's warranty requirements.

1.4 MANUFACTURER'S REPRESENTATIVE

.1 Contractor shall ensure that Manufacturer's Representative provides continual recommendation and periodic site visits to ensure that work of this Section is installed in strict accordance with the manufacturer's written instructions.

1.5 SUBMITTALS

.1 Submittals:

.1 Submit in accordance with the Contract Requirements and Section 01 33 00.

.2 Shop Drawings:

.1 Submit linoleum sheet flooring layout drawings indicating locations of all seams, metal edge strips and installation details required. Do not install linoleum sheet flooring until layout Shop Drawing has been approved by the Engineer.

.3 Samples:

.1 Submit three (3) of each; 610 mm x 610 mm (24" x 24") samples of each linoleum sheet colour and 305 mm (12") long samples of metal edge strip used in this Section to the Departmental Representative for approval.

.4 Safety Data Sheets:

.1 Submit WHMIS safety data sheets for inclusion with project record documents. Keep one copy of WHMIS safety data sheets on site for reference by workers.

.5 Maintenance Data and Operating Instructions:

- .1 Submit three copies of detailed instructions for maintaining, preserving and keeping clean, surfaces of this work, and give adequate warning of maintenance practices or materials detrimental to linoleum sheet flooring for inclusion in the Operating and Maintenance Manual.
- .6 Maintenance Materials:
 - .1 At completion of work of this Section, provide 2% of linoleum sheet flooring materials and accessories, in types, colours and sizes as installed by this Section and include cost of maintenance materials in the Contract Price. Clearly identify all maintenance materials with product description, manufacturer, lot number, colour, pattern and size.
 - .2 Maintenance materials shall be of the same production run as installed materials.
 - .3 Store maintenance materials on the premises as directed by Departmental Representative.
- .7 Submit proof that the linoleum sheet flooring installer is approved and factory trained by the manufacturer, dated and signed by a duly authorized person at the manufacturer.
- .8 Submit proof that the linoleum sheet flooring manufacturer approves use of linoleum sheet flooring adhesive the installer intends to use for the work of this Section.

1.6 DELIVERY, STORAGE, HANDLING AND PROTECTION

- .1 Coordinate deliveries to comply with Construction Schedule and arrange ahead for off-the-ground, under cover storage location. Do not load any area beyond the design limits.
- .2 Materials shall be carefully checked, unloaded, stored and handled to prevent damage. Protect materials with suitable non-staining waterproof coverings.
- .3 Store material in original, undamaged containers or wrappings with Manufacturer's seals and labels intact.
- .4 Restrict traffic by other trades during installation.
- .5 Provide adequate protection of completed surfaces to prevent damage by other trades until final completion of this project. Minimum protection shall consist of kraft paper.

1.7 ENVIRONMENTAL CONDITIONS

- .1 Temperature of room, floor surface and materials shall not be less than 21EC for 48 hours before, during and for 48 hours after installation. Concrete floors shall be aged for a minimum of 28 days and shall be dry before application of the linoleum sheet flooring.
- .2 Climatize linoleum sheet flooring in room(s)/area(s) which are scheduled to receive linoleum for minimum of 48 hours prior to installation.

- .3 Moisture content of floor shall not exceed a maximum of 3 lb of water per 1000 sq. ft. of concrete slab area over a 24-hour period as measured by one of the following methods, as reviewed by Engineer:
 - .1 Rubber Manufacturer's Association (RMA) moisture test using anhydrous calcium chloride.
 - .2 Does not exceed 3% as measured by Calcium Carbide Hygrometer procedure.
 - .3 Does not exceed 5% as measured by normal Protimeter.
- .4 Avoid exposure to high humidity, cold drafts and abrupt temperature changes.

1.8 WARRANTY

- .1 Warrant the Work of this Section against defects in materials and workmanship in accordance with the Contract Requirements but for a period of three (3) years and agree to repair or replace faulty materials or work which become evident during warranty period without cost to PCA. Defects shall include, but not limited to, bond failure, bubbling of linoleum sheet, extensive colour fading and seam separations.

Part 2 Products

2.1 MATERIALS

- .1 Linoleum Sheet Flooring:
 - .1 2.5mm (1/10") thick x 2000 mm (6'-6 3/4") wide linoleum sheets, free of blisters, cracks, embedded foreign matter and other defects which mar appearance and function, conforming to CSA A146, BS 6826, BS 5750 and for flammability CAN4-S102.2, Class 1, as indicated on drawings.
 - .2 Refer to drawings for locations.
- .2 Fillers and Primers:
 - .1 Types and brands approved, acceptable to linoleum sheet flooring material manufacturer for the applicable conditions. Use non-shrinking latex compound.
- .3 Linoleum Sheet Flooring Adhesive:
 - .1 Shall be medium consistency, latex resin emulsion type adhesive for jute backed linoleum sheet flooring, 72 Flooring Adhesive by Flextile Ltd., or Elastocol 635 by Forbo-Krommenie B.V., or Chemond 390 by Chemtron Mfg. Ltd., or Chemond 3590 by Chemtron Mfg. Ltd.
 - .2 Linoleum sheet adhesive must be approved by linoleum sheet flooring manufacturer prior to use.
- .4 Linoleum Sheet Seam and Edge Adhesive:
 - .1 As recommended by the linoleum sheet flooring manufacturer to suit conditions.
- .5 Metal Edge Strips:

- .1 Provide brass metal edge trim on floors where linoleum sheet flooring meets other floor finishes, heights to suit locations and finishes 'Schluter-Schiene-M' to suit conditions, by Schluter Systems (Canada) Inc., or approved equal by Benguard Manufacturing Limited. Lip of metal edge strips shall extend under linoleum sheet flooring with the shoulder of the metal edge strips finishing flush with top of linoleum sheet flooring and carpet or ceramic tile.
- .6 Resilient Wall Base (RB): Smooth, buffed exposed face and ribbed or grooved bonding surface supplied in maximum practical length, with pre-moulded end stops and external corners to match base, conforming to ASTM F1861 and as follows:
 - .1 Type: TP – Thermoplastic Rubber
 - .2 1 – Homogeneous
 - .3 Style: B – Cove
 - .4 Height: 100 mm
 - .5 Thickness: 3 mm
 - .6 Length: Manufacturers standard maximum length
 - .7 Colour: As indicated in drawings.
- .7 Cleaners, Sealers and Finishes:
 - .1 Types as recommended by the linoleum sheet manufacturer.

Part 3 Execution

3.1 EXAMINATION

- .1 Ensure that concrete substrates are dry using test methods recommended by resilient sheet flooring adhesive manufacturer and Engineer, and that they exhibit no alkalinity, carbonization, dusting and scaling.
- .2 Protect substrates against entry of water and moisture.
- .3 Examine substrates for unevenness which would impair quality of linoleum flooring work.
- .4 Examine substrates for curing compounds, sealers, hardeners and other substances not compatible with adhesive.
- .5 Apply linoleum sheet flooring in respective areas during final stages of building completion when ceilings and permanent partitions are finished, paint prime coats are applied and substrate conditions are suitable.

3.2 PREPARATION

- .1 Accept delivery of products to area of work to provide minimum 48 hours prior to application. Allow linoleum sheet flooring to become fully acclimatized. Examine products supplied and report all deficiencies, damages, and the like immediately to the Engineer.

- .2 Remove ridges and bumps from substrates.
- .3 Remove curing compounds, sealers and hardeners not compatible with primers and adhesives.
- .4 Clean substrates of debris, dust, dirt, grease, oil and other foreign matter.
- .5 Fill cracks and fill depressions 3 mm (1/8") or less in depth in floor substrates with crack filler.
- .6 Prime substrates as recommended by linoleum sheet flooring manufacturer.

3.3 APPLICATION - ADHESIVE

- .1 Mix and spread adhesives evenly, in minimum quantities, using correct tool type to manufacturer's instructions.
- .2 Cover only amount of area which can be covered by linoleum sheet flooring products within adhesive's working time. If adhesive over-dries, completely remove it. Use solvents compatible with new adhesive. Re-apply adhesive.
- .3 Do not soil walls, bases, fitments, casework and adjacent areas with adhesive. Promptly remove spillage.

3.4 INSTALLATION - LINOLEUM SHEET FLOORING

- .1 Lay linoleum sheet flooring to approved seaming plan.
- .2 Lay linoleum sheet flooring with straight "butt" joints. Butt sheets to moderate contact and lay with pattern direction parallel to axis of area. Obtain a uniform effect. Abrupt variations not permitted.
- .3 Adhesive apply linoleum sheet flooring to floor.
- .4 Accurately cut in precut linoleum sheet numerals and letters into linoleum sheet flooring as indicated on drawings, and apply linoleum sheet numerals and letters in linoleum sheet flooring with adhesive to produce a continuous, uniform appearance.
- .5 Accurately scribe around walls, columns, floor outlets and other projections through the floor. Fit flooring material neatly into breaks, under recesses, around pipes, penetrations, saddles, thresholds, and around permanent cabinets and equipment.
- .6 Where cleanout covers occur, set linoleum sheet flooring in recess provided. Provide 3/8" diameter aluminum markers same thickness of sheet flooring and insert in floor surface wherever covers occur.
- .7 Provide seam and edge adhesive at all "butt" joints. Make joints smooth.
- .8 At openings, where no thresholds occur and where linoleum sheet flooring is not continuous, finish linoleum sheet flooring against strike side of door stop, unless otherwise indicated on the drawings or otherwise specified.

- .9 Roll after laying with a polished, clean roller weighing at least 45 kg (100 lb) in two directions perpendicular to each other.
- .10 Seal linoleum sheet flooring to drains and pipes, and at room perimeters watertight with sealant. Refer to Section 07 92 00.

3.5 INSTALLATION - METAL EDGE STRIPS

- .1 Install metal edge strips at unprotected edges and where linoleum sheet flooring meets carpet or ceramic tile using filler feathered out minimum 610 mm (24") onto concrete floor, so that abutting finishes are flush after installation.
- .2 Where indicated on drawings, curve metal edge strips to radii and curves as indicated on drawings where linoleum sheet flooring meets carpet by notching horizontal leg of metal edge strips and install metal edge strips using filler feathered out minimum 610 mm (24") onto concrete floor, so that abutting finishes are flush after installation.

3.6 CLEANING AND FINISHING

- .1 Remove adhesive from surface of flooring as work progresses. Remove loose, damaged and defective products and replace with new units.
- .2 Protect newly laid work from construction traffic for a period of seven days to allow for firm, secure bond. At end of this time, thoroughly clean surfaces with a cleaner approved by the manufacturer of the flooring materials.
- .3 After the linoleum sheet flooring has been cleaned and dried, apply thin coat of polish. Allow polish to dry and buff linoleum sheet flooring with buffing machine as recommended by linoleum sheet flooring manufacturer.

3.7 PROTECTION OF COMPLETED WORK

- .1 Protect linoleum sheet flooring installed prior to and during Work or while repairs are being carried out, by covering floor with suitable protective material.
- .2 Avoid static loads on newly installed Work until adhesive has set thoroughly.
- .3 Protect completed installation from exterior elements. In summer months provide ventilation and prevent excessive heat and humidity.
- .4 Hand over linoleum sheet flooring to PCA free of blemishes and in perfect condition.

END OF SECTION

Part 1 General**1.1 SUMMARY**

- .1 Provide labour, materials, tools and other equipment, services and supervision required to complete interior and exterior, including above roof, painting and decorating work.
- .2 Surface preparation for this section will be limited to priming and back-priming, and specific pre-treatments noted in this section or as specified in the Master Painters Institute (MPI) Painting Specification Manual.

1.2 RELATED REQUIREMENTS

- .1 Other sections of the specification requiring painting refer to this section. Coordinate requirements of referencing sections.

1.3 REFERENCE STANDARDS

- .1 Environmental Choice Paints and Surface Coatings, Low VOC Product Listings Program (ECP):
 - .1 Paints and Surface Coatings, Low VOC Product Listings
- .2 The Master Painters Institute (MPI):
 - .1 New Surfaces: Architectural Painting Specification Manual.
 - .2 Existing Surfaces: Interior and Exterior Maintenance Repainting Manuals.
- .3 The Society for Protective Coatings (SSPC):
 - .1 Coating Materials Guidelines
 - .2 Surface Preparation Guidelines
 - .3 Application, Inspection and Quality Control Guidelines

1.4 DEFINITIONS

- .1 Gloss Levels: Standard coating terms defined by MPI Manual apply to products of this Section as follows:
 - .1 G1: Matte or Flat: Lustreless or matte finish with a gloss range below 10 when measured at 85° to meter and 0 to 5 when measured at 60°.
 - .2 G2: Velvet: Matte to low sheen finish with a gloss range of 10 to 35 when measured at 85° to meter and 0 to 10 when measured at 60°.
 - .3 G3: Eggshell: Low sheen finish with a gloss range of 10 to 35 when measured at 85° to meter and 10 to 25 when measured at 60°.
 - .4 G4: Satin: Low to medium sheen with a gloss range of minimum 35 when measured at 85° to meter and 20 to 35 when measured at 60°.

- .5 G5: Semi-Gloss: Medium sheen finish with a gloss range of 35 to 70 when measured at 60° to meter.
- .6 G6: Gloss: High sheen finish with a gloss range of 70 to 85 when measured at 60° to meter.
- .7 G7: High Gloss: Reflective sheen having a gloss range in excess of 85 when measured at 60° to meter.
- .2 Gloss Values: Generally, provide paints and coatings having the following sheens when installed on the following substrates:
 - .1 Walls: Eggshell (G3) or Satin (G4) as selected by Engineer at a later date.
 - .2 Trim and Doors: Semi-gloss (G5).
 - .3 Ceilings: Flat (G1).

1.5 SUBMITTALS

- .1 Provide required information in accordance with Section 01 33 00 Submittals.
- .2 Action Submittals: Provide the following submittals before starting any work of this Section:
 - .1 Product Data: Submit list of all painting materials used for the Work to the Engineer for review prior to ordering materials for each paint system indicated, including block fillers and primers.
 - .1 Material List: An inclusive list of required coating materials indicating each material and cross reference specific coating, finish system, and application; identify each material by manufacturer's catalogue number and general classification.
 - .2 Manufacturer's Information: Manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material.
 - .2 Samples: Provide stepped samples, defining each separate coat, including block fillers and primers using representative colours required for the project; label each sample for location and application, and as follows:
 - .1 Drawdown Samples: Provide three (3) drawdown sample charts (cards) for each type, texture and colour of finish specified for verification purposes before ordering paint materials.
 - .3 Informational Submittals: Provide the following submittals when requested by the Engineer:
 - .1 Certification: Submit certification reports for paint products indicating that they meet or exceed low VOC and coloured base requirements listed in this Section.

1.6 PROJECT CLOSEOUT SUBMISSIONS

- .1 Operation and Maintenance Data: Submit copies of paint manufacturer's written maintenance information for inclusion in the operations manual in accordance with Section 01 33 00 – Submittals: Operations and Maintenance Data, including specific warning of any maintenance practice or materials that may damage or disfigure the finished Work.
- .2 Maintenance Materials: Deliver maintenance materials to PCA in quantities indicated and in accordance with Section 01 33 00 Submittals, that match products installed; packaged with protective covering for storage, and identified with labels describing contents and building location and as follows:
 - .1 Paints and Coatings: Minimum of 4-4L containers of field colours and 4-1 L containers of each accent colour, and all remnants.

1.7 QUALITY ASSURANCE

- .1 Conform to the standards contained in the MPI Manual.
- .2 Applicator Qualifications: A firm or individual experienced in applying paints and coatings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in service performance, and as follows:
 - .1 Have a minimum of five (5) years proven satisfactory experience and shall show proof before commencement of work that he will maintain a qualified crew of painters throughout the duration of the work.
 - .2 When requested provide a list of the last three comparable jobs including, name and location, specifying authority, start and completion dates and cost amount of the painting work.
 - .3 Apprentices may be employed provided they work under the direct supervision of a qualified journeyman in accordance with trade regulations.
- .3 Source Limitations: Obtain block fillers and primers for each coating system from the same manufacturer as the finish coats and as follows:
 - .1 Use only paint manufacturers and products as listed under the Approved Products section of the MPI Manual Architectural Painting Specification Manual.

1.8 ENVIRONMENTAL REQUIREMENTS

- .1 Conform to MPI Manual and manufacturers requirements.
- .2 Perform no painting or decorating work when the ambient air and substrate temperatures, relative humidity and dew point and substrate moisture content is below or above requirements for both interior and exterior work.

- .3 Apply paint only to dry, clean, properly cured and adequately prepared surfaces in areas where dust is no longer generated by construction activities such that airborne particles will not affect the quality of finished surfaces.
- .4 Ensure adequate continuous ventilation and sufficient heating and lighting is in place.
- .5 Paint, stain and wood preservative finishes and related materials (thinners, solvents, caulking, empty paint cans, cleaning rags, etc.) shall be regarded as hazardous products. Recycle and dispose of same subject to regulations of applicable authorities having jurisdiction.
- .6 To reduce the amount of contaminants entering waterways, sanitary/storm drain systems or into the ground retain cleaning water and filter out and properly dispose of sediments.
- .7 Set aside and protect surplus and uncontaminated finish materials not required by the PCA and deliver or arrange collection for verifiable re-use or re-manufacturing.

1.9 WARRANTY

- .1 Special Warranty: Provide an MPI two (2) year guaranty, or a 100% two (2) year Maintenance Bond in accordance with MPI Manual requirements; painting subcontractors choosing the Maintenance Bond option must provide a maintenance bond consent from a reputable surety company licensed to do business in Canada as follows:
 - .1 Warrant that painting work has been performed in accordance with MPI Manual requirements.
 - .2 Provide a cash value to repair or replace defective coatings in the event that the original installer is not able to perform warranty work.

Part 2 Products

2.1 MANUFACTURERS

- .1 Subject to compliance with requirements, manufacturers that have attained the prerequisites for ecologically sustainable labelling mark on their products and may be incorporated into the Work include; but are not limited to, the following:
 - .1 As indicated on drawings.

2.2 MATERIALS

- .1 Primers, paints, coatings, varnishes, stains, lacquers, fillers, thinners, solvents, and other painting materials shall be in accordance with the MPI Manual "Approved Product" listing and shall be from a single manufacturer for each system used.
- .2 Materials such as linseed oil, shellac, and other accessory materials shall be the highest quality product of an approved manufacturer listed in the MPI Manual and shall be compatible with other coating materials.

.3 All materials and paints shall be lead and mercury free and shall have low VOC content where possible.

.4 Colour: As indicated on drawings.

Part 3 Execution

3.1 PREPARATION OF SURFACES:

.1 Prepare surfaces in accordance with MPI Manual requirements. Refer to the Manual for specific surface preparation requirements for each substrate material.

.2 Prepare aluminum surfaces to receive new premium paint finish, where indicated on drawings. Sand, clean and test aluminum surfaces scheduled to receive paint finish under adequate illumination, ventilation and temperature requirements, as recommended by the paint manufacturer to ensure proper adhesion of the paint.

.1 Protect adjacent surfaces from sanding, so not to cause damage to those surfaces.

3.2 APPLICATION

.1 Paint when substrates and environmental conditions (heating, ventilation, lighting and completion of other work) are acceptable for applications of products specified in this Section.

.2 Paint or stain surfaces requiring paint or stain finish to Premium MPI Manual finish requirements with application methods in accordance with best trade practices for type and application of materials used.

.3 Continue paint finishes through behind wall mounted items.

.4 Painting coats specified are intended to cover surfaces satisfactorily when applied at proper consistency and in accordance with manufacturer's recommendations.

.5 Apply a minimum of four coats of paint where deep or bright colours are used to achieve satisfactory results.

3.3 SCHEDULE OF FINISHES

.1 As indicated on drawings.

3.4 MECHANICAL AND ELECTRICAL EQUIPMENT

.1 Paint "unfinished" conduits, piping, hangers, ductwork and other mechanical and electrical equipment with colour and texture to match adjacent surfaces, in the following areas:

.1 In exposed to view exterior and interior areas.

.2 In interior high humidity interior areas.

- .3 In boiler room, mechanical rooms, and electrical rooms.
- .2 Leave conduits, piping, hangers, ductwork and other mechanical and electrical equipment in original finish and touch up scratches and marks in unfinished areas.
- .3 Paint inside of ductwork where visible behind louvers, grilles and diffusers beyond sight line with primer and one coat of matt black (non-reflecting) paint.
- .4 Paint the inside of light valances gloss white.
- .5 Refer to Mechanical and Electrical specifications for painting, banding, stencilling of other surfaces and equipment, and generally as follows:
 - .1 Paint gas piping gas standard yellow where visible in service spaces.
 - .2 Paint both sides and all edges of plywood backboards for equipment before installation.
 - .3 Leave equipment in original finish except for touch-up as required, and paint conduits, mounting accessories and other unfinished items.
 - .4 Do not paint over nameplates.

3.5 SITE QUALITY CONTROL

- .1 Painted surfaces will be considered to lack uniformity and soundness if any of the following defects are apparent at time of field review when viewed from a distance of 4' from the painted surface:
 - .1 Runs, sags, hiding or shadowing by inefficient application methods
 - .2 Evidence of poor coverage at rivet heads, plate edges, lap joints, crevices, pockets, corners and re-entrant angles
- .2 Painted surfaces will be considered as deficient if any of the following defects are apparent at time of field review, regardless of viewing distance.
 - .1 Damage due to touching before paint is sufficiently dry or any other contributory cause.
 - .2 Damage due to application on moist surfaces or caused by inadequate protection from the weather.
 - .3 Damage or contamination of paint due to windblown contaminants (dust, sand blast materials, salt spray, etc)
- .3 Painted surfaces determined to be unacceptable shall be replaced or repaired at no cost to PCA or Engineer:
 - .1 Small affected areas may be touched up
 - .2 Large affected areas or areas without sufficient dry film thickness of paint shall be repainted.

- .3 Runs, sags or damaged paint shall be removed by scraper or by sanding before application of new paint coats.

3.6 PROTECTION

- .1 Protect newly painted exterior surfaces from rain and snow, condensation, contamination, dust, salt spray and freezing temperatures until paint coatings are completely dry.
- .2 Curing periods shall exceed the manufacturers recommended minimum time requirements.
- .3 Erect barriers or screens and post signs to warn of or limit or direct traffic away or around work area as required.

3.7 CLEANUP

- .1 Remove all paint where spilled, splashed, splattered or sprayed as work progresses using means and materials that are not detrimental to affected surfaces.
- .2 Keep work area free from an unnecessary accumulation of tools, equipment, surplus materials and debris.
- .3 Remove combustible waste materials and empty paint cans each day and safely dispose of in accordance with requirements of authorities having jurisdiction.
- .4 Clean equipment and dispose of wash water or solvents, and other cleaning and protective materials (rags, drop cloths, masking papers, etcetera), paints, thinners, paint removers and strippers in accordance with the safety requirements of authorities having jurisdiction.

END OF SECTION

Part 1 General**1.1 GENERAL REQUIREMENTS**

- .1 General Conditions, Supplementary Conditions and Division 01 apply to this Section.

1.2 SUMMARY

- .1 Furnish labour, materials and other services to complete the fabrication and installation of;
 - .1 Washroom accessories and framed mirrors and
 - .2 Attachment hardware.
- .2 Include all materials and fitments required for the operation of any unit furnished, in the manner, direction and performance shown on the shop drawings and specified herein.

1.3 RELATED REQUIREMENTS

- .1 Section 06 10 00: Rough Carpentry
- .2 Section 09 21 16: Gypsum Wallboard
- .3 Section 09 30 00: Tiling

1.4 REFERENCES

- .1 American Society for Testing and Materials (ASTM):
 - .1 ASTM A153/A153M-09, Standard Specification for Zinc Coating (Hot Dip) on Iron and Steel Hardware
 - .2 ASTM A653/A653M-15, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
 - .3 ASTM A666-10, Standard Specification for Annealed or Cold-Worked Austenitic Stainless-Steel Sheet, Strip, Plate, and Flat Bar
 - .4 ASTM A1008/A1008M-12a, Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable

1.5 SUBMITTALS

- .1 Provide submittals specified and as required to assess conformance with the Contract Documents, in accordance with Section 01 33 00 Submittals.
- .2 Shop Drawings: Show and describe in detail, materials, finishes, dimensions, details of connections and fastenings, elevations, plans, sections, metal gauges, hardware and any other pertinent information.

- .3 Coordinate the work of this Section with the placement of internal wall reinforcement.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Coordinate deliveries to comply with construction schedule and arrange ahead for off the ground, under cover storage location.
- .2 Materials shall be carefully checked, unloaded, stored and handled to prevent damage. Protect materials with suitable non-staining waterproof coverings.
- .3 Store materials in original, undamaged containers or wrappings with manufacturer's seals and labels intact.
- .4 Unsatisfactory materials shall be removed from the site.
- .5 Adequately protect the structure and work of other Sections during delivery, storage, handling and execution of the work of the Section.
- .6 Provide tools, plant and other equipment required for the proper execution of the work of this Section.

Part 2 Products

2.1 MANUFACTURERS

- .1 Basis-of-Design Products: Products named in this Section were used as the basis-of-design for the project; additional manufacturers offering similar products may be incorporated into the work of this Section provided they meet the performance requirements established by the named products and provided they submit requests for substitution in accordance with Section 01 33 00 Submittals.
- .2 Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include; but are not limited to, the following:
 - .1 Bobrick
 - .2 Frost
 - .3 Or equal

2.2 MATERIALS

- .1 Provide one of the products indicated for each designation in the Washroom and Custodial Accessory Schedule below, subject to compliance with specified requirements.
- .2 Stainless Steel: In accordance with ASTM A666, Type 304, with No. 4 finish (satin); minimum nominal thickness as established by product type.
- .3 Sheet Steel: Steel: In accordance with ASTM A1008/A1008M, cold rolled, commercial quality; minimum nominal thickness as established by product type; surface preparation and metal pretreatment as required for applied finish.

- .4 Galvanized Steel Sheet: In accordance with ASTM A653/A653M, minimum Z180 coating designation.
- .5 Galvanized Steel Mounting Devices: In accordance with ASTM A153/A153M, hot dip galvanized after fabrication.
- .6 Fasteners: Screws, bolts, and other devices of same material as accessory unit, tamper and theft resistant when exposed, and of galvanized steel when concealed.

2.3

FABRICATION

- .1 Washroom Accessories:
 - .1 Surface Mounted:
 - .1 Fabricate units with tight seams and joints, and exposed edges rolled.
 - .2 Hang doors and access panels with continuous stainless-steel hinge.
 - .3 Provide concealed anchorage where possible.
 - .2 Recessed Mounted:
 - .1 Fabricate units of all welded construction, without mitred corners.
 - .2 Hang doors and access panels with full length, stainless steel hinge.
 - .3 Provide anchorage that is fully concealed when unit is closed.
- .2 Workmanship shall be best grade of modern shop practice known to recognized manufacturers specializing in this work. Joints and intersecting members shall be accurately fitted, made in true planes with adequate fastening. Wherever possible fastenings shall be concealed.
- .3 Isolate where necessary to prevent electrolysis between dissimilar metal to metal or metal to masonry or concrete contact.
- .4 Fabricate and erect work square, plumb, straight, true and accurately fitted. Provide adequate reinforcing and anchorage.
- .5 Drilling shall be reamed and exposed edges left clean and smooth.
- .6 Include anchors and fastenings necessary to anchor work of this Section.
- .7 Coordinate with Section 06 10 00: Rough Carpentry, for wood blocking for attachment of washroom accessories.
- .8 Keys: Provide universal keys for internal access to accessories for servicing and re-supplying. Provide minimum of six (6) keys to Departmental Representative.

Part 3 Execution**3.1 EXAMINATION**

- .1 Inspect surfaces over which the work of this Section is dependent for any irregularities detrimental to the application and performance of the work. Notify Departmental Representative in writing of all conditions which are at variance with those in the Contract Documents and/or detrimental to the proper and timely installation of the work of this Section. The decision regarding corrective measures shall be obtained from the Departmental Representative prior to proceeding with the affected work.
- .2 Commencement of work of this Section implies acceptance of surfaces and conditions.

3.2 INSTALLATION

- .1 Make thorough examination of drawings and details, determine the intent, extent, materials, conditions of interfacing with other work and be fully cognizant of requirements.
- .2 Work of this Section shall include complete installation of items specified herein. Installation shall be in strict accordance with manufacturer's printed instructions.
- .3 Securely fasten accessories, level and plumb in the locations shown on the drawings and specified herein. All fastenings shall be concealed.
- .4 Co-ordinate the work of this Section with the work of other Sections to provide the necessary recesses, edge conditions wood blocking for the accessories as required.
- .5 Do all drilling of steel, masonry and concrete necessary for the anchorage of the work.
- .6 Installed grab bars shall be capable of supporting a downward pull of 500 lbs. per lineal foot.

3.3 ADJUSTING

- .1 Check mechanisms, hinges, locks and latches, adjust and lubricate to ensure that accessories are in perfect working order.

3.4 CLEANING

- .1 Upon completion of the work of this Section or when directed by Departmental Representative, remove all protective coatings, and coverings. Clean and polish exposed surfaces.

3.5 WASHROOM ACCESSORY SCHEDULE

- .1 As indicated on drawings.

END OF SECTION

Part 1 General**1.1 REFERENCE STANDARDS**

- .1 The latest adopted version of:
 - .1 American National Standards Institute/National Fire Prevention Association (ANSI/NFPA).
 - .1 ANSI/NFPA 13, Installation of Sprinkler Systems.
 - .2 ANSI/NFPA 10, Portable Fire Extinguishers.
 - .3 ANSI/NFPA 25, Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems.
 - .2 Underwriter's Laboratories of Canada (ULC).
 - .3 CAN4 S543, Standard for Internal Lug Quick Connect Couplings for Fire Hose.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for kitchen rang hood fire suppression system and fire extinguishers, and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Alberta, Canada.
 - .2 Indicate on drawings:
 - .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.

1.3 CLOSEOUT SUBMITTALS

- .1 Operation and Maintenance Data: submit operation and maintenance data for kitchen rang hood fire suppression system and fire extinguishers for incorporation into manual.
 - .1 Operation and maintenance manual approved by, and final copies deposited with Departmental Representative before final inspection.
 - .2 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.
- .3 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.
- .4 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.
- .5 Approvals:
 - .1 Submit 2 copies of draft Operation and Maintenance Manual to Departmental Representative for approval. Submission of individual data will not be accepted unless directed by Departmental Representative.
 - .2 Make changes as required and re-submit as directed by Departmental Representative.
- .6 Additional data:
 - .1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.
- .7 Site records:
 - .1 Provide sets of white prints as required for the completion of the work. Mark changes as work progresses and as changes occur. Include changes to existing mechanical systems, control systems and low voltage control wiring.
 - .2 Use different colour waterproof ink for each service.
 - .3 Make available for reference purposes and inspection.
- .8 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 Departmental Representative 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.
- .9 Submit copies of as-built drawings for inclusion in final TAB report.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- .1 Furnish spare parts as follows:

- .1 One set of fire extinguisher.
- .2 Provide one set of special tools required to service equipment.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .2 Storage and Handling Requirements:
 - .1 Store materials indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Replace defective or damaged materials with new.
- .3 Packaging Waste Management: remove for reuse and return by manufacturer of packaging materials, and coordinate with the client on site for waste management.

Part 2 Products

2.1 ABOVE GROUND PIPING SYSTEMS

- .1 Provide fittings for changes in direction of piping and for connections:
 - .1 Make changes in piping sizes through tapered reducing pipe fittings, bushings will not be permitted.
 - .2 Perform welding in shop; field welding will not be permitted.
 - .3 Conceal piping in areas with suspended ceiling.

2.2 PIPE, FITTINGS AND VALVES

- .1 Pipe:
 - .1 Ferrous: to ANSI/NFPA 13.
- .2 Fittings and joints to ANSI/NFPA 13:
 - .1 Ferrous: screwed, flanged or roll grooved.
 - .2 Provide threaded, grooved-end type fittings into which sprinkler heads, sprinkler head riser nipples, or drop nipples are threaded.
 - .3 Fittings: ULC approved for use in wet pipe sprinkler systems.
 - .4 Ensure fittings, mechanical couplings, and rubber gaskets are supplied by same manufacturer.
- .3 Valves:
 - .1 ULC listed for fire protection service.
 - .2 Provide indicators on isolation valves beneath each alarm valve in each riser when more than one alarm valve is supplied from same water supply pipe.
 - .3 Check valves: flanged clear opening swing-check type with flanged inspection and access cover plate for sizes 10 cm and larger.
- .4 Pipe Hangers:
 - .1 ULC listed for fire protection services in accordance with NFPA 13.

2.3 SPRINKLER HEADS

- .1 General: to ANSI/NFPA 13 and ULC listed for fire services:

- .1 Release element of each head to be of temperature read as suitable for specific application.
- .2 Provide polished chrome sprinklers where exposed.
- .3 Provide corrosion-resistant sprinkler heads and sprinkler head guards in accordance with NFPA 13.

2.4 SUPERVISORY SWITCHES

- .1 General: to ANSI/NFPA 13 and ULC listed for fire service.
- .2 Valves:
 - .1 Mechanically attached to valve body, with normally open and normally closed contacts and supervisory capability.
- .3 Flow switch type:
 - .1 With normally open and normally closed contacts and supervisory capability.
 - .2 Provide switch with circuit opener or closer for automatic transmittal of alarm over facility fire alarm system.
 - .3 Alarm actuating device: mechanical diaphragm controlled retard device adjustable from 30 to 90 seconds and instantly recycle.

2.5 PRESSURE GAUGES

- .1 ULC listed 90 mm, dial type: to ASME B40.100, Grade 2A, stainless steel bourdon tube having 0.5% accuracy full scale unless otherwise specified.
- .2 Maximum limit of not less than twice normal working pressure at point where installed.

2.6 ESCUTCHEON PLATES

- .1 Provide split hinge type metal plates for piping passing through walls, floors, and ceilings in exposed spaces.
- .2 Provide polished chromium-plated finish on copper alloy plates in finished spaces.
- .3 Provide paint finish on metal plates in unfinished spaces.

2.7 INSPECTOR'S TEST CONNECTION

- .1 Locate inspector's test connection at hydraulically most remote part of each system, provide test connections approximately 2.4 m above floor for each sprinkler system or portion of each sprinkler system equipped with alarm device.
- .2 Provide discharge orifice of same size as corresponding sprinkler orifice.

2.8 SIGNS

- .1 Attach properly lettered and approved metal signs to each valve and alarm device to ANSI/NFPA 13.
- .2 Permanently fix hydraulic design data nameplates to riser of each system.

2.9 SPARE PARTS CABINET

- .1 Provide metal cabinet with extra sprinkler heads and sprinkler head wrench adjacent to each alarm valve.

2.10 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. Sizes 4.5 kg (10 lbs) or as indicated.
- .2 Cabinets:
 - .1 Semi-recessed type as indicated, constructed of 1.6 mm (1/16") thick steel, 180° opening door of 2.5 mm (3/32") thick steel with latching device.
 - .2 Cabinet to maintain fire resistive rating of construction in which they occur.
 - .3 Cabinet door: with 5mm (3/16") full glass panel.
 - .4 Finish: Tub: prime coated; Door, frame and visible parts: No. 4 satin finish stainless steel.
- .3 Identification:
 - .1 Identify extinguishers in accordance with recommendations of ANSI/NFPA 10.
 - .2 Attach tag or label to extinguishers, indicating month and year of installation. Provide space for service dates.

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 the installation in accordance with manufacturer's written instructions.
 - .1 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .2 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 PAINTING REPAIRS AND RESTORATION

- .1 Prime and touch up marred finished paintwork to match original.
- .2 Restore to new condition, finishes which have been damaged.

3.3 SYSTEM CLEANING

- .1 Clean interior and exterior of all systems including strainers. Vacuum interior of ductwork and air handling units.

3.4 FIELD QUALITY CONTROL

- .1 Site Tests:
 - .1 Perform test to determine compliance with specified requirements in presence of Departmental Representative and Authority Having Jurisdiction.
 - .2 Test, inspect, and approve piping before covering or concealing.
 - .3 Preliminary Tests:
 - .1 Hydrostatically test each system at 1.4 MPa for a two hour period with no leakage or reduction in pressure.
 - .2 Flush piping with potable water in accordance with NFPA 13.
 - .3 Piping above suspended ceilings: tested, inspected, and approved before installation of ceilings.

- .4 Test alarms and other devices.
- .5 Test water flow alarms by flowing water through inspector's test connection. After testing is completed and the necessary corrections have been made, the Contractor is to submit a signed and dated certificate in accordance with NFPA 13.
- .4 Formal Tests and Inspections:
 - .1 Do not submit request for formal test and inspection until preliminary test and corrections are completed and approved.
 - .2 Submit written request for formal inspection at least 15 days prior to inspection date.
 - .3 Repeat required tests as directed.
 - .4 Correct defects and make additional tests until systems comply with contract requirements.
 - .5 Furnish equipment, instruments, and personnel for tests.

3.5 DEMONSTRATION

- .1 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.

3.6 CLEANING

- .1 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.
- .2 Waste Management:
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.7 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 REFERENCE STANDARDS**

- .1 National Plumbing Code of Canada 2015.

1.2 RELATED REQUIREMENTS

- .1 Section 22 05 05 Selective demolition for plumbing.
- .2 Section 22 05 15 Plumbing specialties and accessories.
- .3 Section 22 11 16 Domestic water piping.
- .4 Section 22 13 16.13 Sanitary waste and vent piping - Cast iron and copper.
- .5 Section 22 13 16.16 Sanitary waste and vent piping – Plastic.
- .6 Section 22 42 19 Commercial bathtubs and showers.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for plumbing fixtures and equipment and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Alberta, Canada.
 - .2 Indicate on drawings:
 - .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.

1.4 CLOSEOUT SUBMITTALS

- .1 Operation and Maintenance Data: submit operation and maintenance data for incorporation into manual.
 - .1 Operation and maintenance manual approved by, and final copies deposited with, Departmental Representative before final inspection.
 - .2 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.

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- .5 Description of actions to be taken in event of equipment failure.
- .6 Valves schedule and flow diagram.
- .7 Colour coding chart.
- .3 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.
- .4 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.
- .5 Approvals:
 - .1 Submit 2 copies of draft Operation and Maintenance Manual to Departmental Representative for approval.
 - .2 Make changes as required and re-submit as directed by Departmental Representative.
- .6 Additional data:
 - .1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.
- .7 Site records:
 - .1 Provide sets of white prints as required for the completion 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.
- .8 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 Departmental Representative 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.
- .9 Submit copies of as-built drawings for inclusion in final TAB report.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- .1 Furnish spare parts as follows:
 - .1 One set of packing for each pump.
 - .2 One casing joint gasket for each size pump.
 - .3 One glass for each gauge glass.
- .2 Provide one set of special tools required to service equipment as recommended by manufacturers.
- .3 Furnish one commercial quality grease gun, grease and adapters to suit different types of grease and grease fittings.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .2 Storage and Handling Requirements:
 - .1 Store materials indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Replace defective or damaged materials with new.

Part 2 Products**2.1 NOT USED**

- .1 Not used.

Part 3 Execution**3.1 EXAMINATION**

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

3.2 PAINTING REPAIRS AND RESTORATION

- .1 Prime and touch up marred finished paintwork to match original.
- .2 Restore to new condition, finishes which have been damaged.

3.3 SYSTEM CLEANING

- .1 Clean interior and exterior of all systems including strainers. Vacuum interior of ductwork and air handling units.

3.4 FIELD QUALITY CONTROL

- .1 Site Tests: Perform test to determine compliance with National Plumbing Code of Canada 2015, and manufacturer's instructions.

3.5 DEMONSTRATION

- .1 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, trouble-shooting and servicing of all systems and equipment during regular work hours, prior to acceptance.
- .2 Use operation and maintenance manual, as-built drawings, and audio visual aids as part of instruction materials.
- .3 Instruction duration time requirements as specified in appropriate sections.

3.6 CLEANING

- .1 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.
- .2 Waste Management:
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.7 PROTECTION

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

END OF SECTION

Part 1 General**1.1 SUMMARY**

- .1 This Section includes requirements for selective demolition and removal of plumbing, and sprinkler systems and related mechanical components and incidentals required to complete work described in this Section and ready for new construction.

1.2 RELATED REQUIREMENTS

- .1 Section 02 41 19.16 - Selective Interior Demolition
- .2 Section 02 42 00 - Removal and Salvage of Construction Materials

1.3 REFERENCE STANDARDS

- .1 CSA Group (CSA)
 - .1 CSA S350 M1980 (R2003), Code of Practice for Safety in Demolition of Structures.

1.4 DEFINITIONS

- .1 Demolish: Detach items from existing construction and legally dispose of items off site, unless indicated as removed and salvaged, or removed and reinstalled.
- .2 Remove: Planned deconstruction and disassembly of electrical items from existing construction including removal of conduit, junction boxes, cabling and wiring from electrical component to panel taking care not to damage adjacent assemblies designated to remain; legally dispose of items off site, unless indicated as removed and salvaged, or removed and reinstalled.
- .3 Remove and Salvage: Detach items from existing construction and deliver them to Departmental Representative ready for reuse.
- .4 Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.
- .5 Existing to Remain: Existing items of construction that are not removed and that are not otherwise indicated as being removed and salvaged, or removed and reinstalled.
- .6 Hazardous Substances: Dangerous substances, dangerous goods, hazardous commodities and hazardous products may include asbestos, mercury and lead, PCB's, poisons, corrosive agents, flammable substances, radioactive substances, or other material that can endanger human health or wellbeing or environment if handled improperly as defined by the Federal Hazardous Products Act (RSC 1985) including latest amendments.

1.5 ADMINISTRATIVE REQUIREMENTS

- .1 Coordination: Coordinate work of this Section to avoid interference with work by other Sections.
- .2 Scheduling: Account for Departmental Representative's continued occupancy requirements during selective demolition with Section 02 41 19.13 - Selective Building Demolition and Section 02 41 19.16 - Selective Interior Demolition and schedule staged occupancy and worksite activities as coordinated with the Departmental Representative.

1.6 QUALITY ASSURANCE

- .1 Regulatory Requirements: Perform work of this Section in accordance with the following:
 - .1 Government of Canada, Labour Program: Workplace Safety and Alberta Occupational Health and Safety Standards and Programs.

1.7 SITE CONDITIONS

- .1 Existing Conditions: Condition of materials identified as being salvaged or demolished are based on their observed condition at time of site examination before tendering.
- .2 Existing Hazardous Substances:
 - .1 Hazardous substances will be removed by a hazardous abatement specialist engaged by the Departmental Representative before start of the Work.
- .3 Existing Hazardous Substances:
 - .1 Hazardous substances are as defined in the Hazardous Products Act.
 - .2 Hazardous substances will be removed by the Contractor as a part of the Contract before starting Work in accordance with work results described in Related Requirements listed above.
- .4 Discovery of Hazardous Substances: It is not expected that Hazardous Substances will be encountered in the Work; immediately notify Departmental Representative if materials suspected of containing hazardous substances are encountered and perform the following activities:
 - .1 Hazardous substances will be as defined in the Hazardous Products Act.
 - .2 Stop work in the area of the suspected hazardous substances.
 - .3 Take preventative measures to limit users' and workers' exposure, provide barriers and other safety devices and do not disturb.
 - .4 Proceed only after written instructions have been received from Departmental Representative.

1.8 SALVAGE AND DEBRIS MATERIALS

- .1 Demolished items become Contractor's property and will be removed from Project site; except for items indicated as being reused, salvaged, or otherwise indicated to remain Departmental Representative's property.
- .2 Carefully remove materials and items designated for salvage and store in a manner to prevent damage or devaluation of materials.

Part 2 Products

2.1 MATERIALS

- .1 General Patching and Repair Materials: Refer to Section 02 41 19.16 - Selective Interior Demolition for listing of patching and repair materials incidental to removal or demolition of components associated with work of this Section.
- .2 Plumbing Repair Materials: Use only new materials required for completion or repair matching materials damaged during performance of work of this Section; new materials are required to meet assembly or system characteristics as existing systems indicated to remain and carry CSA approval labels required by the Authority Having Jurisdiction.
- .3 Fire stopping Repair Materials: Use fire stopping materials compatible with existing fire stopping systems where removal or demolition work affects rated assemblies, restore to match existing fire rated performance.

Part 3 Execution**3.1 EXAMINATION**

- .1 Verification of Existing Conditions: Visit site, thoroughly examine and become familiar with conditions that may affect the work of this Section before tendering the Bid; Departmental Representative will not consider claims for extras for work or materials necessary for proper execution and completion of the contract that could have been determined by a site visit.

3.2 PREPARATION

- .1 Protection of Existing Systems to Remain: Protect systems and components indicated to remain in place during selective demolition operations and as follows:
 - .1 Prevent movement and install bracing to prevent settlement or damage of adjacent services and parts of existing buildings scheduled to remain.
 - .2 Notify Departmental Representative and cease operations where safety of buildings being demolished, adjacent structures or services appears to be endangered and await additional instructions before resuming demolition work specified in this Section.
 - .3 Prevent debris from blocking drainage inlets.
 - .4 Protect mechanical systems that must remain in operation.
- .2 Protection of Building Occupants: Sequence demolition work so that interference with the use of the building by the Departmental Representative and users is minimized and as follows:
 - .1 Prevent debris from endangering the safe access to and egress from occupied buildings.
 - .2 Notify Departmental Representative and cease operations where safety of occupants appears to be endangered and await additional instructions before resuming demolition work specified in this Section.

3.3 EXECUTION

- .1 Demolition and Removal: Coordinate requirements of this Section with information contained in Section 02 41 19.16 - Selective Interior Demolition and as follows:
 - .1 Disconnect and cap mechanical services in accordance with requirements of local Authority Having Jurisdiction.
 - .2 Do not disrupt active or energized utilities without approval of the Departmental Representative.
 - .3 Erect and maintain dust proof and weather tight partitions to prevent the spread of dust and fumes to occupied building areas; remove partitions when complete.
 - .4 Demolish parts of existing building to accommodate new construction and remedial work as indicated.
 - .5 At end of each day's work, leave worksite in safe condition.
 - .6 Perform demolition work in a neat and workmanlike manner:
 - .1 Remove any tools or equipment after completion of work, and leave site clean and ready for subsequent renovation work.
 - .2 Repair and restore damages caused as a result of work of this Section to match existing materials and finishes.

3.4 CLOSEOUT ACTIVITIES

- .1 Demolition Waste Disposal: Arrange for legal disposal and remove demolished materials to accredited provincial landfill site or alternative disposal site (recycle centre) except where explicitly noted otherwise for materials being salvaged for re use in new construction in accordance with Section 02 42 00 - Removal and Salvage of Construction Materials.

END OF SECTION

Part 1 General**1.1 RELATED REQUIREMENTS**

- .1 Section 22 11 16 Domestic water piping.
- .2 Section 22 13 16.13 Sanitary waste and vent piping - Cast iron and copper.
- .3 Section 22 13 16.16 Sanitary waste and vent piping – Plastic.
- .4 Section 22 42 19 Commercial bathtubs and showers.

1.2 REFERENCE STANDARDS

- .1 CSA Group (CSA)
 - .1 CSA-B64 Series-11, Backflow Preventers and Vacuum Breakers.
 - .2 CSA B79-08, Commercial and Residential Drains and Cleanouts.
 - .3 CAN/CSA-B356-10, Water Pressure Reducing Valves for Domestic Water Supply Systems.
- .2 National Research Council Canada (NRC)
 - .1 National Plumbing Code of Canada 2015 (NPC).
- .3 Plumbing and Drainage Institute (PDI)
 - .1 PDI-WH201-R2010, Water Hammer Arresters Standard.

1.3 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-installation Meetings:
 - .1 Convene pre-installation meeting 1 week prior to beginning on-site installation, with general contractor's representative to:
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Co-ordination with other building construction subtrades.
 - .4 Review manufacturer's written installation instructions and warranty requirements.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for plumbing products and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Shop Drawings:
 - .1 Indicate on drawings to indicate materials, finishes, method of anchorage, number of anchors, dimensions, construction and assembly details, and accessories.
 - .2 Do not order products without the shop dwgs submission for Departmental Representative's review. Failure to do so the contractor is to pay any associated cost and responsible for any construction schedule delay.
 - .3 Electronic copy of shop dwgs is acceptable.

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- .3 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .4 Instructions: submit manufacturer's installation instructions.

1.5 CLOSEOUT SUBMITTALS

- .1 Operation and Maintenance Data: submit operation and maintenance data for plumbing specialties and accessories for incorporation into manual.
 - .1 Description of plumbing specialties and accessories, giving manufacturers name, type, model, year and capacity.
 - .2 Details of operation, servicing and maintenance.
 - .3 Recommended spare parts list.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .2 Storage and Handling Requirements:
 - .1 Store materials indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Replace defective or damaged materials with new.

Part 2 Products**2.1 FLOOR DRAINS**

- .1 Floor Drains and Trench Drains: to CSA B79.
- .2 Type 1: general duty; cast iron body, round, adjustable head, sediment basket, nickel bronze strainer, integral seepage pan, and clamping collar.
- .3 Type 2: combination funnel floor drain; cast iron body with integral seepage pan, clamping collar, nickel-bronze adjustable head strainer with integral funnel.

2.2 CLEANOUTS

- .1 Cleanout Plugs: heavy cast iron male ferrule with brass screws and threaded brass or bronze plug. Sealing-caulked lead seat or neoprene gasket.
- .2 Access Covers:
 - .1 Wall Access: face or wall type, stainless steel round cover with flush head securing screws, bevelled edge frame complete with anchoring lugs.
 - .2 Floor Access: round cast iron body and frame with adjustable secured nickel bronze top and:
 - .1 Plugs: bolted bronze with neoprene gasket.
 - .2 Cover for Unfinished Concrete Floors: cast iron, gasket, vandal-proof screws.
 - .3 Cover for Terrazzo Finish: polished nickel bronze with recessed cover for filling with terrazzo, vandal-proof locking screws.
 - .4 Cover for Tile and Linoleum Floors: polished nickel bronze with recessed cover for linoleum or tile infill, complete with vandal-proof locking screws.

- .5 Cover for Carpeted Floors: polished nickel bronze with deep flange cover for carpet infill, complete with carpet retainer vandal-proof locking screws.

2.3 WATER HAMMER ARRESTORS

- .1 Stainless steel construction, piston type: to PDI-WH201.

2.4 BACK FLOW PREVENTERS

- .1 Preventers: to CSA-B64 Series, application as indicated and per NPC requirement.

2.5 VACUUM BREAKERS

- .1 Breakers: to CSA-B64 Series.
- .2 Atmospheric vacuum breaker.
- .3 Hose connection vacuum breaker.
- .4 Laboratory faucet intermediate vacuum breaker.

2.6 HOSE BIBBS AND SEDIMENT FAUCETS

- .1 Bronze construction complete with integral back flow preventer, hose thread spout, replaceable composition disc, and chrome plated in finished areas.

2.7 TRAP SEAL PRIMERS

- .1 Brass, with integral vacuum breaker, NPS 1/2 solder ends, NPS 1/2 drip line connection.

2.8 STRAINERS

- .1 860 kPa, Y type with 20 mesh, monel, bronze or stainless steel removable screen.
- .2 NPS 2 and under, bronze body, screwed ends, with brass cap.
- .3 NPS 2 1/2 and over, cast iron body, flanged ends, with bolted cap.

2.9 PLUMBING EQUIPMENT SCHEDULE - STANDARD OF ACCEPTANCE

- .1 Provide plumbing equipment as listed in the "Plumbing Equipment Schedule" on drawings or provide equivalent manufacturer matching the specified fixture.

Part 3 Execution

3.1 EXAMINATION

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

3.2 MANUFACTURER'S INSTRUCTIONS

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

3.3 INSTALLATION

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- .1 Install in accordance with National Plumbing Code of Canada - 2015(NPC), and local authority having jurisdiction.
- .2 Install in accordance with manufacturer's instructions and as specified.

3.4 CLEANOUTS

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

3.5 WATER HAMMER ARRESTORS

- .1 Install on branch supplies to fixtures or group of fixtures.

3.6 BACK FLOW PREVENTERS

- .1 Install in accordance with CSA-B64 Series, where indicated and elsewhere as required by code.
 - .1 Drains.
 - .2 Backwater Valves.
- .2 Pipe discharge to terminate over nearest drain or service sink.

3.7 HOSE BIBBS AND SEDIMENT FAUCETS

- .1 Install at bottom of risers, at low points to drain systems, and as indicated.

3.8 TRAP SEAL PRIMERS

- .1 Install for floor drains and elsewhere, as indicated.
- .2 Install on cold water supply to nearest frequently used plumbing fixture, in concealed space.
- .3 Install soft copper or plastic tubing to floor drain.

3.9 STRAINERS

- .1 Install with sufficient room to remove basket for maintenance.

3.10 START-UP

- .1 Timing: start-up only after:
 - .1 Pressure tests have been completed.
 - .2 Disinfection procedures have been completed.
 - .3 Certificate of static completion has been issued.
 - .4 Water treatment systems operational.
- .2 Provide continuous supervision during start-up.

3.11 TESTING AND ADJUSTING

- .1 Timing:
 - .1 After start-up deficiencies rectified.
 - .2 After certificate of completion has been issued by authority having jurisdiction.

- .2 Application tolerances:
 - .1 Pressure at fixtures: +/- 70 kPa.
 - .2 Flow rate at fixtures: +/- 20%.
- .3 Adjustments:
 - .1 Verify that flow rate and pressure meet design criteria.
 - .2 Make adjustments while flow rate or withdrawal is (1) maximum and (2) 25% of maximum and while pressure is (1) maximum and (2) minimum.
- .4 Floor drains:
 - .1 Verify operation of trap seal primer.
 - .2 Prime, using trap primer. Adjust flow rate to suit site conditions.
 - .3 Check operations of flushing features.
 - .4 Check security, accessibility, removability of strainer.
 - .5 Clean out baskets.
- .5 Vacuum breakers, backflow preventers, backwater valves:
 - .1 Test tightness, accessibility for O&M of cover and of valve.
 - .2 Simulate reverse flow and back-pressure conditions to test operation of vacuum breakers, backflow preventers.
 - .3 Verify visibility of discharge from open ports.
- .6 Access doors:
 - .1 Verify size and location relative to items to be accessed.
- .7 Cleanouts:
 - .1 Verify covers are gas-tight, secure, yet readily removable.
- .8 Water hammer arrestors:
 - .1 Verify proper installation of correct type of water hammer arrester.
- .9 Strainers:
 - .1 Clean out repeatedly until clear.
 - .2 Verify accessibility of cleanout plug and basket.
 - .3 Verify that cleanout plug does not leak.
- .10 Hose bibbs, sediment faucets:
 - .1 Verify that flow and pressure meet design criteria.
 - .2 Check for leaks, replace compression washer if required.

3.12 CLEANING

- .1 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.
- .2 Waste Management:
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.13 PROTECTION

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

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- .2 Repair damage to adjacent materials caused by plumbing specialties and accessories installation.

END OF SECTION

Part 1 General**1.1 RELATED REQUIREMENTS**

- .1 Section 22 05 15 Plumbing specialties and accessories.
- .1 Section 22 42 19 Commercial bathtubs and showers.

1.2 REFERENCE STANDARDS

- .1 American Society of Mechanical Engineers International (ASME)
 - .1 ANSI/ASME B16.15-13, Cast Copper Alloy Threaded Fittings, Classes 125 and 250.
 - .2 ANSI/ASME B16.18-12, Cast Copper Alloy Solder Joint Pressure Fittings.
 - .3 ANSI/ASME B16.22-13, Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
 - .4 ANSI/ASME B16.24-11, Cast Copper Alloy Pipe Flanges and Flanged Fittings: Class 150, and 300.
- .2 ASTM International (ASTM)
 - .1 ASTM B42-15a, Seamless Copper Tube, Standard Sizes.
 - .2 ASTM B88M-14, Standard Specification for Seamless Copper Water Tube.
 - .3 ASTM F876-15, Standard Specification for Crosslinked Polyethylene (PEX) Tubing.
 - .4 ASTM F877-11, Standard Specification for Crosslinked Polyethylene (PEX) Hot and Cold Water Distribution System.
- .3 CSA Group (CSA)
 - .1 CSA B137.5-13, Crosslinked Polyethylene (PEX) Tubing Systems for Pressure Applications.
 - .2 CSA B242-05, Groove and Shoulder Type Mechanical Pipe Couplings.
- .4 Underwriters Laboratories of Canada (ULC)
 - .1 CAN/ULC S115-11, Standard Method of Fire Tests of Firestop.
- .5 Manufacturer's Standardization Society of the Valve and Fittings Industry (MSS).
 - .1 MSS-SP-70-06, Grey Iron Gate Valves, Flanged and Threaded Ends.
 - .2 MSS-SP-71-05, Grey Iron Swing Check Valves, Flanged and Threaded Ends.
 - .3 MSS-SP-80-03, Bronze Gate, Globe, Angle and Check Valves.
- .6 National Research Council (NRC)
 - .1 National Plumbing Code of Canada (NPC) 2015.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Product Data
 - .1 Provide manufacturer's printed product literature and datasheets for insulation and adhesives, and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Place materials defined as hazardous or toxic in designated containers.
- .2 Handle and dispose of hazardous materials in accordance with local regulation.

Part 2 Products**2.1 PIPING**

- .1 Domestic hot, cold and recirculation systems, within building.
 - .1 Above ground:
 - .1 Copper tube, hard drawn, type L: to ASTM B88M.
 - .2 PEX Piping to CSA B137.5.
 - .2 Contractor is to verify the exiting piping system and materials on site and match the exiting when applicable.

2.2 FITTINGS

- .1 Bronze pipe flanges and flanged fittings, Class 150 and 300: to ANSI/ASME B16.24.
- .2 Cast bronze threaded fittings, Class 125 and 250: to ANSI/ASME B16.15.
- .3 Cast copper, solder type: to ANSI/ASME B16.18.
- .4 Wrought copper and copper alloy, solder type: to ANSI/ASME B16.22.
- .5 NPS 2 and larger:
 - .1 ANSI/ASME B16.18 or ANSI/ASME B16.22 roll grooved to CSA B242.
 - .2 PEX fittings to CSA B137.5 and F1960.
- .6 NPS 1 ½ and smaller:
 - .1 Wrought copper to ANSI/ASME B16.22 cast copper to ANSI/ASME B16.18.
 - .2 PEX fittings to CSA B137.5.

2.3 JOINTS

- .1 Rubber gaskets, latex-free 1.6 mm thick: to AWWA C111.
- .2 Bolts, nuts, hex head and washers: to ASTM A307, heavy series.
- .3 Solder: 95/5.
- .4 Teflon tape: for threaded joints.
- .5 Grooved couplings: designed with angle bolt pads to provide rigid joint, complete with EPDM gasket.
- .6 Dielectric connections between dissimilar metals: dielectric fitting, complete with thermoplastic liner.
- .7 NPS 1 ½ and smaller: PEX fittings to CSA B137.5.
- .8 NPS 2 and larger: PEX fittings to CSA B137.5 and ASTM F1960. Elbows, adapters, couplings, plugs, tees, multi-port tees and valves.

2.4 BALL VALVES

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- .1 NPS 2 and under, screwed:
 - .1 Class 150.
 - .2 Bronze body, stainless steel ball, adjustable packing, brass gland and PTFE seat.
- .2 NPS 2 and under, soldered:
 - .1 To ANSI/ASME B16.18, Class 150.
 - .2 Bronze body, stainless steel ball, adjustable packing, brass gland and PTFE seat.
- .3 NPS 2 and under, mechanical:
 - .1 To CSA B137.5 and ASTM F1960.
 - .2 Lead free brass body.

Part 3 Execution**3.1 APPLICATION**

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

3.2 INSTALLATION

- .1 Install in accordance with NPC Plumbing Code – 2015 and local authority having jurisdiction.
- .2 Assemble piping using fittings manufactured to ANSI and Standard Council of Canada (SCC) standards.
- .3 Install CWS piping below and away from HWS and HWC and other hot piping so as to maintain temperature of cold water as low as possible.
- .4 Connect to fixtures and equipment in accordance with manufacturer's written instructions unless otherwise indicated.
- .5 Valves
 - .1 Isolate equipment, fixtures and branches with ball valves.
 - .2 Balance recirculation system using lockshield globe valves. Mark settings and record on as-built drawings on completion.

3.3 PRESSURE TESTS

- .1 Conform to requirements of Section 23 05 00 Common Work Results – Mechanical.
- .2 Test pressure: greater of 1.5 times maximum system operating pressure or 860 kPa.

3.4 FLUSHING AND CLEANING

- .1 Flush entire system for 8 h. Ensure outlets flushed for 2 hours. Let stand for 24 hours, then draw one sample off longest run. Submit to testing laboratory to verify that system is clean. Let system flush for additional 2 hours, then draw off another sample for testing.

3.5 PRE-START-UP INSPECTIONS

- .1 Systems to be complete, prior to flushing, testing and start-up.

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- .2 Verify that system can be completely drained.
- .3 Ensure that pressure booster systems are operating properly.
- .4 Ensure that air chambers, expansion compensators are installed properly.

3.6 DISINFECTION

- .1 Flush out, disinfect and rinse system to requirements of authority having jurisdiction and Departmental Representative.
- .2 Upon completion, provide laboratory test reports on water quality for Departmental Representative approval.

3.7 START-UP

- .1 Timing: start up after:
 - .1 Pressure tests have been completed.
 - .2 Disinfection procedures have been completed.
 - .3 Certificate of static completion has been issued.
 - .4 Water treatment systems operational.
- .2 Provide continuous supervision during start-up.
- .3 Start-up procedures:
 - .1 Establish circulation and ensure that air is eliminated.
 - .2 Check pressurization to ensure proper operation and to prevent water hammer, flashing and/or cavitation.
 - .3 Bring HWS storage tank up to design temperature slowly.
 - .4 Monitor piping HWS and HWC piping systems for freedom of movement, pipe expansion as designed.
 - .5 Check control, limit, safety devices for normal and safe operation.
- .4 Rectify start-up deficiencies.

3.8 PERFORMANCE VERIFICATION

- .1 Procedures:
 - .1 Verify that flow rate and pressure meet Design Criteria.
 - .2 TAB HWC in accordance with Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.
 - .3 Adjust pressure regulating valves while withdrawal is maximum and inlet pressure is minimum.
 - .4 Sterilize HWS and HWC systems for Legionella control.
 - .5 Verify performance of temperature controls.
 - .6 Verify compliance with safety and health requirements.
 - .7 Check for proper operation of water hammer arrestors. Run one outlet for 10 seconds, then shut off water immediately. If water hammer occurs, replace water hammer arrestor or re-charge air chambers. Repeat for outlets and flush valves.
 - .8 Confirm water quality consistent with supply standards, and ensure no residuals remain as result of flushing or cleaning.
- .2 Reports:

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- .1 Include certificate of water flow and pressure tests conducted on incoming water service, demonstrating adequacy of flow and pressure.
- .2 Submit all TAB (testing adjusting balancing) reports for Departmental Representative's review.

END OF SECTION

Part 1 General**1.1 REFERENCE STANDARDS**

- .1 ASTM International (ASTM)
 - .1 ASTM B32-08, Standard Specification for Solder Metal.
 - .1 ASTM B306-02, Standard Specification for Copper Drainage Tube (DWV).
 - .1 ASTM C564-03a, Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
- .2 CSA Group (CSA)
 - .2 CSA B67, Lead Service Pipe, Waste Pipe, Traps, Bends and Accessories.
 - .2 CAN/CSA-B70, Cast Iron Soil Pipe, Fittings and Means of Joining.
 - .2 CAN/CSA-B125.3, Plumbing Fittings.
- .3 National Research Council Canada (NRC)
 - .3 National Plumbing Code of Canada 2015 (NPC).

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Product Data:
 - .1 Provide manufacturer's printed product literature and datasheets for adhesives, and include product characteristics, performance criteria, physical size, finish and limitations.

Part 2 Products**2.1 COPPER TUBE AND FITTINGS**

- .1 Above ground sanitary and vent Type DWV to: ASTM B306.
 - .1 Fittings.
 - .1 Cast brass: to CAN/CSA-B125.3.
 - .2 Wrought copper: to CAN/CSA-B125.3.
 - .1 Solder: lead free, tin-95:5, type TA, to ASTM B32.
- .1 Contractor is to verify the exiting piping system and materials on site and match the exiting when applicable.

2.2 CAST IRON PIPING AND FITTINGS

- .1 Buried sanitary to: CAN/CSA-B70, with one layer of protective coating of epoxy.
 - .1 Joints:
 - .1 Mechanical joints:
 - .2 Hub and spigot:
- .2 Above ground sanitary and vent: to CAN/CSA-B70.
 - .2 Joints: Neoprene or butyl rubber compression gaskets with stainless steel clamps.

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- .2 Contractor is to verify the exiting piping system and materials on site and match the exiting when applicable.

Part 3 Execution**3.1 APPLICATION**

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

3.2 INSTALLATION

- .1 Install in accordance with National Plumbing Code 2015 and local authority having jurisdiction.

3.3 TESTING

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

3.4 PERFORMANCE VERIFICATION

- .1 Cleanouts:
 - .1 Ensure accessible and that access doors are correctly located.
 - .1 Open, cover with linseed oil and re-seal.
 - .1 Verify that cleanout rods can probe as far as the next cleanout, at least.
- .2 Test to ensure traps are fully and permanently primed.
- .3 Ensure that fixtures are properly anchored, connected to system and effectively vented.
- .4 Affix applicable label (storm, sanitary, vent, pump discharge etc.) c/w directional arrows every floor or 4.5 m (whichever is less).

END OF SECTION

Part 1 General**1.1 REFERENCE STANDARDS**

- .1 ASTM International (ASTM)
 - .1 ASTM D2235- 04, Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.
 - .2 ASTM D2564- 04e1, Standard Specification for Solvent Cements for Poly (Vinyl-Chloride) (PVC) Plastic Piping Systems.
- .2 CSA Group (CSA)
 - .1 CAN/CSA-Series B1800- 06, Thermoplastic Non-pressure Pipe Compendium - B1800 Series.
- .3 Green Seal Environmental Standards (GSES)
 - .1 Standard GS-36- 00, Commercial Adhesives.
- .4 National Research Council Canada (NRC)
 - .1 National Plumbing Code of Canada 2015 (NPC).

1.2 DELIVERY, STORAGE AND HANDLING

- .1 Store at temperatures and conditions recommended by manufacturer.

Part 2 Products**2.1 PIPING AND FITTINGS**

- .1 For buried and above ground DWV piping to:
 - .1 CAN/CSA B1800.

2.2 JOINTS

- .1 Solvent weld for PVC: to ASTM D2564.
- .2 Solvent weld for ABS: to ASTM D2235.

Part 3 Execution**3.1 APPLICATION**

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

3.2 INSTALLATION

- .1 Install in accordance with National Plumbing Code 2015 and local authority having jurisdiction.
- .2 Do not install combustible piping in return air plenums unless pipe and fittings are approved for such use by the authority having jurisdiction.

3.3 TESTING

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

3.4 PERFORMANCE VERIFICATION

- .1 Cleanouts:
 - .1 Ensure accessible and that access doors are correctly located.
 - .2 Open, cover with linseed oil and re-seal.
 - .3 Verify cleanout rods can probe as far as the next cleanout, at least.
- .2 Test to ensure traps are fully and permanently primed.
- .3 Ensure fixtures are properly anchored, connected to system and effectively vented.
- .4 Affix applicable label sanitary, vent, pump discharge c/w directional arrows every floor or 4.5 m (whichever is less).

END OF SECTION

Part 1 General**1.1 RELATED REQUIREMENTS**

- .1 Section 22 05 16 Plumbing specialties and accessories.
- .2 Section 22 11 16 Domestic water piping.
- .3 Section 22 13 16.13 Sanitary waste and vent piping - Cast iron and copper.
- .4 Section 22 13 16.16 Sanitary waste and vent piping – Plastic.
- .5 CSA Group (CSA)
 - .1 CAN/CSA-B45 Series-02(R2008), Plumbing Fixtures.
 - .2 CAN/CSA-B125.3-05 Plumbing Fittings.
 - .3 CAN/CSA-B651-04, Accessible Design for the Built Environment.
- .6 National Research Council Canada (NRC)
 - .1 National Building Code of Canada 2015 (NBC).

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Product Data:
 - .1 Provide manufacturer's printed product literature and datasheets for fixtures, and include product characteristics, performance criteria, physical size, finish and limitations.

1.3 CLOSEOUT SUBMITTALS

- .1 Include:
 - .1 Description of fixtures and trim, giving manufacturer's name, type, model, year, capacity.
 - .2 Details of operation, servicing, maintenance.
 - .3 List of recommended spare parts.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

Part 2 Products**2.1 SUSTAINABLE MATERIAL****2.2 MANUFACTURED UNITS**

- .1 Fixtures: manufacture in accordance with CAN/CSA-B45 series.
- .2 Trim, fittings: manufacture in accordance with CAN/CSA-B125.3.
- .3 Exposed plumbing brass to be chrome plated.
- .4 Number, locations: architectural drawings to govern.
- .5 Fixtures in any one location to be product of one manufacturer and of same type.

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- .6 Trim in any one location to be product of one manufacturer and of same type.
- .7 Individual shower stall showerhead.
 - .1 Individual showerhead.
 - .1 Chrome plated brass, non-clog, with adjustable spray, ball joint, standard chrome plated bent arm and escutcheon. Limit maximum flow rate to 9.5 l/minute at 550 kPa.
 - .2 Barrier free, stainless steel.
 - .2 Shower supply valve:
 - .1 Pressure-balanced-actuated element, volume control, 40 degrees C maximum setting, strainer and check-stops on each inlet, dial handle.
 - .3 Shower cabinet.
 - .1 Cabinet: polypropylene.
 - .2 Base: moulded stone with chrome plated brass strainer and tailpiece.
 - .3 Accessories: soap dish, plastic curtain and hooks.
 - .4 Standard of Acceptance: Refer to "Plumbing Fixture Schedule" on the drawings.
- .8 Fixture piping:
 - .1 Hot and cold water supplies to each fixture.
 - .1 Chrome plated rigid supply pipes each with handwheel stop, reducers, escutcheon.
 - .2 Waste:
 - .1 Brass P trap with cleanout on each fixture not having integral trap.
 - .2 Chrome plated in all exposed places.

Part 3 Execution**3.1 APPLICATION**

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

3.2 INSTALLATION

- .1 Mounting heights:
 - .1 Standard: to comply with manufacturer's recommendations unless otherwise indicated or specified.
 - .2 Physically handicapped: to comply with most stringent of either NBC or CAN/CSA B651.

3.3 ADJUSTING

- .1 Conform to water conservation requirements specified this section.
- .2 Adjustments:
 - .1 Adjust water flow rate to design flow rates.
 - .2 Adjust pressure to fixtures to ensure no splashing at maximum pressures.
- .3 Checks:
 - .1 Aerators: operation, cleanliness.

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- .2 Vacuum breakers, backflow preventers: operation under all conditions.
- .4 Thermostatic controls:
 - .1 Verify temperature settings, operation of control, limit and safety controls.

END OF SECTION

Part 1 General**1.1 REFERENCE STANDARDS**

- .1 National Air Duct Cleaners Association (NADCA)
 - .1 ACR Standard: Assessment, Cleaning and Restoration of HVAC Systems.
- .2 North American Insulation Manufacturers Association (NAIMA)
 - .1 NAIMA 2005, Cleaning Fibrous Glass Insulated Duct Systems - Recommended Practices.

1.2 DEFINITIONS

- .1 HVAC System: complete air duct system from outside air intake louvers to furthest air supply terminal unit and including:
 - .1 Rigid supply and return ductwork;
 - .2 Flexible ductwork;
 - .3 Mixing plenum boxes;
 - .4 Return air plenums including ceiling plenums;
 - .5 Condensate drain pans, eliminator blades and humidifiers;
 - .6 Fans, fan blades and fan housing;
 - .7 Filter housing and frames;
 - .8 Acoustically insulated duct linings;
 - .9 Diffusers, registers and terminal units;
 - .10 Dampers and controls.

1.3 ADMINISTRATIVE REQUIREMENTS

- .1 Site Evaluation: conduct site visit 2 weeks before start of work to establish specific co-ordinated video survey and cleaning plan to establish specific co-ordinated video survey and cleaning plan determining how areas of facility and HVAC systems will be protected during cleaning operations.
 - .1 Organize and lay out plan for video survey and identify camera and cleaning apparatus insertion points.
 - .2 Ensure plan identifies sequence and schedule of survey and cleaning operations for each individual HVAC system and for complete facility.
 - .1 Take account of elbows, bends, turning vanes, dampers, transitions, take-offs, and other internal features.
- .2 Scheduling: Hours of Operation:
 - .1 Coordinate with the client for the schedule.
- .3 Project Co-ordination: assign Project Co-ordinator to oversee air duct cleaning processes.
- .4 Security:
 - .1 Coordinate with the client for security requirement.

1.4 CLOSEOUT SUBMITTALS

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- .1 Post Cleaning Inspection Report: submit 4 copies of Final Inspection Report, including data collected, observations and recommendations as well as following information:
 - .1 Name and address of facility;
 - .2 Name and address of HVAC cleaning contractor;
 - .3 Description of HVAC systems with drawings identifying systems cleaned;
 - .4 Identification scheme for location points in systems that were inspected with accompanying notes describing methods of inspection or tests used;
 - .5 Identification of points where samples were collected and type of analysis used for each collection;
 - .6 Identification of each sample collected;
 - .7 Comments complete with photographs of each sampling location and other observed system features;
 - .8 Identify systems tested, observations, actions taken and recommendations for future maintenance.
- .2 Submit verification of delivery of hazardous or toxic waste materials to contaminated waste facility.

1.5 EXTRA MATERIALS

- .1 Extra Stock Materials:
 - .1 Supply 4 extra filters for each HVAC System cleaned.
 - .2 Ensure filters are correct match, size, type and configuration of existing HVAC Systems.

1.6 QUALITY ASSURANCE

- .1 Contractor: verification of 5 years minimum experience in work similar to or exceeding work of this Section.
- .2 Project Co-ordinator: Air System Cleaning Specialist (ASCS) certified by NADCA on full time basis and verification of 5 years minimum experience in work similar to or exceeding work of this Section.

Part 2 Products**2.1 ACCESS DOORS AND PANELS**

- .1 Equipment Access Doors and Panels: construct from same materials as equipment panelling complete with sealing gasket and positive locking device.
 - .1 Size access doors and panels in equipment to allow for inspection and cleaning.
- .2 Ductwork Access Doors: construct access doors from 1.27 mm minimum galvanized sheet steel sheet aluminum with gasketed seal.
 - .1 Ensure access door is 25 mm greater in every dimension than access opening.
 - .2 Access door size 200mm x 200 mm minimum.
 - .3 Secure access doors with sheet metal screws on 75 mm centres minimum. Ensure 3 screws per side minimum.
- .3 Access Doors and Panels Acoustic Lining:
 - .1 Install acoustic lining to match existing.

- .2 Self-adhesive glass fibre tape capable of adhering to both acoustic lining and metal access door or panel materials.
- .3 Water-based duct sealer for repairing cut acoustic lining.

2.2 SYSTEM FILTERS

- .1 Supply and install new filters for each HVAC System cleaned.

2.3 AIR DUCT CLEANING EQUIPMENT

- .1 Manually propelled full contact brushes:
 - .1 Ensure brushes are specifically manufactured and shaped to fit individual ducts, equipment and components of HVAC system.
 - .1 Ensure brushes are sized to fit various duct sizes in HVAC system.
 - .2 Ensure brushes make scrubbing motion and full contact with HVAC system interior surfaces to be cleaned.
- .2 Brushes: manually propelled with integrally-mounted drive and nylon or other non-metallic material bristles.
 - .1 Ensure drive has capacity to continue to push brush after bristles are distorted.
 - .2 Replace worn and ineffective brushes when required.

Part 3 Execution

3.1 PREPARATION

- .1 Close down HVAC system.
- .2 Locate and identify externally visible HVAC system features which may affect cleaning process including:
 - .1 Control devices;
 - .2 Fire and smoke control dampers;
 - .3 Balancing dampers: indicate and record positions for resetting;
 - .4 Air volume control boxes: indicate and record positions for resetting;
 - .5 Fire alarm devices;
 - .6 Monitoring devices and controls.
- .3 Cut openings in equipment panels and ductwork for access to system interior.
 - .1 Square or rectangular opening sizes: 200 mm minimum each side.
 - .2 Circular opening sizes: 200 mm minimum diameter.
- .4 Installation of Access Doors and Panels: install access doors and panels for equipment where required to facilitate system inspection and cleaning.
 - .1 Install access doors and panels for inspection and cleaning of equipment as follows:
 - .1 Fan units;
 - .2 Filters;
 - .3 Dampers;
 - .4 Sensors.

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- .5 Installation of Access Doors in Ductwork: install access doors in ductwork where required to facilitate system inspection and cleaning.
 - .1 Access door installation is not permitted in flexible ductwork.
 - .1 Inspect flexible ductwork only by disconnecting from main duct and inspecting from open end.
- .6 When acoustically lined duct is cut for access, repair cut edges of acoustic lining using self-adhesive fibre glass tape and water based duct sealer.
 - .1 Adhere new acoustic lining to match existing to inside of access panel or door to ensure continuity of acoustic properties of system.
- .7 Remove and reinstall ceiling tiles and panels to gain access to HVAC system as required.
 - .1 Replace ceiling tiles and panels damaged or soiled by air duct cleaning procedures.

3.2 EXAMINATION / PRE-CLEANING INSPECTION

- .1 Verification of Conditions:
 - .1 Make visual inspection of interior of HVAC system using remote controlled robotic camera.
 - .2 Insert camera at pre-established strategic locations to evaluate condition and cleanliness of HVAC systems and components.
- .2 Evaluation and Assessment:
 - .1 Identify location and type of internal components.
 - .2 Identify extent of potential problems.
 - .3 If toxic or hazardous materials or deposits are suspected after initial inspection immediately stop work and inform Departmental Representative.
 - .1 Do not proceed further with inspection operations until written approval from Departmental Representative.

3.3 DUCT CLEANING

- .1 Do duct cleaning in accordance with NADCA ACR Standard.
- .2 Isolate and clean sections in zones to ensure that dirt deposits and debris from zone being cleaned does not pass through another zones which has already been cleaned.
 - .1 Isolate zone of duct using closed-cell polyurethane foam before cleaning.
- .3 Ensure vacuum units and evacuation fans are securely in place before starting cleaning operation of isolated section of HVAC air duct system.
- .4 Install HEPA filter evacuation fan at one end of zone section and insert full contact brushes at other end.
- .5 Clean HVAC supply air duct system and components where particulate sample collected from surfaces is greater than 75 mg of particulate per 0.01 square metres.
- .6 Clean exhaust, return, transfer ductwork and plenums, equipment and components where particulate sample collected from surfaces is greater than 75 mg of particulate per 0.01 square metres.
- .7 Energize brushes to travel from insertion point to HEPA filter evacuation fan.
 - .1 Pass brushes through sections as often as necessary to achieve required cleanliness.

- .2 Change brush sizes as required to ensure positive contact with duct and component interiors.
- .3 Clean corners and pockets where dirt and debris can accumulate.
- .8 Clean equipment, components and other features in isolated zone before moving to next zone of HVAC air duct system.
- .9 Clean diffusers, registers, louvers, and other terminal units.
- .10 Remove perforated supply diffusers from suspended tee-bar ceiling.
 - .1 Dismantle and clean perforated plates and supply diffuser duct collars.
 - .2 Re-assemble perforated plate diffusers and reconnect to HVAC system using supply diffuser duct collar after cleaning.
- .11 Advise Departmental Representative 72 hours minimum before deactivation of fire alarm and smoke detectors duct cleaning operations.

ACOUSTICALLY LINED DUCTWORK CLEANING

- .12 Clean glass fibre acoustically insulated ducts to NAIMA recommended practices.
 - .1 Use specifically designed robotic apparatus that has been demonstrated not to damage acoustic glass fibre lining.
 - .2 Monitor cleaning process progress by onboard camera.

3.4 COMPONENTS AND EQUIPMENT CLEANING

- .1 Brush and vacuum coils, humidifiers, air handling unit enclosures, and heat exchanger surfaces to achieve required cleanliness.
- .2 When cleaning equipment and components by brushing and vacuuming is inappropriate or insufficient, dismantle and remove equipment or component and move to area designated by Departmental Representative for cleaning.
 - .1 Pressure wash with water and cleaning solution until required cleanliness is achieved.
 - .2 Clean equipment and components in place only if there is no hazard to adjacent materials.
- .3 Compressed air and manual cleaning is acceptable only for cleaning individual components and small areas as follows and only after written approval from Departmental Representative:
 - .1 Fan blades;
 - .2 Dampers;
 - .3 Turning vanes;
 - .4 Controls;
 - .5 Sensor bulbs;
 - .6 Fire alarms;
 - .7 Smoke detectors.

3.5 ANTI MICROBIAL APPLICATION

- .1 Apply antimicrobial agents when fungal growth is suspected through visual inspection.
- .2 Apply antimicrobial agents after removal of surface deposits and debris.
 - .1 Verify air duct interiors are free from deposits and debris by visual inspection

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- .2 Report findings to Departmental Representative.
- .3 Proceed with application of antimicrobial agents after written approval from Departmental Representative.
- .3 Apply antimicrobial agents in accordance with manufacturer's written instructions and US EPA 40 CFR registration and listing.
- .4 Manual spray antimicrobial agents directly onto interior surfaces of HVAC air duct system.
- .1 Do not use fog mist for downstream surfaces.

3.6 FIELD QUALITY CONTROL/FINAL INSPECTIONS

- .1 Post Cleaning Inspection: carry out final inspection using robotic camera and other visual inspection methods after final cleaning has been completed.
 - .1 Include in final survey areas inspected by Contractor prior to cleaning.
 - .2 Identify on HVAC system record drawings access points used for inspection and cleaning.
 - .3 Re-collect and analyse particulates collected at same locations where original samples were collected before cleaning.
 - .4 Reset components including dampers and sensors, which have been disturbed during cleaning operations.

3.7 SYSTEM STARTUP

- .1 Install new system filters after cleaning operations are completed.
- .2 Cover each inspection opening with access door or panel and secure in place after inspection and cleaning are completed.
- .3 Restart each HVAC system.

END OF SECTION

Part 1 General**1.1 REFERENCE STANDARDS****1.2 ACTION AND INFORMATIONAL SUBMITTALS****.1 Product Data:**

- .1 Submit manufacturer's instructions, printed product literature and data sheets and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Shop Drawings:

- .1 Indicate on drawings:
 - .1 Mounting arrangements.
 - .2 Operating and maintenance clearances.
- .2 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.
- .3 Do not order any product without submitting shop drawings for Departmental Representative's review. Failure to do so the contractor is to be responsible for any additional cost and construction schedule delay.

1.3 CLOSEOUT SUBMITTALS**.1 Operation and Maintenance Data: submit operation and maintenance data for incorporation into manual.**

- .1 Operation and maintenance manual approved by, and final copies deposited with, Departmental Representative before final inspection.
- .2 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.
- .3 Maintenance data to include:
 - .1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.

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- .2 Data to include schedules of tasks, frequency, tools required and task time.
- .4 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.
- .5 Approvals:
 - .1 Submit 2 copies of draft Operation and Maintenance Manual to Departmental Representative for approval.
 - .2 Make changes as required and re-submit as directed by Departmental Representative.
- .6 Additional data:
 - .1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.
- .7 Site records:
 - .1 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 Use different colour waterproof ink for each service.
 - .3 Make available for reference purposes and inspection.
- .8 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 Departmental Representative 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.
- .9 Submit copies of as-built drawings for inclusion in final TAB report.

1.4**MAINTENANCE MATERIAL SUBMITTALS**

- .1 Provide one set of special tools required to service equipment as recommended by manufacturers.

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- .2 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 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .2 Storage and Handling Requirements:
 - .1 Store materials indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Replace defective or damaged materials with new.

Part 2 Products**2.1 NOT USED**

- .1 Not used.

Part 3 Execution**3.1 EXAMINATION**

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable installation in accordance with manufacturer's written instructions.
 - .1 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .2 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 PAINTING REPAIRS AND RESTORATION

- .1 Prime and touch up marred finished paintwork to match original.
- .2 Restore to new condition, finishes which have been damaged.

3.3 SYSTEM CLEANING

- .1 Clean interior and exterior of all systems including strainers. Vacuum interior of ductwork and air handling units.

3.4 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 - ACTION AND INFORMATIONAL SUBMITTALS.

3.5 DEMONSTRATION

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- .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.

3.6 CLEANING

- .1 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.
- .2 Waste Management:
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.7 PROTECTION

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

END OF SECTION

Part 1 General**1.1 SUMMARY**

- .1 This Section includes requirements for selective demolition and removal of heating, ventilation and air conditioning systems, controls and automated automation components, and related mechanical components and incidentals required to complete work described in this Section ready for new construction.

1.2 RELATED REQUIREMENTS

- .1 Section 02 41 19.16 - Selective Interior Demolition
- .2 Section 02 42 00 - Removal and Salvage of Construction Materials
- .3 Section 22 05 05 - Selective Demolition for Plumbing
- .4 Section 26 05 05 - Selective Demolition for Electrical

1.3 REFERENCE STANDARDS

- .1 CSA Group (CSA)
 - .1 CSA S350 M1980 (R2003), Code of Practice for Safety in Demolition of Structures.

1.4 DEFINITIONS

- .1 Demolish: Detach items from existing construction and legally dispose of items off site, unless indicated as removed and salvaged, or removed and reinstalled.
- .2 Remove: Planned deconstruction and disassembly of electrical items from existing construction including removal of conduit, junction boxes, cabling and wiring from electrical component to panel taking care not to damage adjacent assemblies designated to remain; legally dispose of items off site, unless indicated as removed and salvaged, or removed and reinstalled.
- .3 Remove and Salvage: Detach items from existing construction and deliver them to Departmental Representative ready for reuse.
- .4 Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.
- .5 Existing to Remain: Existing items of construction that are not removed and that are not otherwise indicated as being removed and salvaged, or removed and reinstalled.
- .6 Hazardous Substances: Dangerous substances, dangerous goods, hazardous commodities and hazardous products may include asbestos, mercury and lead, PCB's, poisons, corrosive agents, flammable substances, radioactive substances, or other material that can endanger human health or wellbeing or environment if handled improperly as defined by the Federal Hazardous Products Act (RSC 1985) including latest amendments.

1.5 ADMINISTRATIVE REQUIREMENTS

- .1 Coordination: Coordinate work of this Section to avoid interference with work by other Sections.

- .2 Scheduling: Account Departmental Representative's continued occupancy requirements during selective demolition with Section 02 41 19.13 - Selective Building Demolition and Section 02 41 19.16 - Selective Interior Demolition and schedule staged occupancy and worksite activities as coordinated with the Departmental Representative.

1.6 QUALITY ASSURANCE

- .1 Regulatory Requirements: Perform work of this Section in accordance with the following:
 - .1 Government of Canada, Labour Program: Workplace Safety and Alberta Occupational Health and Safety Standards and Programs.

1.7 SITE CONDITIONS

- .1 Existing Conditions: Condition of materials identified as being salvaged or demolished are based on their observed at time of site examination before tendering.
- .2 Existing Hazardous Substances:
 - .1 Hazardous substances will be removed by a hazardous abatement specialist engaged by the Departmental Representative before start of the Work.
- .3 Existing Hazardous Substances:
 - .1 Hazardous substances are as defined in the Hazardous Products Act.
 - .2 Hazardous substances will be removed by the Contractor as a part of the Contract before starting Work in accordance with work results described in Related Requirements listed above.
- .4 Discovery of Hazardous Substances: It is not expected that Hazardous Substances will be encountered in the Work; immediately notify Departmental Representative if materials suspected of containing hazardous substances are encountered and perform the following activities:
 - .1 Hazardous substances will be as defined in the Hazardous Products Act.
 - .2 Stop work in the area of the suspected hazardous substances.
 - .3 Take preventative measures to limit users' and workers' exposure, provide barriers and other safety devices and do not disturb.
 - .4 Proceed only after written instructions have been received from Departmental Representative.

1.8 SALVAGE AND DEBRIS MATERIALS

- .1 Demolished items become Contractor's property and will be removed from Project site; except for items indicated as being reused, salvaged, or otherwise indicated to remain Departmental Representative's property.
- .2 Carefully remove materials and items designated for salvage and store in a manner to prevent damage or devaluation of materials.

Part 2 Products

2.1 MATERIAL

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- .1 General Patching and Repair Materials: Refer to Section 02 41 19.16 - Selective Interior Demolition for listing of patching and repair materials incidental to removal or demolition of components associated with work of this Section.
- .2 HVAC Repair Materials: Use only new materials required for completion or repair matching materials damaged during performance of work of this Section; new materials are required to meet assembly or system characteristics as existing systems indicated to remain and carry CSA approval labels required by the Authority Having Jurisdiction.
- .3 Fire stopping Repair Materials: Use fire stopping materials compatible with existing fire stopping systems where removal or demolition work affects rated assemblies, restore to match existing fire rated performance.

Part 3 Execution**3.1 EXAMINATION**

- .1 Verification of Existing Conditions: Visit site, thoroughly examine and become familiar with conditions that may affect the work of this Section before tendering the Bid; Departmental Representative will not consider claims for extras for work or materials necessary for proper execution and completion of the contract that could have been determined by a site visit.

3.2 PREPARATION

- .1 Protection of Existing Systems to Remain: Protect systems and components indicated to remain in place during selective demolition operations and as follows:
 - .1 Prevent movement and install bracing to prevent settlement or damage of adjacent services and parts of existing buildings scheduled to remain.
 - .2 Notify Departmental Representative and cease operations where safety of buildings being demolished, adjacent structures or services appears to be endangered and await additional instructions before resuming demolition work specified in this Section.
 - .3 Prevent debris from blocking drainage inlets.
 - .4 Protect mechanical systems that must remain in operation.
- .2 Protection of Building Occupants: Sequence demolition work so that interference with the use of the building by the Departmental Representative and users is minimized and as follows:
 - .1 Prevent debris from endangering the safe access to and egress from occupied buildings.
 - .2 Notify Departmental Representative and cease operations where safety of occupants appears to be endangered and await additional instructions before resuming demolition work specified in this Section.

3.3 EXECUTION

- .1 Demolition and Removal: Coordinate requirements of this Section with information contained in Section 02 41 19.16 - Selective Interior Demolition and as follows:
 - .1 Disconnect and cap gas supply and electrical services in accordance with requirements of local Authority Having Jurisdiction.
 - .2 Do not disrupt active or energized utilities without approval of the Departmental Representative.

- .3 Erect and maintain dust proof and weather tight partitions to prevent the spread of dust and fumes to occupied building areas; remove partitions when complete.
- .4 Demolish parts of existing building to accommodate new construction and remedial work as indicated.
- .5 At end of each day's work, leave worksite in safe condition.
- .6 Perform demolition work in a neat and workmanlike manner:
 - .1 Remove any tools or equipment after completion of work, and leave site clean and ready for subsequent renovation work.
 - .2 Repair and restore damages caused as a result of work of this Section to match existing materials and finishes.

3.4 CLOSEOUT ACTIVITIES

- .1 Demolition Waste Disposal: Arrange for legal disposal and remove demolished materials to accredited provincial landfill site or alternative disposal site (recycle centre) except where explicitly noted otherwise for materials being salvaged for re use in new construction in accordance with Section 02 42 00 - Removal and Salvage of Construction Materials.

END OF SECTION

Part 1 General**1.1 REFERENCES**

- .1 The latest adopted version of:
 - .1 American National Standards Institute/ American Society of Mechanical Engineers (ANSI/ASME)
 - .1 ANSI/ASME B31.1, Power Piping, (SI Edition).
 - .2 American Society for Testing and Materials (ASTM)
 - .1 ASTM A125, Specification for Steel Springs, Helical, Heat-Treated.
 - .2 ASTM A307, Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
 - .3 ASTM A563, Specification for Carbon and Alloy Steel Nuts.
 - .3 Canadian Gas Association (CGA)
 - .1 CSA/CGA B149.1, Natural Gas and Propane Installation Code.
 - .4 Factory Mutual (FM)
 - .5 Manufacturer's Standardization Society of the Valves and Fittings Industry (MSS)
 - .1 MSS SP58, Pipe Hangers and Supports - Materials, Design and Manufacture.
 - .2 MSS SP69, Pipe Hangers and Supports - Selection and Application.
 - .3 MSS SP89, Pipe Hangers and Supports - Fabrication and Installation Practices.
 - .6 Underwriter's Laboratories of Canada (ULC)

1.2 DESIGN REQUIREMENTS

- .1 Construct pipe hanger and support to manufacturer's recommendations utilizing manufacturer's regular production components, parts and assemblies.
- .2 Base maximum load ratings on allowable stresses prescribed by ASME B31.1 or MSS SP58.
- .3 Ensure that supports, guides, anchors do not transmit excessive quantities of heat to building structure.
- .4 Design hangers and supports to support systems under all conditions of operation, allow free expansion and contraction, prevent excessive stresses from being introduced into pipework or connected equipment.
- .5 Provide for vertical adjustments after erection and during commissioning. Amount of adjustment to be in accordance with MSS SP58.

1.3 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings and product data for following items:
 - .1 Bases, hangers and supports.

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- .2 Connections to equipment and structure.
- .3 Structural assemblies.

Part 2 Products**2.1 GENERAL**

- .1 Fabricate hangers, supports and sway braces in accordance with ANSI B31.1 and MSS SP58.
- .2 Use components for intended design purpose only. Do not use for rigging or erection purposes.

2.2 PIPE HANGERS

- .1 Finishes:
 - .1 Pipe hangers and supports: painted with zinc-rich paint after manufacture.
 - .2 Ensure steel hangers in contact with copper piping are copper plated or epoxy coated.
- .2 Structural attachments: to suit structural medium (wood, concrete, steel).
- .3 Shop and field-fabricated assemblies.
 - .1 Trapeze hanger assemblies: to MSS SP89.
 - .2 Steel brackets: to MSS SP89.
- .4 Hanger rods: threaded rod material to MSS SP58.
 - .1 Ensure that hanger rods are subject to tensile loading only.
 - .2 Provide linkages where lateral or axial movement of pipework is anticipated.
 - .3 Do not use 22 mm (0.86") or 28 mm (1.1") rod.
- .5 Pipe attachments: material to MSS SP58.
 - .1 Attachments for steel piping: carbon steel black.
 - .2 Attachments for copper piping: copper plated black steel.
 - .3 Use insulation shields for hot pipework.
 - .4 Oversize pipe hangers and supports.
- .6 Adjustable clevis: material to MSS SP69, clevis bolt with nipple spacer and vertical adjustment nuts above and below clevis.
 - .1 Ensure "U" has hole in bottom for rivetting to insulation shields as required.
- .7 Yoke style pipe roll: carbon steel yoke, rod and nuts with cast iron roll, to MSS SP69.
- .8 U-bolts: carbon steel to MSS SP69 with 2 nuts at each end to ASTM A563.
 - .1 Finishes for steel pipework: black.
 - .2 Finishes for copper, brass or aluminum pipework: copper or black, with formed portion plastic coated.

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- .9 Pipe rollers: cast iron roll and roll stand with carbon steel rod to MSS SP69.

2.3 RISER CLAMPS

- .1 Steel or cast iron pipe: black carbon steel to MSS SP58, type 42.
- .2 Copper pipe: carbon steel copper plated to MSS SP58, type 42.
- .3 Bolts: to ASTM A307.
- .4 Nuts: to ASTM A563.

2.4 INSULATION PROTECTION SHIELDS

- .1 Insulated cold piping:
 - .1 64 kg/m³ density insulation plus insulation protection shield to: MSS SP69, galvanized sheet carbon steel. Length designed for maximum 3 m (10') span.
- .2 Insulated hot piping:
 - .1 Curved plate 300 mm (12") long, with edges turned up, welded-in centre plate for pipe sizes 300 mm (12") and over, carbon steel to comply with MSS SP69.

2.5 EQUIPMENT SUPPORTS

- .1 Fabricate equipment supports not provided by equipment manufacturer from structural grade steel. Submit calculations with shop drawings.

2.6 EQUIPMENT ANCHOR BOLTS AND TEMPLATES

- .1 Provide templates to ensure accurate location of anchor bolts.

2.7 HOUSE-KEEPING PADS

- .1 For base-mounted equipment: Concrete, at least 100 mm (4") high, 50 mm (2") larger all around than equipment, with chamfered edges unless detailed otherwise.
- .2 Concrete: to drawings.

2.8 OTHER EQUIPMENT SUPPORTS

- .1 From structural grade steel meeting requirements of drawings.
- .2 Submit structural calculations with shop drawings.

Part 3 Execution**3.1 INSTALLATION**

- .1 Install in accordance with:

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- .1 Manufacturer's instructions and recommendations.
- .2 Clamps on riser piping:
 - .1 Support independent of connected horizontal pipework using riser clamps and riser clamp lugs welded to riser.
 - .2 Bolt-tightening torques to be to industry standards.
 - .3 Steel pipes: Install below coupling or shear lugs welded to pipe.
 - .4 Cast iron pipes: Install below joint.
- .3 Clevis plates:
 - .1 Attach to concrete with 4 minimum concrete inserts, one at each corner.
- .4 Provide supplementary structural where structural bearings do not exist or where concrete inserts are not in correct locations.

3.2 HANGER SPACING

- .1 Plumbing piping: most stringent requirements of Canadian Plumbing Code or authority having jurisdiction.
- .2 Fire protection: to applicable fire code.
- .3 Natural gas piping: to CAN/CSA B149.1.
- .4 Copper and steel piping: to MSS SP69M.
- .5 Plastic Pipe: in accordance with manufacturer's instructions.

3.3 HANGER INSTALLATION

- .1 Install hanger so that rod is vertical under operating conditions.
- .2 Adjust hangers to equalize load.
- .3 Support from structural members. Where structural bearing does not exist or inserts are not in suitable locations, provide supplementary structural steel members.

3.4 HORIZONTAL MOVEMENT

- .1 Angularity of rod hanger resulting from horizontal movement of pipework from cold to hot position not to exceed 4 degrees from vertical.
- .2 Where horizontal pipe movement is less than 13 mm ($\frac{1}{2}$ "), offset pipe hanger and support so that rod hanger is vertical in the hot position.

3.5 FINAL ADJUSTMENT

- .1 Adjust hangers and supports:
 - .1 Ensure that rod is vertical under operating conditions.
 - .2 Equalize loads.

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- .2 Adjustable clevis:
 - .1 Tighten hanger load nut securely to ensure proper hanger performance.
 - .2 Tighten upper nut after adjustment.
- .3 C-clamps:
 - .1 Follow manufacturer's recommended written instructions and torque values when tightening C-clamps to bottom flange of beam.
- .4 Beam clamps:
 - .1 Hammer jaw firmly against underside of beam.

END OF SECTION

Part 1 General**1.1 REFERENCES**

- .1 The latest adopted version of:
 - .1 Canadian Gas Association (CGA)
 - .1 CSA/CGA B149.1, Natural Gas and Propane Installation Code.
 - .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-24.3-92, Identification of Piping Systems.

Part 2 Products**2.1 MANUFACTURER'S EQUIPMENT NAMEPLATES**

- .1 Metal or plastic laminate nameplate mechanically fastened to each piece of equipment by manufacturer.
- .2 Lettering and numbers to be raised or recessed.
- .3 Information to include, as appropriate:
 - .1 Equipment: Manufacturer's name, model, size, serial number, capacity.
 - .2 Motor: voltage, Hz, phase, power factor, duty, frame size.

2.2 SYSTEM NAMEPLATES

- .1 Colours:
 - .1 Hazardous: red letters, white background.
 - .2 Elsewhere: black letters, white background (except where required otherwise by applicable codes).
- .2 Construction:
 - .1 3 mm (1/8") thick laminated plastic or white anodized aluminum, matte finish, with square corners, letters accurately aligned and machine engraved into core.

.3 Sizes:

.1 Conform to following table:

Size # mm (in)	Sizes mm (in)	No. of Lines	Height of Letters mm (in)
1	10 x 50 (½ x 2")	1	3 (1/8")
2	13 x 75 (½ x 3")	1	5 (3/16")
3	13 x 75 ½ x 3	2	3 (1/8")
4	20 x 100 (¾ x 4")	1	8 (5/16")
5	20 x 100 (¾ x 4")	2	5 (3/16")
6	20 x 200 (¾ x 8")	1	8 (5/16")
7	25 x 125 (1 x 5")	1	12 (½ ")
8	25 x 125 (1 x 5")	2	8 (5/16")
9	35 x 200 (1½ x 8")	1	20 (¾ ")

.2 Use maximum of 25 letters/numbers per line.

.4 Locations:

.1 Terminal cabinets, control panels: Use size # 5.

.2 Equipment in Mechanical Rooms: Use size # 9.

2.3 PIPING SYSTEMS GOVERNED BY CODES

.1 Identification:

.1 Natural gas: to CSA/CGA B149.1.

2.4 IDENTIFICATION OF PIPING SYSTEMS

.1 Identify contents by background colour marking, pictogram (as necessary), legend; direction of flow by arrows. To CAN/CGSB 24.3 except where specified otherwise.

.2 Pictograms:

.1 Where required, to Workplace Hazardous Materials Information System (WHMIS) regulations.

.3 Legend:

.1 Block capitals to sizes and colours listed in CAN/CGSB 24.3.

- .4 Arrows showing direction of flow:
- .1 Outside diameter of pipe or insulation less than 75 mm (3"): 100 mm (4") long x 50 mm (2") high.
 - .2 Outside diameter of pipe or insulation 75 mm (3") and greater: 150 mm (6") long x 50 mm (2") high.
 - .3 Use double-headed arrows where flow is reversible.
- .5 Extent of background colour marking:
- .1 To full circumference of pipe or insulation.
 - .2 Length to accommodate pictogram, full length of legend and arrows.
- .6 Materials for background colour marking, legend, arrows:
- .1 Pipes and tubing 20 mm ($\frac{3}{4}$ ") and smaller: Waterproof and heat-resistant pressure sensitive plastic marker tags.
 - .2 All other pipes: Pressure sensitive vinyl with protective overcoating, waterproof contact adhesive undercoating, suitable for ambient of 100%RH and continuous operating temperature of 150°C (300°F) and intermittent temperature of 200°C (390°F).
- .7 Colours and Legends:
- .1 Where not listed, obtain direction from Departmental Representative.
 - .2 Colours for legends, arrows: To following table:

Background colour:	Legend, arrows:
Yellow	BLACK
Green	WHITE
Red	WHITE

- .3 Background colour marking and legends for piping systems:

Contents	Background colour marking	Legend
Hot water heating supply	Yellow	HEATING WATER SUPPLY
Hot water heating return	Yellow	HEATING WATER RETURN
Chilled water supply	Green	CH. WTR. SUPPLY
Chilled water return	Green	CH. WTR. RETURN
Glycol Heating supply	Yellow	HEATING SUPPLY
Glycol Heating return	Yellow	HEATING RETURN
Domestic hot water supply	Green	DOM. HW SUPPLY
Dom. HWS recirculation	Green	DOM. HW CIRC
Domestic cold water supply	Green	DOM. CWS
Storm water	Green	STORM

Contents	Background colour marking	Legend
Sanitary	Green	SAN
Plumbing vent	Green	SAN. VENT
Refrigeration suction	Yellow	REF. SUCTION
Refrigeration liquid	Yellow	REF. LIQUID
Natural gas	to Codes	
Gas regulator vents	to Codes	

2.5 IDENTIFICATION DUCTWORK SYSTEMS

- .1 2" (50 mm) high stencilled letters and directional arrows 150 mm (6") long x 50 mm (2") high.
- .2 Colours: Black, or co-ordinated with base colour to ensure strong contrast.

2.6 VALVES, CONTROLLERS

- .1 Brass tags with 12 mm (½") stamped identification data filled with black paint.
- .2 Include flow diagrams for each system, of approved size, showing charts and schedules with identification of each tagged item, valve type, service, function, normal position, location of tagged item.

2.7 CONTROLS COMPONENTS IDENTIFICATION

- .1 Identify all systems, equipment, components, controls, sensors with system nameplates specified in this section.
- .2 Inscriptions to include function and (where appropriate) fail-safe position.

2.8 LANGUAGE

- .1 Identification to be in English.

Part 3 Execution

3.1 INSTALLATION

- .1 Perform work in accordance with CAN/CGSB-24.3 except as specified otherwise.
- .2 Provide ULC and or CSA registration plates as required by respective agency.

3.2 NAMEPLATES

- .1 Locations:

- .1 In conspicuous location to facilitate easy reading and identification from operating floor.
- .2 Standoffs:
 - .1 Provide for nameplates on hot and/or insulated surfaces.
- .3 Protection
 - .1 Do not paint, insulate or cover in any way.

3.3 LOCATION OF IDENTIFICATION ON PIPING AND DUCTWORK SYSTEMS

- .1 On long straight runs in open areas in boiler rooms, equipment rooms, open and t-bar hallways: At not more than 17 m (56') intervals and more frequently if required to ensure that at least one is visible from any one viewpoint in operating areas and walking aisles.
- .2 Adjacent to each change in direction.
- .3 At least once in each small room through which piping or ductwork passes.
- .4 On both sides of visual obstruction, and where run is difficult to follow.
- .5 On both sides of separations such as walls, floors, partitions.
- .6 Where system is installed in pipe chases, inaccessible ceiling spaces, galleries, confined spaces, at entry and exit points, and at access openings.
- .7 At beginning and end points of each run and at each piece of equipment in run.
- .8 At point immediately upstream of major manually operated or automatically controlled valves, dampers, etc. Where this is not possible, place identification as close as possible, preferably on upstream side.
- .9 Identification to be easily and accurately readable from usual operating areas and from access points.
 - .1 Position of identification to be approximately at right angles to most convenient line of sight, considering operating positions, lighting conditions, risk of physical damage or injury and reduced visibility over time due to dust and dirt.

3.4 VALVES, CONTROLLERS

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

END OF SECTION

Part 1 General**1.1 SUMMARY**

- .1 TAB is used throughout this Section to describe the process, methods and requirements of testing, adjusting and balancing for HVAC.
- .2 TAB means to test, adjust and balance to perform in accordance with requirements of Contract Documents and to do other work as specified in this section.

1.2 QUALIFICATIONS OF TAB PERSONNEL

- .1 Names of personnel it is proposed to perform TAB to be submitted to and approved by Departmental Representative within 90 days of award of contract.
- .2 Provide documentation confirming qualifications, successful experience.

1.3 PURPOSE OF TAB

- .1 Test to verify proper and safe operation, determine actual point of performance, evaluate qualitative and quantitative performance of equipment, systems and controls at design, average and low loads using actual or simulated loads
- .2 Adjust and regulate equipment and systems so as to meet specified performance requirements and to achieve specified interaction with other related systems under normal and emergency loads and operating conditions.
- .3 Balance systems and equipment to regulate flow rates to match load requirements over full operating ranges.

1.4 EXCEPTIONS

- .1 TAB of systems and equipment regulated by codes and standards to be to satisfaction of authority having jurisdiction.

1.5 CO-ORDINATION

- .1 Schedule time required for TAB (including repairs, re-testing) into project construction and completion schedule so as to ensure completion before acceptance of project.
- .2 Do TAB of each system independently and subsequently, where interlocked with other systems, in unison with those systems.

1.6 PRE-TAB REVIEW

- .1 Review contract documents before project construction is started and confirm in writing to Departmental Representative adequacy of provisions for TAB and other aspects of design and installation pertinent to success of TAB.
- .2 Review specified standards and report to Departmental Representative in writing all proposed procedures which vary from standard.
- .3 During construction, co-ordinate location and installation of TAB devices, equipment, accessories, measurement ports and fittings.

1.7 START-UP

- .1 Follow start-up procedures as recommended by equipment manufacturer unless specified otherwise.
- .2 Follow special start-up procedures specified elsewhere in Division 23.

1.8 OPERATION OF SYSTEMS DURING TAB

- .1 Operate systems for length of time required for TAB.

1.9 START OF TAB

- .1 Notify Departmental Representative 7 days prior to start of TAB.
- .2 Start TAB when building is essentially completed, including:
- .3 Installation of ceilings, doors, windows, other construction affecting TAB.
- .4 Application of weatherstripping, sealing, caulking.
- .5 All pressure, leakage, other tests specified elsewhere Division 23.
- .6 All provisions for TAB installed and operational.
- .7 Start-up, verification for proper, normal and safe operation of mechanical and associated electrical and control systems affecting TAB including but not limited to:
 - .1 Proper thermal overload protection in place for electrical equipment.
 - .2 Air systems:
 - .1 Filters in place, clean.
 - .2 Duct systems clean.
 - .3 Ducts, air shafts, ceiling plenums are airtight to within specified tolerances.
 - .4 Correct fan rotation.
 - .5 Fire, smoke, volume control dampers installed and open.
 - .6 Coil fins combed, clean.
 - .7 Access doors, installed, closed.
 - .8 Outlets installed, volume control dampers open.
 - .3 Liquid systems:
 - .1 Flushed, filled, vented.
 - .2 Correct pump rotation.
 - .3 Strainers in place, baskets clean.
 - .4 Isolating and balancing valves installed, open.
 - .5 Calibrated balancing valves installed, at factory settings.
 - .6 Chemical treatment systems complete, operational.

1.10 APPLICATION TOLERANCES

- .1 Do TAB to following tolerances of design values:
 - .1 HVAC systems: plus 5 %, minus 5 %.

1.11 ACCURACY TOLERANCES

- .1 Measured values to be accurate to within plus or minus 2 % of actual values.

1.12 INSTRUMENTS

- .1 Prior to TAB, submit to Departmental Representative list of instruments to be used together with serial numbers.
- .2 Calibrate in accordance with requirements of most stringent of referenced standard for either applicable system or HVAC system.
- .3 Calibrate within 3 months of TAB. Provide certificate of calibration to Departmental Representative.

1.13 SUBMITTALS

- .1 Submit, prior to commencement of TAB:
- .2 Proposed methodology and procedures for performing TAB if different from referenced standard.

1.14 TAB REPORT

- .1 Format to be in accordance with referenced standard.
- .2 TAB report to show results in SI units and to include:
 - .1 Project record drawings.
 - .2 System schematics.
- .3 Submit 3 copies of TAB Report to Departmental Representative for approval, in D-ring binders, complete with index tabs.

1.15 VERIFICATION

- .1 Reported results subject to verification by Departmental Representative.
- .2 Provide manpower and instrumentation to verify up to 10 % of reported results.
- .3 Number and location of verified results to be at discretion of Departmental Representative.
- .4 Bear costs to repeat TAB as required to satisfaction of Departmental Representative.

1.16 SETTINGS

- .1 After TAB is completed to satisfaction of Departmental Representative, replace drive guards, close access doors, lock devices in set positions, and ensure sensors are at required settings.
- .2 Permanently mark settings to allow restoration at any time during life of facility. Markings not to be eradicated or covered in any way.

1.17 COMPLETION OF TAB

- .1 TAB to be considered complete when final TAB Report received and approved by Departmental Representative.

1.18 AIR SYSTEMS

- .1 Standard: TAB to be to most stringent of this section or NEBB.
- .2 Do TAB of the following systems, equipment, components, and controls:
 - .1 Domestic Water Heating Systems.
 - .2 Air Handling Unit.
 - .3 Heat Recovery Unit.
 - .4 Exhaust Fans.
- .3 Qualifications: personnel performing TAB to be current member in good standing of NEBB.
- .4 Quality assurance: Perform TAB under direction of supervisor qualified by to standards of NEBB.
- .5 Measurements: to include, but not limited to, following as appropriate for systems, equipment, components, controls: air velocity, static pressure, flow rate, pressure drop (or loss), temperatures (dry bulb, wet bulb, dewpoint), duct cross-sectional area, RPM, electrical power, voltage, noise, vibration.
- .6 Locations of equipment measurements: To include, but not be limited to, following as appropriate:
 - .1 Inlet and outlet of dampers, filter, coil, fan, other equipment causing changes in conditions.
 - .2 At controllers, controlled device.
- .7 Locations of systems measurements to include, but not be limited to, following as appropriate: Main ducts, main branch, sub-branch, run-out (or grille, register or diffuser).

1.19 DOMESTIC HWC SYSTEMS

- .1 Meet requirements as specified for hydronic systems.
- .2 Locations of equipment measurements: To include, but not be limited to, following as appropriate: Inlet and outlet of heaters, circulators and balancing valves.
- .3 Locations of systems measurements to include, but not be limited to, following as appropriate: main, main branch, branch, sub-branch.

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 The latest adopted version of:
 - .1 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM C335, Test Method for Steady State Heat Transfer Properties of Horizontal Pipe Insulation.
 - .2 ASTM C449/C449, Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.
 - .3 ASTM C553, Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
 - .4 ASTM C612, Specification for Mineral Fiber Block and Board Thermal Insulation.
 - .5 ASTM C921, Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.
 - .2 Canadian General Standards Board (CGSB)
 - .1 CGSB 51-GP-52Ma, Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.
 - .3 Thermal Insulation Association of Canada (TIAC): National Insulation Standards (R1999).
 - .4 Underwriters Laboratories of Canada (ULC)
 - .1 CAN/ULC-S102, Surface Burning Characteristics of Building Materials and Assemblies.

1.2 DEFINITIONS

- .1 For purposes of this section:
 - .1 "CONCEALED" - insulated mechanical services and equipment in suspended ceilings and non-accessible chases and furred-in spaces.
 - .2 "EXPOSED" - will mean "not concealed" as defined herein.
 - .3 "Cold temperature" mechanically cooled supply air.
 - .4 Insulation systems - insulation material, fasteners, jackets, and other accessories.
- .2 TIAC Codes:
 - .1 CRD: Code Round Ductwork,
 - .2 CRF: Code Rectangular Finish.

1.3 SHOP DRAWINGS

- .1 Submit for approval manufacturer's catalogue literature related to installation, fabrication for duct jointing recommendations.

1.4 MANUFACTURERS' INSTRUCTIONS

- .1 Submit manufacturer's installation instructions.
- .2 Installation instructions to include procedures used, and installation standards achieved.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .2 Protect from weather and construction traffic.
- .3 Protect against damage from any source.
- .4 Store at temperatures and conditions recommended by manufacturer.

Part 2 Products**2.1 FIRE AND SMOKE RATING**

- .1 In accordance with CAN/ULC-S102:
 - .1 Maximum flame spread rating: 25.
 - .2 Maximum smoke developed rating: 50.

2.2 INSULATION

- .1 Mineral fibre: as specified includes glass fibre, rock wool, slag wool.
- .2 Thermal conductivity ("k" factor) not to exceed specified values at 75°F (24°C) mean temperature when tested in accordance with ASTM C335.
- .3 TIAC Code C-1: Rigid mineral fibre board to ASTM C612, with factory applied vapour retarder jacket to CGSB 51-GP-52Ma (as scheduled in PART 3 of this Section).
- .4 TIAC Code C-2: Mineral fibre blanket to ASTM C553 faced with factory applied vapour retarder jacket to CGSB 51-GP-52Ma (as scheduled in PART 3 of this section).
 - .1 Mineral fibre: to ASTM C553.
 - .2 Jacket: to CGSB 51-GP-52Ma.
 - .3 Maximum "k" factor: to ASTM C553.

2.3 JACKETS

- .1 Canvas:
 - .1 220 gm/m² cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C921.
- .2 Lagging adhesive: Compatible with insulation.

2.4 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 C449.
- .4 ULC Listed Canvas Jacket:

Drumheller Institution – 50 Bed Unit – Slab Repair

- .1 220 gm/m² cotton, plain weave.
- .5 Tape: self-adhesive, aluminum, reinforced, 50 mm (2") wide minimum.
- .6 Contact adhesive: quick-setting
- .7 Canvas adhesive: washable.
- .8 Tie wire: 1.5 mm (0.05") stainless steel.
- .9 Banding: 19 mm (¾") wide, 0.5 mm (0.019") thick stainless steel.
- .10 Fasteners: 4 mm (0.15") diameter pins with 35 mm (1.38") diameter clips, length to suit thickness of insulation.

Part 3 Execution**3.1 PRE-INSTALLATION REQUIREMENTS**

- .1 Pressure testing of ductwork systems complete, witnessed and certified.
- .2 Surfaces clean, dry, free from foreign material.

3.2 INSTALLATION

- .1 Install in accordance with TIAC National Standards.
- .2 Apply materials in accordance with manufacturer's instructions and as indicated.
- .3 Use two layers with staggered joints when required nominal thickness exceeds 75 mm (3").
- .4 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.
 - .1 Hangers, supports to be outside vapour retarder jacket.
- .5 Supports, Hangers in accordance with Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.
 - .1 Apply high compressive strength insulation where insulation may be compressed by weight of ductwork.
- .6 Fasteners: At 300 mm (12") on centre in horizontal and vertical directions, minimum two rows each side.

3.3 DUCTWORK INSULATION SCHEDULE

- .1 Insulation types and thicknesses: Conform to following table:

	TIAC Code	Vapour Retarder	Thickness mm (inches)
Supply air ducts with mechanical cooling (AH1 & HR1)	C-1 or C-2	yes	25mm (1")
Supply air without cooling			none

Drumheller Institution – 50 Bed Unit – Slab Repair

	TIAC Code	Vapour Retarder	Thickness mm (inches)
Supply, return and exhaust ducts exposed in space being served			none
Outside air ducts to mixing plenum	C-1 or C-2	yes	25mm (1")
Mixing plenums	C-1	yes	25mm (1")
Exhaust duct between dampers and outside	C-1 or C-2	no	25mm (1")
Acoustically lined ducts	none		
Attic ducts	C-1 or C-2	yes	25mm (1")

END OF SECTION

1. General**1.1 REQUIREMENTS**

- .1 Design stand alone control system to control reinstalled HVAC equipment.
- .2 Contractor is to review the existing mechanical equipment and system control requirement on site prior to the demolition and coordinate with the client for the re-installation and control requirement.

1.2 SUBMITTALS

- .1 Product Data: Verify and record manufacturer's printed product literature, specifications and datasheet, including product characteristics, performance criteria, and limitations of all existing mechanical equipment on site and coordinate with the client operation to get those O&M manuals.
- .2 Provide wiring diagrams illustrating the interconnection of control components. Coordinate with electrical on site for control and wiring and power connections.

2. Products**2.1 THERMOSTAT (LOW VOLTAGE PROGRAMMABLE)**

- .1 General:
 - .1 Wall thermostat with polymer casing and thermostat guard. Slots for air circulation to thermostat.
 - .2 Automatic heat/cool system changeover.
 - .3 Configurable for natural gas or electric heat equipment.
 - .4 Permanent program memory.
 - .5 Integral thermostat and system diagnostics.
 - .6 Thermostat to maintain setpoint temperature within $\pm 1^{\circ}\text{C}$.
 - .7 Carry the Energy Star label.
 - .8 Remote temperature sensors suitable for hazardous areas.
- .2 Interface:
 - .1 Large luminescent display with touch pad interface.
 - .2 Thermostat configuration menu to allow keypad selection of options and programming without the requirement of an additional subbase.

2.2 SOLID STATE RELAYS

- .1 General:
 - .1 Relays to be socket or rail mounted.
 - .2 Relays to have LED Indicator.
 - .3 Input and output Barrier Strips to accept 14 to 28 AWG wire.
 - .4 Operating temperature range to be -20 degrees C to 70 degrees C.
 - .5 Relays to be CSA Certified.

- .6 Input/output Isolation Voltage to be 4000 VAC at 25 degrees C for 1 second maximum duration.
- .7 Operational frequency range, 45 to 65 HZ.
- .2 Input:
 - .1 Control voltage, 3 to 32 VDC.
 - .2 Drop out voltage, 1.2 VDC.
- .3 Output.
 - .1 AC or DC Output Model to suit application.

2.4 PROPORTIONAL VALVE CONTROLLER AND COMPONENTS

- .1 Supply one each of the following for each coil, with remote duct sensors.
- .2 Temperature controllers:
 - .1 Electronic proportional plus integral temperature controllers.
 - .2 Construction: high impact plastic DIN rail mounted.
 - .3 Input: 24VAC
 - .4 Sensing: compatible with resistance type thermocouple sensors.
 - .5 Output: 0-10VDC or 0-20mA with minimum output adjustment.
 - .6 Control actions: field selectable reverse or direct acting.
- .3 Digital Display module:
 - .1 Display module shall have an LED readout of the supply duct temperature and readout of the set point temperature.
- .4 Transformers:
 - .1 120/240VAC / 24VAC transformer compatible with temperature controller.
 - .2 Construction: high impact plastic DIN rail mounted.
- .5 Duct sensor:
 - .1 Averaging type incorporating several encapsulated sensors at equal distances over the length of the probe.
 - .2 Match sensor resistance values to the temperature controller.

2.5 CONTROL DAMPERS

- .1 Damper:
 - .1 Parallel blade type.
 - .2 Extruded aluminum, interlocking blades, complete with extruded vinyl seals, spring stainless steel side seals, extruded aluminum frame.
 - .3 Pressure fit self-lubricated bronze bearings.
 - .4 Linkage: plated steel tie rods, brass pivots and plated steel brackets, complete with plated steel control rod.
 - .5 Leakage: in closed position less than 2% of rated air flow at 25 Pa differential across damper.
 - .6 Frames: insulated with extruded polystyrene foam with RSI 0.88.

- .7 Blades: constructed from aluminum extrusions with internal hollows insulated with polyurethane or polystyrene foam, RSI 0.88.
- .2 Electronic damper actuators:
 - .1 Direct mount modulating.
 - .2 Spring return for "fail-safe" in Normally Open or Normally Closed position as indicated.
 - .3 Operator: size to control dampers against maximum pressure and dynamic closing/opening pressure, whichever is greater.
 - .4 Damper actuator to drive damper from full open to full closed in less than 30 seconds.
- .3 Economizer Controller:
 - .1 Wall mounted, steel cabinet to house microprocessor and terminal strips for temperature sensors and damper wiring.
 - .2 Operate without the use of battery backup to preserve non-volatile memory and time clock.
 - .3 Power supply: 24 VAC, 60 Hz
 - .4 Status indication for:
 - .1 System mode, and
 - .2 Interconnected equipment status
 - .5 Power protection:
 - .1 Damper motor and sensor wiring thermal operated circuit breakers.
 - .2 Watchdog timer to monitor the CPU and reset the system after power disturbances.
 - .6 Adjustable setpoints:
 - .1 Drybulb Temperature changeover (5.5°C to 25.5°C),
 - .2 Fresh air cycles per hour (0 to 12)
 - .7 Interface terminals:
 - .1 Exhaust, return, and outside air dampers,
 - .2 Outside air, return air and enthalpy sensors, and
 - .3 Control panel interface.
 - .8 Temperature Sensors:
 - .1 10 kOhm thermistor sensor

2.6

CONTROL VALVES

- .1 Valve body: characterized ball.
 - .1 Equal percentage flow characteristic.
 - .2 Flow factor CV (imperial units) as indicated on control valve schedule.
 - .3 Normally open.
 - .4 Porting: as indicated.
 - .5 Leakage rate ANSI class IV, 0.01% of full open valve capacity.
 - .6 Stem and Ball: stainless steel.
- .2 Electronic / electric valve actuators:
 - .1 Construction: steel, cast iron, aluminum.

- .2 Control signal: 0-10V DC or 4-20 mA DC.
- .3 Positioning time: to suit application, 90 sec maximum.
- .4 Fail to normal position as indicated.
- .5 Scale or dial indication of actual control valve position.
- .6 Size actuator to meet requirements and performance of control valve specifications.
- .7 Minimum shut-off pressure: 275 kPa.

3. Execution

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.
- .2 Work with the client operation on site to get the existing equipment O&M manuals.

3.2 INSTALLATION

- .1 Install control devices and wiring as required to perform the sequence of operation and as indicated on the drawings.
- .2 Connect and program boiler controller and temperature sensors.
- .3 Connect and program all thermostats and associated control valves.
- .4 Install control devices as indicated. Provide the following for each piece of equipment:
 - .1 Furnace GF-1W: programmable thermostat and integral discharge air controller. Thermostat must also control the electric reheat coil.
 - .2 Heat Recovery Ventilator HRV-1W: control interlocked operation with Furnace GF-1W.
- .5 On outside wall, mount thermostats on bracket or insulated pad 25 mm from exterior of wall.

3.3 SEQUENCE OF OPERATION

- .1 Heating and Ventilation system:
 - .1 Applies to the following equipment: furnace GF-1W.
 - .2 Programmable thermostat shall control all equipment.
 - .3 Call for heating shall enable the furnace gas burner until the call for heating is satisfied.
 - .4 The fan shall be on and the outside air damper shall be in the minimum position whenever the space is occupied.
 - .5 Programmed setpoints:
 - .1 Occupied: 24/7, Monday to Sunday.
 - .2 Unoccupied: N/A.
 - .3 Heating space temperature: 21°.

- .2 Heat Recovery Ventilation system:
 - .1 Applies to the following equipment: heat recovery ventilator HEV-1W.
 - .2 Control of operation is interlocked with furnace GF-1W.

END OF SECTION

Part 1 General**1.1 REFERENCES**

- .1 The latest adopted version of:
 - .1 American Society of Mechanical Engineers (ASME)
 - .1 ASME B16.5 Pipe Flanges and Flanged Fittings.
 - .2 ASME B18.2.1, Square and Hex Bolts and Screws.
 - .2 American Society for Testing and Materials (ASTM)
 - .1 ASTM A47/A47M, Specification for Ferritic Malleable Iron Castings.
 - .2 ASTM A53/A53M, Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated, Welded and Seamless.
 - .3 Canadian Standards Association (CSA)
 - .1 CSA W47.1, Certification of Companies for Fusion Welding of Steel Structures.
 - .4 Canadian Standards Association (CSA)/Canadian Gas Association (CGA)
 - .1 CAN/CGA B149.1, Natural Gas Installation Code.

Part 2 Products**2.1 PIPE**

- .1 Steel pipe: to ASTM A53/A53M, Schedule 40, seamless as follows:
 - .1 12 mm (½") to 50 mm (2"), screwed.
 - .2 65 mm (2 ½") and over, plain end.

2.2 JOINTING MATERIAL

- .1 Screwed fittings: pulverized lead paste.
- .2 Welded fittings: to CSA W47.1.
- .3 Flange gaskets: nonmetallic flat.

2.3 FITTINGS

- .1 Steel pipe fittings, screwed, flanged or welded:
 - .1 Malleable iron: screwed, banded, Class 150.
 - .2 Steel pipe flanges and flanged fittings: to ASME B16.5.
 - .3 Welding: butt-welding fittings.
 - .4 Unions: malleable iron, brass to iron, ground seat, to ASTM A47/A47M.
 - .5 Bolts and nuts: to ASME B18.2.1.
 - .6 Nipples: schedule 40, to ASTM A53/A53M.

2.4 VALVES

- .1 Provincial Code approved, lubricated ball type.

Part 3 Execution**3.1 PIPING**

- .1 Install in accordance with applicable Provincial/Territorial Codes.
- .2 Install in accordance with CAN/CGA B149.1.
- .3 Install drip points:
 - .1 At low points in piping system.
 - .2 At connections to equipment.

3.2 VALVES

- .1 Install valves with stems upright or horizontal.
- .2 Install valves at branch take-offs to isolate pieces of equipment, and as indicated.

3.3 FIELD QUALITY CONTROL

- .1 Test system in accordance with CAN/CGA B149.1 and requirements of authorities having jurisdiction.

3.4 PURGING

- .1 Purge after pressure test in accordance with CAN/CGA B149.1.

3.5 PRE-START-UP INSPECTIONS

- .1 Check vents from regulators, control valves, terminate outside building in approved location, protected against blockage, damage.
- .2 Check gas trains, entire installation is approved by authority having jurisdiction.

3.6 CLEANING AND START-UP

- .1 In accordance with requirements of CAN/CGA B149.1.

END OF SECTION

Part 1 General**1.1 REFERENCES**

- .1 The latest adopted version of:
 - .1 American Society for Testing and Materials (ASTM)
 - .1 ASTM A653/A653M-00, Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.
 - .2 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)
 - .1 SMACNA HVAC Duct Construction Standards, Metal and Flexible 2005.
 - .2 SMACNA HVAC Air Duct Leakage Test Manual 2007.

Part 2 Products**2.1 SEAL CLASSIFICATION**

- .1 SMACNA Class C: transverse joints and connections made air tight with sealant tape or combination thereof. Longitudinal seams unsealed.

2.2 SEALANT

- .1 Sealant: oil resistant, polymer type flame resistant duct sealant. Temperature range of minus 30 deg C to plus 93 deg C (86 deg F to plus 200 deg F).

2.3 TAPE

- .1 Tape: polyvinyl treated, open weave fiberglass tape, 50 mm (2") wide.

2.4 FITTINGS

- .1 Fabrication: to SMACNA.
- .2 Radiused elbows:
 - .1 Rectangular: Centreline radius: 1.5 times width of duct.
 - .2 Round: five piece. Centreline radius: 1.5 times diameter.
- .3 Mitred elbows, rectangular:
 - .1 To 400 mm (16"): with single thickness turning vanes.
 - .2 Over 400 mm (16"): with double thickness turning vanes.

- .4 Branches:
 - .1 Rectangular main and branch: with 45 deg entry on branch.
 - .2 Round main and branch: enter main duct with conical connection.
 - .3 Provide volume control damper in branch duct near connection to main duct.
 - .4 Main duct branches: with splitter damper.
- .5 Transitions:
 - .1 Diverging: 20 deg maximum included angle.
 - .2 Converging: 30 deg maximum included angle.
- .6 Offsets:
 - .1 Short radiused or mitered elbows.

2.5 FIRESTOPPING

- .1 Retaining angles around duct, on both sides of fire separation.
- .2 Firestopping material and installation must not distort duct.

2.6 GALVANIZED STEEL

- .1 Lock forming quality: to ASTM A653, Z90 zinc coating.
- .2 Thickness, fabrication and reinforcement: to SMACNA.
- .3 Joints: to SMACNA.

2.7 HANGERS AND SUPPORTS

- .1 Strap hangers: of same material as duct but next sheet metal thickness heavier than duct. Maximum size duct supported by strap hanger: 500 mm (19.68").
- .2 Hanger configuration: to SMACNA.
- .3 Hangers: galvanized steel angle with galvanized steel rods to SMACNA.
- .4 Upper hanger attachments:
 - .1 For steel joist: manufactured joist clamp.
 - .2 For steel beams: manufactured beam clamps:

Part 3 Execution

3.1 GENERAL

- .1 Do work in accordance with SMACNA and as indicated.
- .2 Do not break continuity of insulation vapour barrier with hangers or rods.
- .3 Support risers in accordance with SMACNA.

- .4 Install breakaway joints in ductwork on sides of fire separation.
- .5 Install proprietary manufactured flanged duct joints in accordance with manufacturer's instructions.
- .6 Manufacture duct in lengths and diameter to accommodate installation of acoustic duct lining as shown.

3.2 HANGERS

- .1 Strap hangers: install in accordance with SMACNA.
- .2 Angle hangers: complete with locking nuts and washers.
- .3 Hanger spacing: in accordance with SMACNA.

3.3 WATERTIGHT DUCT

- .1 Provide watertight duct for:
 - .1 Humidifier sections.
- .2 Form bottom of horizontal duct without longitudinal seams. Solder or weld joints of bottom and side sheets. Seal other joints with duct sealer.
- .3 Slope horizontal branch ductwork down towards drain points.
- .4 Fit base of riser with 150 mm (6") deep drain sump and 32 mm (1.25") drain connected, with deep seal trap and trap primer and discharging to open funnel drain or slope duct to drain to intake point.

3.4 SEALING AND TAPING

- .1 Apply sealant to outside of joint to manufacturer's recommendations.
- .2 Bed tape in sealant and recoat with minimum of one coat of sealant to manufacturers recommendations.

END OF SECTION

Part 1 General**1.1 REFERENCES**

- .1 The latest adopted version of:
 - .1 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)
 - .1 SMACNA - HVAC Duct Construction Standards - Metal and Flexible.

Part 2 Products**2.1 GENERAL**

- .1 Manufacture in accordance with SMACNA - HVAC Duct Construction Standards.

2.2 FLEXIBLE CONNECTIONS

- .1 Frame: galvanized sheet metal frame 1.6 mm (0.06") thick with fabric clenched by means of double locked seams.
- .2 Material:
 - .1 Fire resistant, self extinguishing, neoprene coated glass fabric, temperature rated at minus 40 deg C to plus 90 deg C, density of 1.3 kg/m2.

2.3 ACCESS DOORS IN DUCTS

- .1 Non-insulated ducts: sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 0.6 mm (0.02") thick complete with sheet metal angle frame.
- .2 Insulated ducts: sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 0.6 mm (0.02") thick complete with sheet metal angle frame and 25 mm (1") thick rigid glass fibre insulation.
- .3 Gaskets: foam rubber.
- .4 Hardware:
 - .1 Up to 300 x 300 mm (12" x 12"): two sash locks complete with safety chain.
 - .2 301 to 450 mm (12" to 18"): four sash locks complete with safety chain.
 - .3 451 to 1000 mm (18" to 40"): piano hinge and minimum two sash locks.

2.4 TURNING VANES

- .1 Factory or shop fabricated single thickness or double thickness with trailing edge, to recommendations of SMACNA and as indicated.

Part 3 Execution**3.1 INSTALLATION**

- .1 Flexible connections:
 - .1 Install in following locations:
 - .1 Inlets and outlets of air moving equipment as shown.
 - .2 Length of connection: 100 mm (4").
 - .3 Minimum distance between metal parts when system in operation: 75 mm (3").
 - .4 Install in accordance with recommendations of SMACNA.
 - .5 When fan is running:
 - .1 Ducting on sides of flexible connection to be in alignment.
 - .2 Ensure slack material in flexible connection.
- .2 Access doors and viewing panels:
 - .1 Size:
 - .1 As indicated or as required by task required.
 - .2 Locations:
 - .1 Fire dampers.
 - .2 Control dampers.
 - .3 Devices requiring maintenance.
 - .4 Required by code.
 - .5 Elsewhere as indicated.
- .3 Turning vanes:
 - .1 Install in accordance with recommendations of SMACNA and as indicated.

END OF SECTION

Part 1 General**1.1 REFERENCES**

- .1 The latest adopted version of:
 - .1 Sheet Metal and Air Conditioning National Association (SMACNA)
 - .1 SMACNA HVAC Duct Construction Standards, Metal and Flexible.

Part 2 Products**2.1 GENERAL**

- .1 Manufacture to SMACNA standards.

2.2 SINGLE BLADE DAMPERS

- .1 Of same material as duct, but one sheet metal thickness heavier. V-groove stiffened.
- .2 Size and configuration to recommendations of SMACNA, except maximum height 200 mm (8").
- .3 Locking quadrant with shaft extension to accommodate insulation thickness where required.
- .4 Inside and outside nylon end bearings.
- .5 Channel frame of same material as adjacent duct, complete with angle stop.

2.3 MULTI-BLADED DAMPERS

- .1 Factory manufactured of material compatible with duct.
- .2 Opposed blade: configuration, metal thickness and construction to recommendations of SMACNA.
- .3 Maximum blade height: 100 mm (4").
- .4 Bearings: self-lubricating nylon.
- .5 Linkage: shaft extension with locking quadrant.
- .6 Channel frame of same material as adjacent duct, complete with angle stop.

Part 3 Execution**3.1 INSTALLATION**

- .1 Install where indicated.

Drumheller Institution – 50 Bed Unit – Slab Repair

- .2 Install in accordance with recommendations of SMACNA and in accordance with manufacturer's instructions.
- .3 For supply, return and exhaust systems, locate balancing dampers in each branch duct.
- .4 Runouts to registers and diffusers: install single blade damper located as close as possible to main ducts.
- .5 All dampers to be vibration free.
- .6 Ensure damper operators are observable and accessible.

END OF SECTION

Part 1 General**1.1 REFERENCES**

- .1 The latest adopted version of:
 - .1 American Society for Testing and Materials (ASTM)
 - .1 ASTM A 653M, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by Hot-Dip Process.

1.2 PRODUCT DATA

- .1 Submit product data indicate the following:
 - .1 Performance data.

1.3 CLOSEOUT SUBMITTALS

- .1 Provide maintenance data for incorporation into manual.

1.4 CERTIFICATION OF RATINGS

- .1 Catalogue or published ratings shall be those obtained from tests carried out by manufacturer or those ordered by him from independent testing agency.

Part 2 Products**2.1 MULTI-LEAF DAMPERS**

- .1 Opposed or Parallel blade type as indicated.
- .2 Extruded aluminum, interlocking blades, complete with extruded vinyl seals, spring stainless steel side seals, extruded aluminum frame.
- .3 Pressure fit self-lubricated bronze bearings.
- .4 Linkage: plated steel tie rods, brass pivots and plated steel brackets, complete with plated steel control rod.
- .5 Operator: to requirements of controls section.
- .6 Performance:
 - .1 Leakage: in closed position to be less than 2% of rated air flow at 250 Pa differential across damper.
 - .2 Pressure drop: at full open position to be less than 15 Pa differential across damper at 2.5 m/s.

2.2 BACK DRAFT DAMPERS

- .1 Automatic gravity operated, multi leaf, aluminum construction with nylon bearings, spring assisted or counterweighted, as indicated.

2.3 RELIEF DAMPERS

- .1 Automatic multi-leaf aluminum dampers with ball bearing centre pivoted and counter-weights set to open static pressure, as indicated.

Part 3 Execution

3.1 INSTALLATION

- .1 Install where indicated.
- .2 Install in accordance with recommendations of SMACNA and manufacturer's instructions.
- .3 Seal multiple damper modules with silicon sealant.
- .4 Install access door adjacent to each damper. See Section 23 33 00 - Duct Accessories.
- .5 Ensure dampers are observable and accessible.

END OF SECTION

Part 1 General**1.1 REFERENCES**

- .1 The latest adopted version of:
 - .1 American National Standards Institute/National Fire Protection Association (ANSI/NFPA)
 - .1 ANSI/NFPA 90A, Installation of Air Conditioning and Ventilating Systems.
 - .2 Underwriters Laboratories of Canada (ULC)
 - .1 CAN4-S112, Fire Test of Fire Damper Assemblies.

1.2 PRODUCT DATA

- .1 Submit product data, indicate the following:
 - .1 Fire dampers.
 - .2 Operators.
 - .3 Fusible links.
 - .4 Design details of break-away joints.

1.3 CLOSEOUT SUBMITTALS

- .1 Provide maintenance data for incorporation into manual.

1.4 CERTIFICATION OF RATINGS

- .1 Catalogue or published ratings shall be those obtained from tests carried out by manufacturer or those ordered by him from independent testing agency signifying adherence to codes and standards.

Part 2 Products**2.1 FIRE DAMPERS**

- .1 Fire dampers: Type C, listed and bear label of ULC, meet requirements of authorities having jurisdiction. Fire damper assemblies to be fire tested in accordance with CAN4-S112.
- .2 Mild steel, factory fabricated for fire rating requirement to maintain integrity of fire wall and/or fire separation.
- .3 Fire dampers shall be curtain type, and shall have blades retailed in a recess so free area of connecting ductwork is not reduced.
- .4 Top hinged: round or square; multi-blade hinged or interlocking type; sized to maintain full duct cross section.

- .5 Fusible link actuated, weighted to close and lock in closed position when released or having negator-spring-closing operator for multi-leaf type or roll door type in horizontal position with vertical air flow. Fusible links shall be set for 72°C (162°F).
- .6 40 x 40 x 3 mm (1½" x 1½" x 1/8") retaining angle iron frame, on full perimeter of fire damper, on both sides of fire separation being pierced.

Part 3 Execution

3.1 INSTALLATION

- .1 Install in accordance with ANSI/NFPA 90A and in accordance with conditions of ULC listing.
- .2 Maintain integrity of fire separation.
- .3 After completion and prior to concealment obtain approvals of complete installation from authority having jurisdiction.
- .4 Install access door adjacent to each damper. See Section 23 33 00 - Duct Accessories.
- .5 Coordinate with installer of firestopping.
- .6 Ensure access doors/panels, fusible links, damper operators are easily observed and accessible.
- .7 Install break-away joints of approved design on each side of fire separation.

END OF SECTION

Part 1 General**1.1 PRODUCT DATA**

- .1 Submit product data.

Part 2 Products**2.1 GENERAL**

- .1 To meet capacity, pressure drop, terminal velocity, throw, noise level, neck velocity as indicated.
- .2 Grilles, registers and diffusers of same generic type to be product of one manufacturer
- .3 Frames:
 - .1 Full perimeter gaskets.
 - .2 Plaster frames where set into plaster or gypsum board at all locations and as specified.
 - .3 Concealed fasteners.
- .4 Concealed manual volume control damper operators, where required.
- .5 Colour: white, unless indicated otherwise.

2.2 GRILLES, REGISTERS, DIFFUSERS - STANDARD OF ACCEPTANCE

- .1 Provide grilles as specified on drawings or an equivalent manufacturer meeting the specified products as a standard of acceptance.

Part 3 Execution**3.1 INSTALLATION**

- .1 Install in accordance with manufacturers instructions and as shown.
- .2 Install with flat head stainless steel screws in countersunk holes where fastenings are visible.
- .3 Provide concealed opposed blade balance dampers on grilles mounted directly on duct main.

END OF SECTION

Part 1 General**1.1 RELATED REQUIREMENTS**

- .1 Division 01 – General Requirements.
- .2 Division 02 - Demolition
- .3 Division 03 - Concrete.
- .4 Division 10 – Specialties.
- .5 Division 21, 22, 23 – Mechanical.

1.2 REFERENCE STANDARDS

- .1 CSA Group
 - .1 CSA C22.1-18, Canadian Electrical Code, Part 1 (24nd Edition), Safety Standard for Electrical Installations.
 - .2 CSA C22.2
 - .3 CAN3-C235-83(R2015), Preferred Voltage Levels for AC Systems, 0 to 50,000V.
- .2 Institute of Electrical and Electronics (IEEE)/National Electrical Safety Code Product Line (NESC)
 - .1 IEEE SP1122-2000, The Authoritative Dictionary of IEEE Standards Terms, 7th Edition.

1.3 DEFINITIONS

- .1 Electrical and electronic terms: unless otherwise specified or indicated, terms used in these specifications, and on drawings, are those defined by IEEE SP1122.

1.4 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 approval and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Submit for review single line electrical diagrams under plexiglass and locate as indicated.
 - .1 Electrical distribution system in main electrical room.
 - .2 Electrical power generation and distribution systems in power plant rooms.
- .4 Submit for review fire alarm riser diagram, plan and zoning of building under plexiglass at fire alarm control panel and annunciator.
- .5 Shop drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Alberta, Canada.

- .2 Submit wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure co-ordinated installation.
- .3 Identify on wiring diagrams circuit terminals and indicate internal wiring for each item of equipment and interconnection between each item of equipment.
- .4 Indicate on drawings clearances for operation, maintenance, and replacement of operating equipment devices.
- .5 Submit 3 number of copies of 600 x 600 mm minimum size drawings and product data to authorities.
- .6 If changes are required, notify authority having jurisdiction of these changes before they are made.
- .6 Certificates:
 - .1 Provide CSA certified equipment and material.
 - .2 Where CSA certified equipment and material is not available, submit such equipment and material to inspection authorities for special approval before delivery to site.
 - .3 Submit test results of installed electrical systems and instrumentation.
 - .4 Permits and fees: in accordance with General Conditions of contract.
 - .5 Submit, upon completion of Work, load balance report as described in PART 3 - LOAD BALANCE.
 - .6 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to authority having jurisdiction.
- .7 Manufacturer's Field Reports: submit to Departmental Representative manufacturer's written report, within 3 days of review, verifying compliance of Work and electrical system and instrumentation testing, as described in PART 3 - FIELD QUALITY CONTROL.
- .8 Sustainable Design Submittals:
 - .1 Construction Waste Management:
 - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.
 - .2 Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating that 75% of construction wastes were recycled or salvaged.
 - .2 Building Energy and Water Consumption: submit Measurement and Verification Plan following IPMVP for monitoring end-uses as follows:
 - .1 Lighting systems and controls.
 - .2 Constant and variable motor loads.
 - .3 Variable frequency drive (VFD) operation.
 - .4 Chiller efficiency at variable loads (kW/ton).
 - .5 Cooling load.
 - .6 Air and water economizer and heat recovery cycle.
 - .7 Air distribution static pressures and ventilation air volumes.
 - .8 Boiler efficiencies.

- .9 Building-related process energy systems and equipment.
- .10 Indoor water risers and outdoor irrigation systems.
- .3 Recycled Content:
 - .1 Submit listing of recycled content products used, including details of required percentages or recycled content materials and products, showing their costs and percentages of post-consumer content, and total cost of materials for project.
- .4 Regional Materials: submit evidence that project incorporates required percentage of regional materials and products, showing their cost, distance from project to furthest site of extraction or manufacture, and total cost of materials for project.

1.5 CLOSEOUT SUBMITTALS

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

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

- .2 Store and protect from nicks, scratches, and blemishes.
- .3 Replace defective or damaged materials with new.
- .4 Develop Construction Waste Management Plan related to Work of this Section and in accordance with Section 01 35 21 - LEED Requirements.
- .5 Packaging Waste Management: remove for reuse and return as specified in Construction Waste Management Plan in accordance with Section 01 74 19 - Waste Management and Disposal.

Part 2 Products

2.1 DESIGN REQUIREMENTS

- .1 Operating voltages: to CAN3-C235.
- .2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard.
 - .1 Equipment to operate in extreme operating conditions established in above standard without damage to equipment.
- .3 Language operating requirements: provide identification nameplates and labels for control items in English.
- .4 Use one nameplate or label for each language.

2.2 MATERIALS AND EQUIPMENT

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

2.3 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS

- .1 Verify installation and co-ordination responsibilities related to motors, equipment and controls, as indicated.
- .2 Control wiring and conduit: in accordance with Section 26 29 03 - Control Devices except for conduit, wiring and connections below 50 V which are related to control systems specified in mechanical sections and as shown on mechanical drawings.

2.4 WARNING SIGNS

- .1 Warning Signs: in accordance with requirements of authority having jurisdiction.
- .2 Porcelain enamel decal signs, minimum size 175 x 250 mm.

2.5 WIRING TERMINATIONS

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

2.6 EQUIPMENT IDENTIFICATION

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

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

- .2 Labels: embossed plastic labels with 6 mm high letters unless specified otherwise.
- .3 Wording on nameplates and labels to be approved by authority having jurisdiction prior to manufacture.
- .4 Allow for minimum of twenty-five (25) letters per nameplate and label.
- .5 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.
- .6 Identify equipment with Size 3 labels engraved "ASSET INVENTORY NO." as directed by Departmental Representative.
- .7 Disconnects, starters and contactors: indicate equipment being controlled and voltage.
- .8 Terminal cabinets and pull boxes: indicate system and voltage.
- .9 Transformers: indicate capacity, primary and secondary voltages.

2.7 WIRING IDENTIFICATION

- .1 Identify wiring with permanent indelible identifying markings, numbered coloured plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring.
- .2 Maintain phase sequence and colour coding throughout.
- .3 Colour coding: to CSA C22.1.
- .4 Use colour coded wires in communication cables, matched throughout system.

2.8 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.

Type	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

2.9 FINISHES

- .1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.

- .1 Paint outdoor electrical equipment "equipment green" finish.
- .2 Paint indoor switchgear and distribution enclosures light gray.

Part 3 Execution

3.1 EXAMINATION

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

3.2 INSTALLATION

- .1 Do complete installation in accordance with CSA C22.1 except where specified otherwise.
- .2 Do overhead and underground systems in accordance with CAN/CSA-C22.3 No.1 except where specified otherwise.

3.3 NAMEPLATES AND LABELS

- .1 Ensure manufacturer's nameplates, CSA labels and identification nameplates are visible and legible after equipment is installed.

3.4 CONDUIT AND CABLE INSTALLATION

- .1 Install conduit and sleeves prior to pouring of concrete.
 - .1 Sleeves through concrete: schedule 40 steel pipe, sized for free passage of conduit, and protruding 50 mm.

- .2 If plastic sleeves are used in fire rated walls or floors, remove before conduit installation.
- .3 Install cables, conduits and fittings embedded or plastered over, close to building structure so furring can be kept to minimum.

3.5 LOCATION OF OUTLETS

- .1 Locate outlets in accordance with Section 26 05 32 - Outlet Boxes, Conduit Boxes and Fittings.
- .2 Do not install outlets back-to-back in wall; allow minimum 150 mm horizontal clearance between boxes.
- .3 Change location of outlets at no extra cost or credit, providing distance does not exceed 3000 mm, and information is given before installation.
- .4 Locate light switches on latch side of doors.
 - .1 Locate disconnect devices in mechanical and elevator machine rooms on latch side of floor.

3.6 MOUNTING HEIGHTS

- .1 Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicated otherwise.
- .2 If mounting height of equipment is not specified or indicated, verify before proceeding with installation.
- .3 Install electrical equipment at following heights unless indicated otherwise.
 - .1 Local switches: 1400 mm.
 - .2 Wall receptacles:
 - .1 General: 300 mm.
 - .2 Above top of continuous baseboard heater: 200 mm.
 - .3 Above top of counters or counter splash backs: 175 mm.
 - .4 In mechanical rooms: 1400 mm.
 - .3 Panelboards: as required by Code or as indicated.
 - .4 Telephone and interphone outlets: 300 mm.
 - .5 Wall mounted telephone and interphone outlets: 1500 mm.
 - .6 Fire alarm stations: 1500 mm.
 - .7 Fire alarm bells: 2100 mm.
 - .8 Television outlets: 300 mm.
 - .9 Wall mounted speakers: 2100 mm.
 - .10 Clocks: 2100 mm.
 - .11 Doorbell pushbuttons: 1500 mm.

3.7 CO-ORDINATION OF PROTECTIVE DEVICES

- .1 Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to required values and settings.

3.8 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 PART 1 - ACTION AND INFORMATIONAL SUBMITTALS, phase and neutral currents on panelboards, dry-core transformers and motor control centres, operating under normal load, as well as hour and date on which each load was measured, and voltage at time of test.
- .2 Conduct following tests in accordance with Section 01 45 00 - Quality Control.
 - .1 Power generation and distribution system including phasing, voltage, grounding and load balancing.
 - .2 Circuits originating from branch distribution panels.
 - .3 Lighting and its control.
 - .4 Motors, heaters and associated control equipment including sequenced operation of systems where applicable.
 - .5 Systems: fire alarm, 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 Carry out tests in presence of Departmental Representative.
- .4 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.
- .5 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 - ACTION AND INFORMATIONAL 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.

3.9 SYSTEM STARTUP

- .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.

3.10 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - 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 00 - Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal 01 35 21 - LEED Requirements.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General**1.1 SUMMARY**

- .1 This Section includes requirements for selective demolition and removal of electrical communications and safety and security components including removal of conduit, junction boxes, and panels to source (home run removal) and incidentals required to complete work described in this Section ready for new construction.

1.2 RELATED REQUIREMENTS

- .1 Section 02 41 19.16 - Selective Interior Demolition
- .2 Section 02 42 00 - Removal and Salvage of Construction Materials

1.3 REFERENCE STANDARDS

- .1 CSA Group (CSA)
 - .1 CSA S350 M1980 (R2003), Code of Practice for Safety in Demolition of Structures

1.4 DEFINITIONS

- .1 Demolish: Detach items from existing construction and legally dispose of items off site, unless indicated as removed and salvaged, or removed and reinstalled.
- .2 Remove: Planned deconstruction and disassembly of electrical items from existing construction including removal of conduit, junction boxes, cabling and wiring from electrical component to panel taking care not to damage adjacent assemblies designated to remain; legally dispose of items off site, unless indicated as removed and salvaged, or removed and reinstalled.
- .3 Remove and Salvage: Detach items from existing construction and deliver them to Owner ready for reuse.
- .4 Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.
- .5 Existing to Remain: Existing items of construction that are not removed and that are not otherwise indicated as being removed and salvaged, or removed and reinstalled.
- .6 Hazardous Substances: Dangerous substances, dangerous goods, hazardous commodities and hazardous products may include asbestos, mercury and lead, PCB's, poisons, corrosive agents, flammable substances, radioactive substances, or other material that can endanger human health or wellbeing or environment if handled improperly as defined by Federal Hazardous Products Act (RSC 1985) including latest amendments.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Action Submittals: Provide in accordance with Section 01 33 00 - Submittal Procedures before starting work of this Section:

- .1 Construction Waste Management Plan (CWM Plan): Submit plan addressing opportunities for reduction, reuse, or recycling of materials prepared in accordance with Section 01 74 19 - Waste Management and Disposal.
- .2 Landfill Records: Indicate receipt and acceptance of selective demolition waste and hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1.6 ADMINISTRATIVE REQUIREMENTS

- .1 Coordination: Coordinate work of this Section to avoid interference with work by other Sections.
- .2 Scheduling: Account for Owner's continued occupancy requirements during selective demolition with Section 02 41 19.16 - Selective Interior Demolition and schedule staged occupancy and worksite activities as a defined Critical Path in Section 01 32 16.16 - Construction Progress Schedule - Critical Path Method (CPM) Activity in Section 01 32 16.19 - Construction Progress Schedule - Bar (GANTT) Chart.

1.7 QUALITY ASSURANCE

- .1 Regulatory Requirements: Perform work of this Section in accordance with:
 - .1 Provincial/Territorial Workers' Compensation Boards/Commissions
 - .2 Government of Canada, Labour Program: Workplace Safety
Provincial/Territorial Occupational Health and Safety Standards and Programs

1.8 SITE CONDITIONS

- .1 Existing Conditions: Condition of materials identified as being salvaged or demolished are based on their observed condition on date that tender is accepted.
- .2 Existing Hazardous Substances: Departmental Representative performed a hazardous substances assessment and it is not expected that hazardous substances will be encountered in Work.
 - .1 Hazardous substances will be removed by a hazardous abatement specialist engaged by Owner before start of Work.
- .3 Existing Hazardous Substances: Owner has performed a hazardous substances assessment and identified materials requiring abatement as follows:
 - .1 Hazardous substances are as defined in Hazardous Products Act.
 - .2 Hazardous substances will be removed by Contractor as a part of Contract before starting Work in accordance with work results described in Related Requirements listed above.
- .4 Discovery of Hazardous Substances: It is not expected that Hazardous Substances will be encountered in Work; immediately notify Departmental Representative if materials suspected of containing hazardous substances are encountered and perform following activities:
 - .1 Refer to Section 01 41 00 - Regulatory Requirements for directives associated with specific material types.
 - .2 Hazardous substances will be as defined in Hazardous Products Act.
 - .3 Stop work in area of suspected hazardous substances.

- .4 Take preventative measures to limit users' and workers' exposure, provide barriers and other safety devices and do not disturb.
- .5 Hazardous substances will be removed by Owner under a separate contract or as a change to Work.
- .6 Proceed only after written instructions have been received from Departmental Representative.

1.9 SALVAGE AND DEBRIS MATERIALS

- .1 Demolished items become Contractor's property and will be removed from Project site; except for items indicated as being reused, salvaged, or otherwise indicated to remain Owner's property.
- .2 Carefully remove materials and items designated for salvage and store in a manner to prevent damage or devaluation of materials in accordance with Section 02 42 00 - Removal and Salvage of Construction Materials.
 - .1 Leave main electrical distribution panel in place; panel can be used for temporary construction power for this and subsequent contracts in accordance with Section 01 51 00 - Temporary Utilities; coordinate temporary power connections with Owner.
 - .2 Leave main telephone terminal backboard in place; panel can be used for temporary construction telephone system for this and subsequent contracts in accordance with Section 01 51 00 - Temporary Utilities; coordinate temporary telephone connections with Owner.

Part 2 Products

2.1 MATERIALS

- .1 General Patching and Repair Materials: Refer to Section 02 41 19.16 - Selective Interior Demolition for listing of patching and repair materials incidental to removal or demolition of components associated with work of this Section.
- .2 Electrical Repair Materials: Use only new materials, CSA or ULC labelled as appropriate and matching components remaining after work associated with components identified for removal or demolition are completed.
- .3 Fire stopping Repair Materials: Use fire stopping materials compatible with existing fire stopping systems where removal or demolition work affects rated assemblies, restore to match existing fire rated performance.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Existing Conditions: Visit site, thoroughly examine and become familiar with conditions that may affect the work of this Section before tendering the Bid; Departmental Representative will not consider claims for extras for work or materials necessary for proper execution and completion of the contract that could have been determined by a site visit.

3.2 PREPARATION

- .1 Protection of Existing Systems to Remain: Protect systems and components indicated to remain in place during selective demolition operations and as follows:
 - .1 Prevent movement and install bracing to prevent settlement or damage of adjacent services and parts of existing buildings scheduled to remain.
 - .2 Notify Departmental Representative and cease operations where safety of buildings being demolished, adjacent structures or services appears to be endangered and await additional instructions before resuming demolition work specified in this Section.
 - .3 Prevent debris from blocking drainage inlets.
 - .4 Protect mechanical systems that will remain in operation.
- .2 Protection of Building Occupants: Sequence demolition work so that interference with the use of the building by the Owner and users is minimized and as follows:
 - .1 Prevent debris from endangering safe access to and egress from occupied buildings.
 - .2 Notify Departmental Representative and cease operations where safety of occupants appears to be endangered and await additional instructions before resuming demolition work specified in this Section.

3.3 EXECUTION

- .1 Demolition and Removal: Coordinate requirements of this Section with information contained in Section 02 41 19.16 - Selective Interior Demolition and as follows:
 - .1 Disconnect electrical circuits and panel feeders; maintain electrical service and main distribution panel as is, ready for subsequent Work.
 - .2 Remove existing luminaires, electrical devices and equipment including associated conduits, boxes, wiring, and similar items unless specifically noted otherwise.
 - .3 Disconnect and remove existing fire alarm system including associated conduits, boxes, wiring, and similar items unless specifically noted otherwise.
 - .4 Disconnect and remove communication systems including associated conduits, boxes, cabling, and similar items unless specifically noted otherwise.
 - .5 Disconnect and remove telephone outlets, associated conduit, cabling and sub terminal backboards and related accessories; maintain telephone service and main terminal backboard as is.
 - .6 Perform demolition work in a neat and workmanlike manner:
 - .1 Remove tools or equipment after completion of work, and leave site clean and ready for subsequent renovation work.
 - .2 Repair and restore damages caused as a result of work of this Section to match existing materials and finishes.
 - .7 Disconnect panel feeders back to main distribution panel and re label respective circuit breaker as "SPARE".
 - .8 Place weatherproof blank cover plates on exterior outlet boxes remaining after demolition and removal activities.

- .9 Remove existing conduits, boxes, cabling and wiring associated with removed luminaires, electrical devices and equipment.
- .10 Grind off conduits and make flush with surface of concrete where conduits are cast into concrete; seal open ends of conduit with silicone sealant and leave in place.
- .11 Seal open ends of conduit with silicone sealant and leave in place where they are inaccessible or cannot be removed without damaging adjacent construction.

3.4 CLOSEOUT ACTIVITIES

- .1 Demolition Waste Disposal: Arrange for legal disposal and remove demolished materials to accredited provincial landfill site or alternative disposal site (recycle centre) except where explicitly noted otherwise for materials being salvaged for re use in new construction in accordance with Section 02 42 00 - Removal and Salvage of Construction Materials.
- .2 Hazardous Substances Disposal: Arrange for disposal of hazardous substances in accordance with requirements of Section 02 81 00 - Hazardous Materials.

END OF SECTION

Part 1 General**1.1 RELATED REQUIREMENTS**

- .1 Section 26 05 00.

1.2 REFERENCE STANDARDS

- .1 CSA Group (CSA)
 - .1 CAN/CSA-C22.2 No.18-98(R2003), Outlet Boxes, Conduit Boxes and Fittings.
 - .2 CAN/CSA-C22.2 No.65-03(R2008), Wire Connectors (Tri-National Standard with UL 486A-486B and NMX-J-543-ANCE-03).
- .2 Electrical and Electronic Manufacturers' Association of Canada (EEMAC)
 - .1 EEMAC 1Y-2-1961, Bushing Stud Connectors and Aluminum Adapters (1200 Ampere Maximum Rating).
- .3 National Electrical Manufacturers Association (NEMA)

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for wire and box connectors and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Sustainable Design Submittals:
 - .1 Construction Waste Management:
 - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.
 - .2 Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating that 75% of construction wastes were recycled or salvaged.

1.4 CLOSEOUT SUBMITTALS

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

1.5 DELIVERY, STORAGE AND HANDLING

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

- .1 Store materials indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Store and protect wire and box connectors from nicks, scratches, and blemishes.
- .3 Replace defective or damaged materials with new.
- .4 Develop Construction Waste Management Plan related to Work of this Section.
- .5 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 19 - Waste Management and Disposal.

Part 2 Products

2.1 MATERIALS

- .1 Pressure type wire connectors to: CAN/CSA-C22.2 No.65, with current carrying parts of copper sized to fit copper conductors as required.
- .2 Fixture type splicing connectors to: CAN/CSA-C22.2 No.65, with current carrying parts of copper sized to fit copper conductors 10 AWG or less.
- .3 Bushing stud connectors: to NEMA to consist of:
 - .1 Connector body and stud clamp for stranded copper conductors.
 - .2 Clamp for stranded copper conductors.
 - .3 Clamp for stranded aluminum conductors.
 - .4 Stud clamp bolts.
 - .5 Bolts for copper conductors.
 - .6 Bolts for aluminum conductors.
 - .7 Sized for conductors as indicated.
- .4 Clamps or connectors for armoured cable, mineral insulated cable, flexible conduit, non-metallic sheathed cable as required to: CAN/CSA-C22.2 No.18.

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 wire and box connectors installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

- .1 Remove insulation carefully from ends of conductors and cables and:
 - .1 Apply coat of zinc joint compound on aluminum conductors prior to installation of connectors.
 - .2 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CAN/CSA-C22.2 No.65.
 - .3 Install fixture type connectors and tighten to CAN/CSA-C22.2 No.65. Replace insulating cap.
 - .4 Install bushing stud connectors in accordance with NEMA.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - 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 00 - Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General**1.1 RELATED REQUIREMENTS**

- .1 Section 26 05 00.

1.2 PRODUCT DATA

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

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Packaging Waste Management: remove for reuse and return by manufacturer of pallets crates padding and packaging materials in accordance with Section 01 74 19 - Waste Management and Disposal.

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 600V insulation of cross-linked thermosetting polyethylene material rated RW90 XLPE, Non Jacketted.
- .3 Copper conductors: size as indicated, with thermoplastic insulation type TWU rated at 600 V.
- .4 Neutral supported cable: 3 phase insulated conductors of Copper and one neutral conductor of Copper steel reinforced, size as indicated. Type: NS75 Insulation: Type NSF-2 flame retardant rated 600 V.

2.2 TECK 90 CABLE

- .1 Cable: in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Conductors:
 - .1 Grounding conductor: copper as indicated.
 - .2 Circuit conductors: copper as indicated, size as indicated.
- .3 Insulation:
 - .1 Ethylene propylene rubber EP.
 - .2 Cross-linked polyethylene XLPE.
 - .3 Rating:, 600 V.
- .4 Inner jacket: polyvinyl chloride material.
- .5 Armour: flat galvanized steel.
- .6 Overall covering: thermoplastic polyvinyl chloride, compliant to applicable Building Code classification for this project.
- .7 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 Channel type supports for two or more cables at centers.
- .3 Threaded rods: 6 mm diameter to support suspended channels.
- .8 Connectors:
 - .1 Watertight approved for TECK cable.

2.3 MINERAL-INSULATED CABLES

- .1 Conductors: solid bare soft-annealed copper, size as indicated.
- .2 Insulation: compressed powdered magnesium oxide or silicon dioxide to form compact homogeneous mass throughout entire length of cable.
- .3 Outer covering: annealed seamless copper sheath, Type M1 rated 600 V, 250 degrees C.
- .4 Overall jacket: PVC applied over the sheath and compliant to applicable Building Code classification for this project.
- .5 Two hour fire rating.
- .6 Connectors: watertight, factory installed and tested approved for MI cable.
- .7 Termination kits: factory installed approved for MI cable

2.4 ARMOURED CABLES

- .1 Conductors: insulated, copper, size as indicated.
- .2 Type: AC90.
- .3 Armour: interlocking type fabricated from galvanized steel strip.
- .4 Type: ACWU90jacket over thermoplastic armour and compliant to applicable Building Code classification for this project.
- .5 Connectors: anti short connectors.

2.5 ALUMINUM SHEATHED CABLE

- .1 Conductors: copper, size as indicated.
- .2 Insulation: cross linked polyethylene type RA90 rated 600V.
- .3 Sheath: aluminum applied to form continuous smooth sheath.
- .4 Outer jacket: none.
- .5 Fastenings for aluminum sheathed cable:
 - .1 One hole steel straps to secure surface cables 25 mm and smaller. Two hole steel straps for cables larger than 25 mm. Use aluminum strap only with single conductor cable.
 - .2 Channel type supports for two or more cables at centers.
 - .3 Threaded rods: 6 mm diameter to support suspended channels.

2.6 CONTROL CABLES

- .1 Type: LVT: 2 soft annealed copper conductors, sized as indicated:
 - .1 Insulation: thermoplastic.
 - .2 Sheath: thermoplastic jacket, and armour of closely wound aluminum wire.
- .2 Type: low energy 300 V control cable: stranded annealed copper conductors sized as indicated LVT: 2 soft annealed copper conductors, sized as indicated:
 - .1 Insulation: PVC.
 - .2 Shielding: tape coated with paramagnetic material over each conductor.
 - .3 Overall covering: PVC jackets.
- .3 Type: 600 V stranded conductors, sizes as indicated:
 - .1 Insulation: PVC.
 - .2 Shielding: magnetic tape over each conductor.
 - .3 Overall covering: thermoplastic jacket with sheath of PVC thermosetting compound.

2.7 NON-METALLIC SHEATHED CABLE

- .1 Non-metallic sheathed copper cable type: NMD90XLPE, size as indicated.

Part 3 Execution

3.1 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Perform tests using method appropriate to site conditions and to approval of Departmental Representative and local authority having jurisdiction over installation.
- .3 Perform tests before energizing electrical system.

3.2 GENERAL CABLE INSTALLATION

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

3.3 INSTALLATION OF BUILDING WIRES

- .1 Install wiring as follows:
 - .1 In conduit systems in accordance with Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.
 - .2 In surface and lighting fixture raceways in accordance with Section 26.
 - .3 In wireways and auxiliary gutters in accordance with Section 21.

3.4 INSTALLATION OF TECK90 CABLE (0 -1000 V)

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

3.5 INSTALLATION OF MINERAL-INSULATED CABLES

- .1 Install cable concealed, securely supported by straps.
- .2 Support 2 hour fire rated cables at 1 m intervals.
- .3 Make cable terminations by using factory-made kits.
- .4 Cable terminations: use thermoplastic sleeving over bare conductors.
- .5 Where cables are buried in cast concrete or masonry, sleeve for exit of cables.
- .6 Do not splice cables unless indicated.

3.6 INSTALLATION OF ARMOURED CABLES

- .1 Group cables wherever possible on channels.

3.7 INSTALLATION OF ALUMINUM SHEATHED CABLE

- .1 Group cables wherever possible on channels.

3.8 INSTALLATION OF CONTROL CABLES

- .1 Install control cables in conduit.
- .2 Ground control cable shield.

3.9 INSTALLATION OF NON-METALLIC SHEATHED CABLE

- .1 Install cables.
- .2 Install straps and box connectors to cables as required.

END OF SECTION

Part 1 General**1.1 RELATED REQUIREMENTS**

- .1 Section 26 05 00.

1.2 REFERENCE STANDARDS

- .1 CSA Group
 - .1 CSA C22.1-18, Canadian Electrical Code, Part 1 (24th Edition), Safety Standard for Electrical Installations.
 - .2 CSA C22.2 No.41-13, Grounding and Bonding Equipment (Tri-National Standard, with NMX-J-590ANCE and UL 467).
 - .3 CSA C22.2 No.65-13, Wire connectors (Tri-National Standard, with UL 486A-486B NMX-J-543-ANCE).

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 connectors and terminations and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Certificates: obtain inspection certificate of compliance covering high voltage stress from inspection authority and include it with as-built drawings.
- .4 Sustainable Design Submittals:
 - .1 Construction Waste Management:
 - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.
 - .2 Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating that 75% of construction wastes were recycled or salvaged.
 - .2 Recycled Content:
 - .1 Submit listing of recycled content products used, including details of required percentages or recycled content materials and products, showing their costs and percentages of post-consumer content, and total cost of materials for project.
 - .3 Regional Materials: submit evidence that project incorporates required percentage of regional materials and products, showing their cost, distance from project to furthest site of extraction or manufacture, and total cost of materials for project.

1.4 CLOSEOUT SUBMITTALS

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

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

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect connectors and terminations from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Develop Construction Waste Management Plan related to Work of this Section.
- .5 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 19 - Waste Management and Disposal.

Part 2 Products

2.1 CONNECTORS AND TERMINATIONS

- .1 Copper compression connectors to CSA C22.2 No.65 as required sized for conductors.
- .2 Contact aid for aluminum cables where applicable.
- .3 4 way joint boxes dry location type in accordance with Section 26 05 33 - Raceway and Boxes for Electrical Systems.
- .4 4 way junction boxes with respective pothead for 4 conductor cables with allowance for stress - cone beyond for butyl rubber cable with copper sheath, in accordance with Section 26 05 33 - Raceway and Boxes for Electrical Systems.

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 connectors and terminations installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

- .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

- .1 Install stress cones, terminations, and splices in accordance with manufacturer's instructions.
- .2 Bond and ground as required to CSA C22.2No.41.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - 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 00 - Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General**1.1 RELATED REQUIREMENTS**

- .1 Section 26 05 00.

1.2 REFERENCE STANDARDS

- .1 Rating System Reference Guide.

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 hangers and supports and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Sustainable Design Submittals:
 - .1 Construction Waste Management:
 - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.
 - .2 Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating that 75% of construction wastes were recycled or salvaged.
 - .2 Recycled Content:
 - .1 Submit listing of recycled content products used, including details of required percentages or recycled content materials and products, showing their costs and percentages of post-consumer content, and total cost of materials for project.
 - .3 Regional Materials: submit evidence that project incorporates required percentage of regional materials and products, showing their cost, distance from project to furthest site of extraction or manufacture, and total cost of materials for project.

1.4 DELIVERY, STORAGE AND HANDLING

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

- .4 Develop Construction Waste Management Plan related to Work of this Section.
- .5 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 19 - Waste Management and Disposal.

Part 2 Products

2.1 SUPPORT CHANNELS

- .1 U shape, size 41 x 41 mm, 2.5 mm thick, surface mounted set in poured concrete walls and ceilings.

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 hangers and supports installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

- .1 Secure equipment to solid masonry, tile and plaster surfaces with lead anchors or nylon shields.
- .2 Secure equipment to poured concrete with expandable inserts.
- .3 Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.
- .4 Secure surface mounted equipment with twist clip fasteners to inverted T bar ceilings. Ensure that T bars are adequately supported to carry weight of equipment specified before installation.
- .5 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.
- .6 Fasten exposed conduit or cables to building construction or support system using straps.
 - .1 One-hole steel straps to secure surface conduits and cables 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 diameter threaded rods and spring clips.

- .2 Support 2 or more cables or conduits on channels supported by 6 mm diameter threaded rod hangers where direct fastening to building construction is impractical.
- .8 For surface mounting of two or more conduits use channels on centre spacing.
- .9 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.
- .10 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.
- .11 Do not use wire lashing or perforated strap to support or secure raceways or cables.
- .12 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Departmental Representative.
- .13 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - 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 00 - Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General**1.1 RELATED REQUIREMENTS**

- .1 Section 26 05 00.

1.2 REFERENCE STANDARDS

- .1 CSA Group (CSA)
 - .1 CSA C22.1-18, Canadian Electrical Code, Part 1, 24th Edition.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Provide shop drawings: in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Alberta, Canada.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

Part 2 Products**2.1 SPLITTERS**

- .1 Construction: sheet metal enclosure, welded corners and formed hinged cover suitable for locking in closed position.
- .2 Terminations: main and branch lugs to match required size and number of incoming and outgoing conductors as indicated.
- .3 Spare Terminals: minimum three spare terminals or lugs on each connection or lug block sized less than 400 A.

2.2 JUNCTION AND PULL BOXES

- .1 Construction: welded steel enclosure.
- .2 Covers Flush Mounted: 25 mm minimum extension all around.
- .3 Covers Surface Mounted: screw-on flat covers.

2.3 CABINETS

- .1 Construction: welded sheet steel as indicated hinged door, lock 2 keys and catch
- .2 Type E Empty: surface return flange mounting as indicated.
- .3 Type T Terminal: surface return flange mounting as indicated containing 19 mm G1S fir plywood backboard.

Part 3 Execution

3.1 SPLITTER INSTALLATION

- .1 Mount plumb, true and square to 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 except where indicated otherwise.
- .3 Install terminal block as indicated in Type T cabinets.
- .4 Only main junction and pull boxes are indicated. Install additional pull boxes as required by CSA C22.1.

3.3 IDENTIFICATION

- .1 Equipment Identification: to Section 26 05 00 - Common Work Results for Electrical.
- .2 Identification Labels: size 2 indicating system name, voltage and phase or as indicated.

END OF SECTION

Part 1 General**1.1 RELATED REQUIREMENTS**

- .1 Section 26 05 00.

1.2 REFERENCE STANDARDS

- .1 CSA Group (CSA)
 - .1 CSA C22.1-18, Canadian Electrical Code, Part 1, 24th Edition.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit samples for floor box in accordance with Section 01 33 00 - Submittal Procedures.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

Part 2 Products**2.1 OUTLET AND CONDUIT BOXES GENERAL**

- .1 Size boxes in accordance with CSA C22.1.
- .2 102 mm square or larger outlet boxes as required.
- .3 Gang boxes where wiring devices are grouped.
- .4 Blank cover plates for boxes without wiring devices.
- .5 347 V outlet boxes for 347 V switching devices.
- .6 Combination boxes with barriers where outlets for more than one system are grouped.

2.2 GALVANIZED STEEL OUTLET BOXES

- .1 One-piece electro-galvanized construction.
- .2 Single and multi-gang flush device boxes for flush installation, minimum size 76 x 50 x 38 mm or as indicated. 102 mm square outlet boxes when more than one conduit enters one side with extension and plaster rings as required.
- .3 Utility boxes for outlets connected to surface-mounted EMT conduit, minimum size 102 x 54 x 48 mm.
- .4 102 mm square or octagonal outlet boxes for lighting fixture outlets.

- .5 Extension and plaster rings for flush mounting devices in finished plaster 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 faceplate. Device mounting plate to accommodate short or long ear duplex receptacles. Minimum depth: 73 mm for receptacles and communication outlets.
- .2 Adjustable, watertight, concrete tight, cast floor boxes with openings drilled and tapped for 16, 21 and 27 mm conduit. Minimum size: 73 mm deep.

2.6 CONDUIT BOXES

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

2.7 OUTLET BOXES FOR NON-METALLIC SHEATHED CABLE

- .1 Electro-galvanized, sectional, screw ganging steel boxes, minimum size 76 x 50 x 63 mm with two double clamps to take non-metallic sheathed cables.

2.8 FITTINGS - GENERAL

- .1 Bushing and connectors with nylon insulated throats.
- .2 Knock-out fillers to prevent entry of debris.
- .3 Conduit outlet bodies for conduit up to 35mm and pull boxes for larger conduits.
- .4 Double locknuts and insulated bushings on sheet metal boxes.

2.9 SERVICE FITTINGS

- .1 'High tension' receptacle fitting made of 2 piece die-cast aluminum with brushed aluminum housing finish for 1 duplex receptacles. Bottom plate with two knockouts for centered or offset installation. 12 x 102 mm extension piece as indicated.
- .2 Pedestal type 'low tension' fitting made of 2 piece die cast aluminum with brushed aluminum housing finish to accommodate two amphenol jack connectors.

Part 3 Execution

3.1 INSTALLATION

- .1 Support boxes independently of connecting conduits.

- .2 Fill boxes with paper, sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of work.
- .3 For flush installations mount outlets flush with finished wall using plaster rings to permit wall finish to come within 6 mm of opening.
- .4 Provide correct size of openings in boxes for conduit, mineral insulated and armoured cable connections. Do not install reducing washers.
- .5 Vacuum clean interior of outlet boxes before installation of wiring devices.
- .6 Identify systems for outlet boxes as required.

END OF SECTION

Part 1 General**1.1 RELATED REQUIREMENTS**

- .1 Section 26 05 00.

1.2 REFERENCE STANDARDS

- .1 System for Existing Buildings: Operations and Maintenance 2009.
- .2 CSA Group (CSA)
 - .1 CSA C22.2 No.40-M1989(R2009), Cutout, Junction and Pull Boxes.

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 raceway and boxes and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Sustainable Design Submittals:
 - .1 Construction Waste Management:
 - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.
 - .2 Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating that 75% of construction wastes were recycled or salvaged.

1.4 CLOSEOUT SUBMITTALS

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

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect raceway and boxes from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Develop Construction Waste Management Plan related to Work of this Section.

- .5 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 19 - Waste Management and Disposal.

Part 2 Products

2.1 SPLICE BOXES

- .1 Splice boxes cast iron enclosures 6 mm thick painted with chromate primer and grey enamel to provide mechanical protection and moisture seal for direct buried cable splices rated 0.6kV and consisting of:
 - .1 Two halves, split along cable axis, finely ground matching surfaces, fastened with silicon bronze bolts, top half with large filling holes with gasketed plugs for medium hard asphalt base compound, bottom half with screws on inside for bonding armour, and box end openings sealed by:
 - .1 Wrapping cables with anhydrous tape and clamping to make snug fit, for 3 and 4 way splices.
 - .2 Fitting boxes with cable entrance fittings suitable for steel tape armour interlocking armour sheaths, for 3 and 4 way splices.
 - .2 Submarine splice boxes to provide mechanical protection and waterproof seal for submarine cables as follows:
 - .1 Cast iron split boxes with cast iron cones and split armour clamps painted with chromate primer and grey enamel with four bronze rods fastened rigidly to splice box and attached to armour clamps to relieve joint of longitudinal stress, designed to be filled with medium hard asphalt base compound, and rated 3kV.
 - .2 Galvanized steel pipe with filling holes for medium hard asphalt base compound, gasketed plugs, with ends right hand and left hand threaded, cast steel end caps with wire armour clamps, to relieve conductors and splice from mechanical stresses.

2.2 JUNCTION BOXES SUBWAY LEVEL

- .1 Cast iron octagonal box with joints ground smooth and sealed with gasket, painted with chromate primer and grey enamel fitted with contacts mounted on porcelain supports to which conductors are fastened by soldered-on lugs, air filled, suitable for 3 phase, 5 kV non-shielded cable up to 500 MCM, 3 ways, for direct burial.
- .2 Welded steel rectangular boxes, gasketed steel plate lid, fastened with silicon-bronze bolts, copper buses mounted on insulating supports, wiring sleeve entrances, cable conductor lugs detachable from bus contacts at no voltage, rated 500 MCM maximum at 3 pole, 5 kV, 4 way, designed for wall mounting in maintenance hole
- .3 Welded steel rectangular boxes, painted with chromate primer and grey enamel, steel plate lids, galvanized forged steel C clamps, silicon-bronze screws, oil resistant gaskets, lined and phases partitioned with bakelite, copper strap buses plastic insulation enclosed mounted on porcelain supports, disconnecting links, insulated switch stick operated at no voltage, interchangeable unit cable heads compound filled, equipped with air valve, designed to operate at 14 kPa air pressure, rated 3 phase, 5 kV, 500 A with number of ways and sets of disconnecting links, for wall mounting in maintenance holes.

2.3 JUNCTION BOXES DISTRIBUTION LEVEL

- .1 Welded steel rectangular boxes 6 mm thick minimum painted with chromate primer and grey enamel with removable plate on front side, designed for through run of main cable and porcelain enclosed disconnecting branches of 3 single conductor cables, using pothead plug and socket disconnectors enclosed in porcelain tubes and caps, standard deep overlapping for submersion designed for no voltage disconnecting, and for wall mounting in maintenance holes, branch cables rated 250 A, 5 kV, filled with medium hard asphalt base compound.

2.4 JUNCTION BOXES POWER LEVEL

- .1 Cast iron octagonal box painted with chromate primer and grey enamel with joints ground smooth and fitted with gasket, contacts mounted on porcelain supports to which conductors are fastened by soldered-on lugs, medium hard asphalt compound filled, suitable for 3 phase, 15 kV cable, 250 MCM maximum cable size, with wiping sleeve entrance.
- .2 Welded steel rectangular boxes, oil resistant gasketed steel plate lids fastened with silicon-bronze bolts, shot blasted and painted with chromate primer and grey enamel, cable heads medium hard asphalt compound filled cap nut sealed potheads with wiping sleeve entrances, air filled, disconnecting links insulated switch stick operated at no voltage rated 500 A at 7500V, 4 way for wall mounting in maintenance holes.

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 raceway and boxes installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

- .1 Install splice boxes at cable joint, on floor of trench. Tighten armour clamps and fill with compound.
 - .1 Ground splice boxes as required.
- .2 Install submarine splice boxes at cable joints, tighten clamps and fill with compound before lowering cable to sea bed.
- .3 Install junctions boxes on trench floor around cable splice to CSA C22.2 No.40. Connect cable terminals to box contacts.
 - .1 Ground junction boxes as required.

- .2 Fasten lid securely and check for air leaks before trench is backfilled.
- .4 Install subway level steel boxes on wall of maintenance holes. Connect cables to bus, install links, fasten lid and test for air leaks.
 - .1 Ground steel boxes as required.
- .5 Install distribution level steel boxes on walls of maintenance holes. Splice main cable in box and connect branch feeder. Fasten cover and fill with compound.
 - .1 Ground steel boxes as required.
- .6 Install power level boxes as follows:
 - .1 Cast iron type: on trench floor, connect cable terminals to box contacts, fasten lid and fill with compound before trench is backfilled.
 - .2 Steel type: mount on wall of maintenance holes; connect cables to box terminals; install disconnect links, fasten lid securely check for air leaks.
 - .3 Ground power level boxes as required.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - 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 00 - Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General**1.1 RELATED REQUIREMENTS**

- .1 Section 26 05 00.

1.2 REFERENCE STANDARDS

- .1 CSA Group (CSA)
 - .1 CAN/CSA-C22.2 No. 62-93(R2003), Surface Raceway Systems.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Quality assurance submittals: provide following in accordance with Section 01 45 00 - Quality Control.
 - .1 Manufacturer's Instructions: provide manufacturer's installation instructions and special handling criteria, installation sequence, cleaning procedures.
- .4 Indicate types of raceways with terminology similar to that used in this Section.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

Part 2 Products**2.1 SURFACE RACEWAY SYSTEM (WIRING PULLED IN)**

- .1 One piece steel, free of sharp edges to CAN/CSA-C22.2 No. 62.
- .2 Corners, pull boxes, elbows, tees, two piece assembly to facilitate site wiring.
- .3 Finish: ivory enamel.
- .4 Switch, receptacle, extension boxes, adapters and fittings required for complete installation.

2.2 SURFACE RACEWAY SYSTEM (WIRING LAID IN)

- .1 Two piece steel assembly CAN/CSA-C22.2 No. 62.
 - .1 Finish: ivory enamel.

- .2 Switch, receptacle, extension boxes, adapters and fittings required for complete installation.

2.3 SURFACE FLOOR RACEWAY SYSTEM

- .1 Two piece steel assembly manufactured for floor lay-in type raceway to CAN/CSA-C22.2 No. 62.
- .2 Finish: ivory enamel.

2.4 CHANNEL RACEWAY

- .1 Channel type raceway: to CAN/CSA-C22.2 No. 62, aluminum, solid perforated.

2.5 PLASTIC RACEWAY

- .1 Plastic raceway: to CAN/CSA-C22.2 No. 62, rigid extruded polyvinyl chloride with slots on either side of raceway for exit of wiring.
- .2 Channel: with solid snap-on cover throughout entire length.

2.6 LIGHTING FIXTURE RACEWAY

- .1 Fluorescent fixture support system using channel type raceway with snap-on cover.
- .2 Channel: minimum 1.6 mm thick.
- .3 Clamp hangers with threaded rod.

2.7 FITTINGS

- .1 Elbows, tees, supports, connectors couplings and fittings: to CAN/CSA-C22.2 No. 62.

Part 3 Execution

3.1 INSTALLATION

- .1 Install raceway systems as indicated and in accordance with manufacturer's instructions.
- .2 Install supports, elbows, tees, connectors, fittings, bushings, adaptors as required.
- .3 Keep number of elbows, offsets and connections to minimum.
- .4 Use wiring with mechanical protection in channel raceways.
- .5 Install barriers in raceways for different services where required by code.
- .6 Install wiring after installation of raceway system is complete.

END OF SECTION

Part 1 General**1.1 RELATED REQUIREMENTS**

- .1 Section 26 05 00.

1.2 REFERENCE STANDARDS

- .1 CSA Group (CSA)
 - .1 CAN/CSA C22.2 No. 18-98(R2020), Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware, A National Standard of Canada.
 - .2 CSA C22.2 No. 45-M1981(R2020), Rigid Metal Conduit.
 - .3 CSA C22.2 No. 56-04, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
 - .4 CSA C22.2 No. 83M1985(R2020), Electrical Metallic Tubing.
 - .5 CSA C22.2 No. 211.2-M1984(R2020), Rigid PVC (Unplasticized) Conduit.
 - .6 CAN/CSA C22.2 No. 227.3-05, Nonmetallic Mechanical Protection Tubing (NMPT), A National Standard of Canada 2020).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product data: submit manufacturer's printed product literature, specifications and datasheets.
 - .1 Submit cable manufacturing data.
- .3 Quality assurance submittals:
 - .1 Test reports: submit certified test reports.
 - .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .3 Instructions: submit manufacturer's installation instructions.

1.4 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.
- .2 Place materials defined as hazardous or toxic waste in designated containers.
- .3 Ensure emptied containers are sealed and stored safely for disposal away from children.

Part 2 Products**2.1 CABLES AND REELS**

- .1 Provide cables on reels or coils.

- .1 Mark or tag each cable and outside of each reel or coil, to indicate cable length, voltage rating, conductor size, and manufacturer's lot number and reel number.
- .2 Each coil or reel of cable to contain only one continuous cable without splices.
- .3 Identify cables for exclusively dc applications.
- .4 Reel and mark shielded cables rated 2,001 volts and above.

2.2 CONDUITS

- .1 Rigid metal conduit: to CSA C22.2 No. 45, galvanized steel threaded.
- .2 Epoxy coated conduit: to CSA C22.2 No. 45, with zinc coating and corrosion resistant epoxy finish inside and outside.
- .3 Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with couplings.
- .4 Rigid pvc conduit: to CSA C22.2 No. 211.2.
- .5 Flexible metal conduit: to CSA C22.2 No. 56, steel-liquid-tight flexible metal.
- .6 FRE conduit:
- .7 Flexible pvc conduit: to CAN/CSA-C22.2 No. 227.3.

2.3 CONDUIT FASTENINGS

- .1 One hole steel straps to secure surface conduits 50 mm and smaller.
 - .1 Two hole steel straps for conduits larger than 50 mm.
- .2 Beam clamps to secure conduits to exposed steel work.
- .3 Channel type supports for two or more conduits on centre.
- .4 Threaded rods, 6 mm diameter, to support suspended channels.

2.4 CONDUIT FITTINGS

- .1 Fittings: to CAN/CSA C22.2 No. 18, manufactured for use with conduit specified.
Coating: same as conduit.
- .2 Ensure factory "ells" where 90 degrees bends for 25 mm and larger conduits.
- .3 Watertight connectors and couplings for EMT.
 - .1 Set-screws are not acceptable.

2.5 EXPANSION FITTINGS FOR RIGID CONDUIT

- .1 Weatherproof expansion fittings with internal bonding assembly suitable for 200 mm linear expansion.
- .2 Watertight expansion fittings with integral bonding jumper suitable for linear expansion and 19 mm deflection.
- .3 Weatherproof expansion fittings for linear expansion at entry to panel.

2.6 FISH CORD

- .1 Polypropylene.

Part 3 Execution**3.1 MANUFACTURER'S INSTRUCTIONS**

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

3.2 INSTALLATION

- .1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.
- .2 Conceal conduits except in mechanical and electrical service rooms.
- .3 Surface mount conduits
- .4 Use rigid galvanized steel threaded conduit except where specified otherwise.
- .5 Use epoxy coated conduit underground.
- .6 Use electrical metallic tubing (EMT) except in cast concrete above 2.4 m not subject to mechanical injury.
- .7 Use rigid pvc conduit underground.
- .8 Use flexible metal conduit for connection to motors in dry areas, connection to recessed incandescent fixtures without prewired outlet box, connection to surface or recessed fluorescent fixtures, work in movable metal partitions.
- .9 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment in damp, wet or corrosive locations.
- .10 Use explosion proof flexible connection for connection to explosion proof motors.
- .11 Install conduit sealing fittings in hazardous areas.
 - .1 Fill with compound.
- .12 Minimum conduit size for lighting and power circuits: 19 mm.
- .13 Install rigid metal conduit from computer room branch circuit panel to outlet boxes located in sub floor.
- .14 Install rigid metal conduit from computer room branch circuit panel to junction box in sub-floor immediately below panel.
 - .1 Run flexible conduit from junction box to outlet boxes for each computer in sub-floor.
- .15 Bend conduit cold:
 - .1 Replace conduit if kinked or flattened more than 1/10th of its original diameter.
- .16 Mechanically bend steel conduit over 19 mm diameter.
- .17 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.
- .18 Install fish cord in empty conduits.
- .19 Run 2-25 mm spare conduits up to ceiling space and 2-25 mm spare conduits down to ceiling space from each flush panel.

- .1 Terminate these conduits in 152 x 152 x 102 mm junction boxes in ceiling space or in case of an exposed concrete slab, terminate each conduit in surface type box.
- .20 Remove and replace blocked conduit sections.
 - .1 Do not use liquids to clean out conduits.
- .21 Dry conduits out before installing wire.

3.3 CLEANING

- .1 Proceed in accordance with Section 01 74 00 - Cleaning.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General**1.1 RELATED REQUIREMENTS**

- .1 Section 26 05 00.

1.2 REFERENCE STANDARDS

- .1 CSA Group (CSA)
 - .1 CSA C22.2 No.26-1952(R2009), Construction and Test of Wireways, Auxiliary Gutters and Associated Fittings.

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 wireways and auxiliary gutters and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Sustainable Design Submittals:
 - .1 Construction Waste Management:
 - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.
 - .2 Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating that 75% of construction wastes were recycled or salvaged.

1.4 CLOSEOUT SUBMITTALS

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

1.5 DELIVERY, STORAGE AND HANDLING

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

- .4 Develop Construction Waste Management Plan related to Work of this.
- .5 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding and packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 19 - Waste Management and Disposal.

Part 2 Products

2.1 WIREWAYS

- .1 Wireways and fittings: to CSA C22.2 No.26.
- .2 Sheet steel with hinged cover to give uninterrupted access.
- .3 Finish: baked grey enamel in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .4 Elbows, tees, couplings and hanger fittings manufactured as accessories to wireway supplied.

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 wireways and auxiliary gutters installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

- .1 Install wireways and auxiliary gutters in accordance with manufacturer's written recommendations.
- .2 Keep number of elbows, offsets, connections to minimum.
- .3 Install supports, elbows, tees, connectors, fittings.
- .4 Install barriers where required.
- .5 Install gutter to full length of equipment.
- .6 Ground metallic wireways and gutters as required.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - 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 00 - Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

1. GENERAL**1.1 INTENT**

1. Except where otherwise specified, arrange and pay for testing, adjusting, balancing and related requirements specified herein.
2. If test results do not conform with applicable requirements, repair, replace, adjust or balance equipment and systems. Repeat testing as necessary until acceptable results are achieved.
3. Provide all labour, materials, instruments and equipment necessary to perform the tests specified.
4. All tests shall be witnessed by persons designated by the Owner, who shall also sign the test documentation.
5. Submit procedures proposed in writing for approval two (2) weeks prior to test.

1.2 RELATED WORK

1. Common Work Results - Electrical Section 26 05 00

1.3 MANUFACTURER'S PRODUCTION TEST RECORDS

1. If requested, submit copies of production test records for production tests required by EEMAC and CSA standards for manufactured electrical equipment.

1.4 SITE TESTING REPORTS

1. Log and tabulate test results on appropriate test report forms.
2. Submit forms to Consultant for approval prior to use.
3. Submit completed test report forms as specified, immediately after tests are performed.

1.5 REFERENCE DOCUMENTS

1. Perform tests in accordance with:
 1. The Contract Documents
 2. Requirements of authorities having jurisdiction
 3. Manufacturer's published instructions
 4. Applicable CSA, IEEE, IPCEA, EEMAC and ASTM standards
2. If requirements of any of the foregoing conflict, notify Consultant before proceeding with test and obtain clarification.

1.6 MANUFACTURER'S SITE SERVICES

1. Arrange and pay for the site services of approximately qualified manufacturer's representatives where site testing, adjusting, or balancing of electrical equipment or systems' performed by Manufacturer's representatives is:
 1. Specified, or
 2. Otherwise required to ensure that electrical equipment and systems are operational in full compliance with the Contract Documents

1.7 SEQUENCING AND SCHEDULING

1. Except where otherwise specified, perform all testing, adjusting, balancing and related requirements specified herein prior to Interim Acceptance of the Work.
2. Perform voltage testing and adjusting after user occupancy or utilization of facility.

2. PRODUCTS**2.1 TEST EQUIPMENT**

1. Provide all equipment and tools necessary to perform testing, adjusting and balancing specified herein and as otherwise required.

3. EXECUTION**3.1 FIRE ALARM SYSTEM TESTING - GENERAL**

1. Refer to Section 26 05 00 – Common Work Results - Electrical.
2. Consultant will be responsible for directing verification of fire alarm system installation in accordance with:
 1. CAN/ULC-S537, Standard for Verification of Fire Alarm System Installations, and
 2. Requirements of authority having jurisdiction.
3. Contractor shall be responsible for:
 1. Performing prerequisites to verification procedure; and
 2. Assisting and cooperating with Consultant in verification procedure

3.2 FIRE ALARM SYSTEM TESTING - PREREQUISITES TO VERIFICATION

1. Prior to requesting verification by Consultant, do the following:
 1. Inspect system to ensure that the following items are completely installed, connected and fully operational in accordance with requirements of the Contract Documents and Manufacturer's recommendations:
 1. Complete fire alarm system including all components thereof
 2. All fire suppression and detection devices

3. All smoke control equipment
 4. All other auxiliary equipment connected to fire alarm system
2. Ensure that any subsequent work remaining to be performed on the above-noted items will not invalidate examinations and tests performed during verification procedures.
3. Ensure that operation and maintenance data has been submitted.
4. Ensure that spare parts and maintenance materials have been delivered.
2. Submit written request to Consultant for verification, certifying that the above prerequisites have been fulfilled and specifying known exceptions in the form of a list of items to be completed, corrected or submitted.
3. Consultant will, within two (2) weeks after receipt of written request:
 1. Proceed with verification, or
 2. Advise contractor that prerequisites are not adequately fulfilled

3.3 FIRE ALARM SYSTEM TESTING - VERIFICATION

1. The contractor and manufacturer shall assist and cooperate with Consultant in verification procedure. The contractor shall provide and pay for the following:
 1. Provide the following equipment:
 1. Voltmeter
 2. Sound pressure level meter
 3. Smoke generator or aerosol test smoke
 4. Four (4) portable communication devices
 5. Scaffolding and ladders
 2. Arrange and ensure that the following parties are present at all times during verification procedures:
 1. Electrical Subcontractor
 2. Fire alarm system manufacturer's representative
 3. Disassemble and reassemble system components
 4. Disconnect and reconnect wiring
 5. Perform required field adjustments
 6. Repair defective work and replace defective components
 7. Perform all work and tests on system required by verification procedure.
2. Do not proceed with verification unless Consultant's representative responsible for directing verification procedure is present.

3.4 LOAD BALANCE TESTING

1. Perform load tests when as many loads as possible, prior to Interim Acceptance of the Work, are operable.
2. Turn on all possible loads.
3. Test load balance on all feeders at distribution centres, motor control centre and panelboards.

4. If load balance exceeds 15%, reconnect circuits to balance loads.
5. Check loads over 48 hour period on both main 13.2 kV transformers and advise consultant of results.

3.5 VOLTAGE TESTING AND ADJUSTING

1. Test voltage at all panelboards.
2. Test voltage at motor control centre.
3. Adjust transformer tap settings to compensate for under-voltage or over-voltage conditions, if directed to do so by Consultant.

3.6 TESTING OF TRANSFORMER

1. Each new transformer shall be completely factory tested and the results certified, proving the performance of the units to provide capacities as listed in these specifications.
2. Submittals
 1. Submit for review, shop drawings of all items specified in this section in accordance with "Shop Drawings" in the General Conditions.
 2. At completion of work the prior to final acceptance, provide maintenance manuals for all items specified in this section.
3. Site Testing
 1. Perform ratio test for all transformer tap positions.
 2. After the connection of line, load, control and alarm wiring, but prior to energizing, the calibration and verification firm is to inspect the installation and confirm the following:
 1. That the transformer has been properly cleaned, is dry and free of foreign materials and contaminants and otherwise is suited for energizing.
 2. That all bus and connector bolts have been installed, tightened, torqued properly, and uninsulated surfaces of connectors and buses have been taped.
 3. That transformer taps have been set to provide the secondary voltage required.
 4. That all insulators are in perfect condition, without cracks, chips or surface contaminants.
 5. That core, coil, terminal boards, bushings and all insulated surfaces have not been damaged.
 6. That the forced cooling fans (if fitted) are functioning and that the power supply circuits to the fans have been properly connected and protected.
 7. That all alarm and indicating devices are operating correctly, are properly connected either internally and externally from the terminal of the instrument to the external system.
 3. Any other tests or inspections deemed necessary or appropriate by the manufacturer.

3.7 COORDINATION AND SHORT CIRCUIT STUDY

1. Provide a coordination/protective system study and short circuit study of all equipment specified herein and submit for review.
 1. Include the following:
 1. Overcurrent and fault protection devices;
 2. Primary and 600V cable thermal damage curves;
 3. 600V circuit breaker overcurrent, overload and ground fault devices;
 4. 347/600 and 120/208V panelboards, MCC's connecting feeder cables and bus duct;
 5. Any additional data necessary for successful completion of the coordination and short circuit study.
 2. Data shall clearly state the operating time in cycles of each breaker and indicate whether the time current curves for relays are inclusive of breaker tripping time or otherwise.
 3. Prepare a summation chart showing all ratings and settings with easy reference to the appropriate curve.
 4. Symmetrical and asymmetrical fault current calculations shall be submitted to verify the correct choice of the protective elements of the System.
 5. Prepare a systems single line diagram on which the resultant short circuit values, device number and ratings are shown.
2. Qualifications
 1. This study shall be performed by and bear the stamp of the Professional Engineer registered in the Province of Alberta.
3. Submittals
 1. Submit the complete study for review prior to carrying out calibration and verification.
4. Tripping Devices
 1. Relay styles, plug settings, CT ratios, circuit breaker sizes and fuse sizes have been selected on a preliminary basis for design purposes. Final selection shall be based on the results of this study and shall be included at no extra cost.
5. Execution
 1. Provide the 600V equipment supplier with all relevant data for equipment not provided by the supplier.

3.8 CALIBRATION AND VERIFICATION

1. Description

1. Calibrate and verify the following equipment items supplied under this contract:
 1. 600V/347V equipment
 2. 208/120V equipment
2. The calibration and Verification shall be carried out in the field after installation and connection of equipment, but prior to energization, in the presence of the Owner and the Consultant.
3. Submittals
 1. Submit details of all test procedures and instruments, together with technician's names, to the Consultant, prior to proceeding.
 2. Submit written verification report after installation is completed to reflect as-built conditions.
4. Qualification
 1. Work shall be performed by a firm specializing in and with relevant experience in testing 13.2 kV and 600V switchgear and protective relaying.
 2. This firm shall also perform the final checkout and testing of the equipment specified in Item 3.13 of this Section.
5. Products
 1. Not applicable.
6. Calibration and Verification
 1. The calibration and verification shall be carried out in the following stages:
 1. 600 V switchgear
 2. 600/347V equipment
 3. 208/120 V equipment
 2. The Electrical Contractor shall advise well in advance when each stage is ready for the calibration and verification and he shall:
 1. Ensure that all equipment is installed, connected and cleaned inside and out.
 2. The electrical rooms are cleaned and are adequately illuminated and heated.
 3. Provide 120V convenience receptacles.
 4. Provide one qualified electrician to assist in the calibration and verification.
 5. Provide all other facilities, equipment and personnel as reasonably required to assist in the calibration and verification.
 3. For each circuit breaker, calibrate all protective relays and overcurrent device time and instantaneous trips in accordance with requirements of the protected equipment and overall coordination scheme. Field set each relay according to the recommend settings.

4. Verify all transformer ratios, insulation values, fuse sizes, C.T. and P.T. ratios, etc. and certify that the installation is in accordance with the requirements of the manufacturer and the Coordination/Short Circuit Study. Submit a written report on this verification to the Consultant.
5. Carry out the tests required of calibration and verification firm as specified in the other related sections.
6. Ensure all bus and cable connections are tightened to manufacturer's specifications.
7. All relays are to be cleaned with dry, dust free compressed air.

END OF SECTION

Part 1 General**1.1 RELATED REQUIREMENTS**

- .1 Section 26 05 00.

1.2 REFERENCE STANDARDS

- .1 CSA Group (CSA)
 - .1 CSA C22.2 No.42-10, General Use Receptacles, Attachment Plugs and Similar Devices.
 - .2 CAN/CSA C22.2 No.42.1-00(R2009), Cover Plates for Flush-Mounted Wiring Devices (Bi-national standard, with UL 514D).
 - .3 CSA C22.2 No.55-M1986(R2008), Special Use Switches.
 - .4 CSA C22.2 No.111-10, General-Use Snap Switches (Bi-national standard, with UL 20).

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 wiring devices and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Alberta, Canada.
 - .1 Indicate on drawings:
- .4 Sustainable Design Submittals:
 - .1 Construction Waste Management:
 - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.
 - .2 Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating that 75% of construction wastes were recycled or salvaged.

1.4 CLOSEOUT SUBMITTALS

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

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect wiring devices from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Develop Construction Waste Management Plan related to Work of this Section.
- .5 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 19 - Waste Management and Disposal.

Part 2 Products

2.1 SWITCHES

- .1 120 V, single pole, double pole, three-way, four-way switches to: CSA C22.2 No.55 and CSA C22.2 No.111.
- .2 Manually-operated general purpose AC switches with following features:
 - .1 Terminal holes approved for No. 10 AWG wire.
 - .2 Silver alloy contacts.
 - .3 Urea or melamine moulding for parts subject to carbon tracking.
 - .4 Suitable for back and side wiring.
 - .5 Ivory toggle.
- .3 Toggle operated fully rated for tungsten filament and fluorescent lamps, and up to 80% of rated capacity of motor loads and heating loads.
- .4 Switches of one manufacturer throughout project.

2.2 RECEPTACLES

- .1 Duplex receptacles, CSA type 5-15 R, 125 V, 15 A, U ground, to: CSA C22.2 No.42 with following features:
 - .1 Ivory urea moulded housing.
 - .2 Suitable for No. 10 AWG for back and side wiring.
 - .3 Break-off links for use as split receptacles.
 - .4 Eight back wired entrances, four side wiring screws.
 - .5 Triple wipe contacts and rivetted grounding contacts.
- .2 Single receptacles CSA type 5-15 R, 125 V, 15 A, U ground with following features:
 - .1 Ivory urea moulded housing.
 - .2 Suitable for No. 10 AWG for back and side wiring.

- .3 Four back wired entrances, 2 side wiring screws.
- .3 Other receptacles with ampacity and voltage as indicated.
- .4 Receptacles of one manufacturer throughout project.

2.3 SPECIAL WIRING DEVICES

- .1 Special wiring devices:
 - .1 Clock hanger outlets, 15 A, 125 V, 3 wire, grounding type, suitable for No. 10 AWG for installation in flush outlet box.
 - .2 Electric shaver outlets, 15 A, 125 V, AC with 20 VA isolating transformer with stainless steel cover plate marked RAZOR ONLY and RASOIR SEULEMENT.
 - .3 Pilot lights as indicated, with neon type 0.04 W, 125 V lamp and red plastic lense flush type.

2.4 WIRING DEVICES FOR COMPUTER ROOMS

2.5 COVER PLATES

- .1 Cover plates for wiring devices to: CSA C22.2 No.42.1.
- .2 Sheet steel utility box cover for wiring devices installed in surface-mounted utility boxes.
- .3 Stainless steel, vertically brushed, 1 mm thick cover plates ivory cover plates, thickness 2.5 mm for wiring devices mounted in flush-mounted outlet box.
- .4 Sheet metal 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 cast aluminum cover plates complete with gaskets for single receptacles or switches.

2.6 SOURCE QUALITY CONTROL

- .1 Cover plates from one manufacturer throughout project.

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 wiring devices installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

- .1 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 for Electrical as indicated.
- .2 Receptacles:
 - .1 Install receptacles in gang type outlet box when more than one receptacle is required in one location.
 - .2 Mount receptacles at height in accordance with Section 26 05 00 - Common Work Results for Electrical as indicated.
 - .3 Where split receptacle has one portion switched, mount vertically and switch upper portion.
 - .4 Install GFI type receptacles as indicated.
- .3 Cover plates:
 - .1 Install suitable common cover plates where wiring devices are grouped.
 - .2 Do not use cover plates meant for flush outlet boxes on surface-mounted boxes.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - 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 00 - Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.4 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Protect stainless steel cover plate finish with paper or plastic film until painting and other work is finished.
- .3 Repair damage to adjacent materials caused by wiring device installation.

END OF SECTION

Part 1 General**1.1 RELATED REQUIREMENTS**

- .1 Section 26 05 00.

1.2 PAYMENT

- .1 Payment for field testing of ground fault equipment performed by Contractor in accordance with Section 01 29 83 - Payment Procedures: Testing Laboratory Services.

1.3 REFERENCE STANDARDS

- .1 CSA Group (CSA)
 - .1 CAN/CSA C22.2 No.144-M91(R2006), Ground Fault Circuit Interrupters.
- .2 National Electrical Manufacturers Association (NEMA)
 - .1 NEMA PG 2.2-1999(R2009), Application Guide for Ground Fault Protection Devices for Equipment.

1.4 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 ground fault circuit interrupters and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Alberta, Canada.
- .4 Test and Evaluation Reports: submit test report for field testing of ground fault equipment to Departmental Representative and certificate that system as installed meets criteria specified.
- .5 Sustainable Design Submittals:
 - .1 Construction Waste Management:
 - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.
 - .2 Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating that 75% of construction wastes were recycled or salvaged.

1.5 CLOSEOUT SUBMITTALS

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

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect ground fault circuit interrupters from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Develop Construction Waste Management Plan related to Work of this Section.
- .5 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 19 - Waste Management and Disposal.

Part 2 Products**2.1 MATERIALS**

- .1 Equipment and components for ground fault circuit interrupters (GFCI): to CAN/CSA C22.2 No.144, NEMA PG 2.2.
- .2 Components comprising ground fault protective system to be of same manufacturer.

2.2 BREAKER TYPE GROUND FAULT INTERRUPTER

- .1 Single pole ground fault circuit interrupter for 20A, 120 V, 1 phase circuit c/w test and reset facilities.

2.3 GROUND FAULT LIFE PROTECTOR

- .1 20 A, 2 pole circuit breaker to supply power to mains of 20 A, 208 V, 2 phase panel and complete with:
 - .1 Automatic shunt trip breaker.
 - .2 Zero sequence current sensor.
 - .3 Facilities for testing and reset.
 - .4 CSA Enclosure 3, surface mounted.
 - .5 Ground fault trip indicator light.

2.4 GROUND FAULT PROTECTOR UNIT

- .1 Self-contained with 15 A, 120 V circuit interrupter and duplex receptacle complete with:
 - .1 Solid state ground sensing device.
 - .2 Facility for testing and reset.
 - .3 CSA Enclosure 1, flush mounted with stainless steel face plate.

2.5 SYSTEM GROUND FAULT PROTECTION PANEL

- .1 Self-contained panel suitable for 208V, 3 phase, 4 wire, grounded supply. Panel to have following features:
 - .1 Automatic 225 A breaker with shunt trip.
 - .2 Ground fault relay factory set at 10 mA with inverse time delay characteristics from pick-up 1 s to 0.025 s.
 - .3 Zero sequence current sensor.
 - .4 Provision for testing and reset.
 - .5 CSA Enclosure 1, flush mounted.
 - .6 Ground fault trip indicating light.
 - .7 Resistor type fused artificial neutral.

2.6 PUMP PROTECTION PANEL

- .1 Ground fault personnel protection panel for pump circuits rated for 20 hp at 208 V, 50 hp at 600 V, 3 phase grounded supply with following features:
 - .1 Test button, ground indicator light, reset button.
 - .2 Line and load terminal blocks and control terminal block for wiring to starter control.
 - .3 Unit sensitivity: 10 mA.
 - .4 CSA Enclosure 1, surface mounted.
 - .5 Contact rating: 5 A, 120 V, 60 Hz.
 - .6 Fused resistive type artificial neutral.

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 ground fault circuit interrupters installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

- .1 Do 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.

3.3 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical and co-ordinate with Section 01 45 00 - Quality Control if required.
- .2 Arrange for field testing of ground fault equipment by ground fault equipment manufacturer before commissioning service.
- .3 Demonstrate simulated ground fault tests.

3.4 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - 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 00 - Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General**1.1 RELATED REQUIREMENTS**

- .1 Section 26 05 00.

1.2 REFERENCE STANDARDS

- .1 American National Standards Institute (ANSI)
 - .1 ANSI C82.1-04, Lamp Ballasts-Line Frequency Fluorescent Lamp Ballast.
 - .2 ANSI C82.4-02(R2007), Ballasts for High-Intensity-Discharge and Low-Pressure Sodium Lamps Multi Supply Type.
- .2 American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE)
 - .1 ANSI/IEEE C62.41-1991, Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits.
- .3 ASTM International Inc.
 - .1 ASTM F1137-00(2006), Standard Specification for Phosphate/Oil and Phosphate/Organic Corrosion Protective Coatings for Fasteners.
- .4 CSA Group (CSA)
- .5 ICES-005-07, Radio Frequency Lighting Devices.
- .6 Underwriters' Laboratories of Canada (ULC)

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Provide complete photometric data prepared by independent testing laboratory for luminaires where specified, for approval by Departmental Representative.
 - .3 Photometric data to include: VCP Table where applicable.
- .3 Samples:
 - .1 Provide samples as indicated. Install sample fixtures, design in mock-up ceiling. Include cost of mock-up in project price. Locate mock-up on site.
- .4 Quality assurance submittals: provide following in accordance with Section 01 45 00 - Quality Control.
 - .1 Manufacturer's instructions: provide manufacturer's written installation instructions and special handling criteria, installation sequence, cleaning procedures.

1.4 QUALITY ASSURANCE

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

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .3 Packaging Waste Management: remove for reuse and return by manufacturer of pallets crates padding and packaging materials in accordance with Section 01 74 19 - Waste Management and Disposal.
- .4 Divert unused metal materials from landfill to metal recycling facility.
- .5 Disposal and recycling of fluorescent lamps as per local regulations.
- .6 Disposal of old PCB filled ballasts.

Part 2 Products**2.1 LAMPS**

- .1 Re-use all existing lighting fixture.
- .2 Contractor to check all lighting fixtures functional. All fluorescent or LED lamps shall be by one manufacturer. All coated metal halide lamps shall be by one manufacturer.
- .3 Fluorescent lamps to be rapid-start, 4100 K, 30,000 hour lamp life, CRI 80; or as indicated.

2.2 BALLASTS

- .1 Fluorescent ballast: CBM and CSA certified, energy efficient type, IC electronic.
 - .1 Rating: voltage as indicated, for use rapid start lamps.
 - .2 Totally encased and designed for 40 degrees Celsius ambient temperature.
 - .3 Power factor: minimum 95% with 95% of rated lamp lumens.
 - .4 Current crest factor: maximum.
 - .5 Harmonics: 10% maximum THD.
 - .6 Operating frequency of electronic ballast: 20 kHz minimum.
 - .7 Total circuit power: 62 Watts.
 - .8 Ballast factor: greater than 0.90.
 - .9 Sound rated: Class A.
 - .10 Mounting: integral with luminaire.

2.3 FINISHES

- .1 Light fixture finish and construction to meet ULC listing and CSA certification related to intended installation.

2.4 OPTICAL CONTROL DEVICES

- .1 As indicated in luminaire schedule.

2.5 LUMINAIRES SCHEDULE AND REQUIREMENTS

- .1 Refer to drawings for luminaires schedule. The general requirements and features of the products are as listed on the product description.
- .2 All fixtures will also be required to meet the testing and documentation requirements as described below. Include for additional testing in accordance with the referenced IES standards if required.
- .3 All linear luminaires to have photometric data in accordance with IES LM-79 “Electrical and Photometric Measurements of Solid State Lighting Products”.
- .4 The LED’s to be tested and have test results in accordance with IES LM-80 “Measuring Lumen Maintenance of LED Light Sources”.
- .5 Lumen maintenance as per IES TM-21-11 “Projecting Long Term Lumen Maintenance of LED Light Sources “to be minimum of 60,000 hours at L70.
- .6 The luminaire must have replaceable drivers and LED arrays. For recessed fixtures, they must be serviceable from below.
- .7 Luminous efficacy of the source to be a minimum of 85 lumens per watt, delivered fixture lumens.
- .8 Provide 2 spare drivers of each different type of driver on the project at project completion.

Part 3 Execution**3.1 INSTALLATION**

- .1 Install fixtures in accordance with manufacturer's requirements, code requirements, and as shown on drawings.
- .2 Confirm compatibility and interface of other materials with luminaire and ceiling systems. Examine room finish schedule and reflected ceiling drawings. Report discrepancies and defer ordering until clarified.
- .3 Supply plaster frames, trim rings and back boxes to other trades as work requires.
- .4 Ground lighting equipment to metal raceway, armour of armoured cable, or to a separate grounding conductor.
- .5 Co-ordinate with other trades to avoid conflicts between luminaires, supports and fittings and mechanical and structural equipment.
- .6 Provide guards where fixtures are subject to mechanical damage.

3.2 WIRING

- .1 Connect luminaires to lighting circuits:
 - .1 Install flexible or rigid conduit for luminaires as indicated.

3.3 LUMINAIRE SUPPORTS

- .1 For suspended ceiling installations support luminaires independently of ceiling.

3.4 LUMINAIRE ALIGNMENT

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

3.5 CLEANING

- .1 Clean in accordance with Section 01 74 00 - Cleaning.
 - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.
- .2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

END OF SECTION

Part 1 General**1.1 RELATED REQUIREMENTS**

- .1 Section 26 05 00.

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 communications equipment and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Sustainable Design Submittals:
 - .1 Construction Waste Management:
 - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.
 - .2 Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating that 75% of construction wastes were recycled or salvaged.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect communications equipment from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Develop Construction Waste Management Plan related to Work of this Section.
- .5 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 19 - Waste Management and Disposal.

Part 2 Products**2.1 TELEPHONE WIRE**

- .1 Heavy duty drop wire: 2No. 16 AWG solid hard drawn copper, lead coated, brass plated conductors with styrene butadiene rubber insulation, neoprene jacket twisted in to pair designed to connect open wire line to cable terminals.
- .2 Service wire: 4 No. 22 AWG solid annealed copper conductors with polyethylene insulation, spiral four lay-up, inner jacket polyvinyl chloride, close serving of flat galvanized steel wire armour, outer jacket of polyvinyl chloride designed for buried service connections.
- .3 Underground wire: 2 No.19 AWG solid annealed copper conductors laid parallel, polyethylene insulation, close serving of flat galvanized steel wire armour, jacket of polyvinyl chloride designed for buried service connections.
- .4 Ground wire: 1 No. 6 AWG stranded annealed copper conductor with polyvinyl chloride insulation designed for ground connections to protect cable terminals and protectors.

2.2 COAXIAL CABLES FOR TELEVISION CABLE SYSTEMS

- .1 Semi-air-dielectric coaxial cable: centre conductor No.10 AWG solid copper, insulation of polyethylene discs 2.16 mm thick, spaced 25 mm apart, outer conductor of longitudinal interlocking copper tape 0.30 mm thick, rated impedance 75 ohms shield of two spiral steel reinforcing tapes and protective covering of:
 - .1 Longitudinal aluminum tape sealed to medium density polyethylene jacket designed for main feeder used in ducts.
 - .2 Inner jacket of polyethylene, aluminum tape applied longitudinally, corrugated steel tape overlapped and soldered, flooding compound and outer jacket of polyethylene designed for main feeder used for installation in ducts.
- .2 Foam-dielectric coaxial cable: centre conductor No.7 AWG solid copper, insulation of foam expanded polyethylene and outer conductor of aluminum, rated impedance 75 ohms designed as main feeder cable for CATV system with protective covering of viscous adhesive flooding compound and medium density polyethylene sheath is suitable for in duct aerial locations that are damp.
- .3 Foam-dielectric coaxial cable designed for distribution cable in CATV system: center conductor No. 10 AWG solid copper, insulation of foam (expanded) polyethylene and outer conductor of aluminum with covering of viscous flooding compound and medium density polyethylene sheath is suitable for in ducts aerially in damp corrosive locations.
- .4 Coaxial drop wire: centre conductor No. 16AWG copper-covered steel, polypropylene foam insulation, medium density polyethylene skin, two longitudinal drain wires for shielding continuity, outer conductor and shield of polyolefin-coated aluminum tape, and outer jacket of polyvinyl chloride, designed for use between distribution cables and building.
- .5 Inner jacket of polyethylene, covered by 1% lead antimony jacket designed for ducts.

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 communications equipment installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

- .1 Install telephone wires on pole line by:
 - .1 Stringing conductors over cross arms.
 - .2 Fasten conductors to insulators on first pole.
 - .3 Tighten conductors to achieve correct sag.
 - .4 Fasten conductors progressively to insulators on poles until last pole in run is reached.
- .2 Install telephone drop wires from pole lines to buildings using drop wire hooks and cable clamps at pole and at building.
- .3 Install aerial armoured cables on pole lines by:
 - .1 Anchoring cable to first pole.
 - .2 Stringing cable along pole line.
 - .3 Tightening cable to achieve correct sag using pulling eyes to protect outer sheath.
 - .4 Anchoring cable progressively to each pole until last pole is reached.
- .4 Install armoured cables by direct burial using:
 - .1 Cable plow.
 - .2 Trench.
- .5 Install armoured cables in ducts using pulling eyes to protect outer sheath.
- .6 Install light wire armoured cable across stream.
- .7 Install telephone ground wires from pedestals and protectors.
- .8 Install coaxial drop wire from terminal block on pole to building, as indicated, using drop wire hooks and cable clamps at pole and at building.
- .9 Install composite video cables:
 - .1 On pole lines by anchoring cable to first pole, stringing cable along pole line, tightening cable to achieve correct sag using pulling eyes to protect outer sheath, and anchoring cable to each pole until last pole is reached.
 - .2 By direct burial in trench.
 - .3 In ducts using pulling eyes to protect outer sheath.

3.3 CLEANING

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- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - 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 00 - Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.4 PROTECTION

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

END OF SECTION

Part 1 General**1.1 RELATED REQUIREMENTS**

- .1 Section 26 05 00.

1.2 REFERENCE STANDARDS

- .1 American National Standards Institute/Telecommunications Industry Association (ANSI/TIA)
 - .1 ANSI/TIA-568-C.0-1-2010, Generic Telecommunications Cabling for Customer Premises.
 - .2 ANSI/TIA-568-C.1-2009, Commercial Building Telecommunications Cabling Standard.
 - .3 ANSI/TIA-568-C.3-2008, Optical Fiber Cabling Components Standard.
 - .4 ANSI/TIA-569-B-2004, Commercial Building Standard for Telecommunications Pathways and Spaces.
- .2 CSA Group (CSA)
 - .1 CSA C22.2 No.214-08, Communications Cables (Bi-national standard, with UL 444).

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 connectors and conductors and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Sustainable Design Submittals:
 - .1 Construction Waste Management:
 - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.
 - .2 Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating that 75% of construction wastes were recycled or salvaged.

1.4 DELIVERY, STORAGE AND HANDLING

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

- .1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Store and protect connectors and conductors from nicks, scratches, and blemishes.
- .3 Replace defective or damaged materials with new.
- .4 Develop Construction Waste Management Plan related to Work of this Section.
- .5 Packaging Waste Management: remove for reuse and return by manufacturer of pallets. Crates, padding, and packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 19 - Waste Management and Disposal.

Part 2 Products

2.1 DESIGN REQUIREMENTS

- .1 Entrance facility: to ANSI/TIA-568-C.0-1, ANSI/TIA-568-C.1, ANSI/TIA-568-C.3, ANSI/TIA-569-B and CSA C22.2 No.214.

2.2 UNDERGROUND TELEPHONE CABLE TERMINALS

- .1 Buried cable terminal for buried cables: base plate, cylindrical weatherproof housing, approximately 305 x 460 x 610 mm, terminal strips with binding posts and connectors.
- .2 Cable terminals for buried cables at reel ends: basic terminal designed to be driven into ground, weatherproof cover approximately 1015 mm from base to top, 2 pair terminal blocks as required, ground clamps and adhesive "ATTENTION" signs and numerals to identify cable circuits.

2.3 COAXIAL CABLE TERMINAL

- .1 Outer connector nut, inside threaded, sliding over body of terminal.
- .2 Terminal body, inside threaded, designed to screw on to outer sheath of cable.

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 connectors and conductors installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

TERMINALS AND CONNECTORS FOR COMMUNICATIONS
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- .1 Install drop cable terminals inside in accordance with manufacturer's instructions. Connect drop cable conductors to terminals and run ground conductor from ground terminal to building electrical system ground.
- .2 Install buried cable terminals. Connect conductors in accordance with manufacturer's instructions. Replace weatherproof housing.
- .3 Drive Z wire terminals into ground until base is flush with ground surface. Install cable, fasten to ground clamps and connect to terminal blocks in accordance with manufacturer's instructions.
- .4 Install coaxial cable terminals in accordance with manufacturer's instructions.
- .5 Install optical fibre terminals in accordance with manufacturer's instructions.

3.3 INSTALLATION OF TELEPHONE CABLES ENTRANCE

- .1 Colour match conductors on terminal strips to telephone authority standard.
- .2 Use appropriate tool for connecting conductors to terminals.

3.4 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - 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 00 - Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.5 PROTECTION

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

END OF SECTION

Part 1 General**1.1 SUMMARY**

- .1 Section Includes:
 - .1 Materials and installation for fire alarm systems.
 - .2 Trouble signal devices.
 - .3 Manual alarm stations.
 - .4 Automatic alarm initiating devices.
 - .5 Audible signal devices.
 - .6 End-of-line devices.
 - .7 Annunciators.
 - .8 Visual alarm signal devices.
 - .9 Ancillary devices.
 - .10 Sustainable requirements for construction and verification.
- .2 Related Requirements
 - .1 Section 26 05 00.

1.2 REFERENCE STANDARDS

- .1 Government of Canada
 - .1 TB OSH Chapter 3-03, 1997-01-28, Treasury Board of Canada, Occupational Safety and Health, Chapter 3-03, Standard for Fire protection Electronic Data Processing Equipment.
 - .2 TB OSH Chapter 3-04, 1994-12-22, Treasury Board of Canada, Occupational Safety and Health, Chapter 3-04, Standard for Fire Alarm Systems.
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Safety Data Sheets (SDS).
- .3 National Fire Protection Agency
 - .1 NFPA 72-2002, National Fire Alarm Code.
 - .2 NFPA 90A-2002, Installation of Air Conditioning and Ventilating Systems.
- .4 National Research Council Canada (NRC)
 - .1 National Building Code of Canada 2015 (NBC).
- .5 Underwriter's Laboratories of Canada (ULC)
 - .1 CAN/ULC-S524-2014, Standard for the Installation of Fire Alarm Systems.
 - .2 CAN/ULC-S525-2016, Audible Signal Device for Fire Alarm Systems.
 - .3 CAN/ULC-S526-2016, Visual Signal Devices for Fire Alarm Systems.
 - .4 CAN/ULC-S527-2019, Control Units.
 - .5 CAN/ULC-S528-2014, Manual Pull Stations for Fire Alarm Systems.

- .6 CAN/ULC-S529-2016, Smoke Detectors for Fire Alarm Systems.
- .7 CAN/ULC-S530-M199, Heat Actuated Fire Detectors for Fire Alarm Systems.
- .8 CAN/ULC-S531-2019, Standard for Smoke Alarms.
- .9 CAN/ULC-S536-S537-2013, Burglar and Fire Alarm Systems and Components.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Safety Data Sheets (SDS) in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Shop Drawings:
 - .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 Shop drawings: stamped and signed by professional engineer registered or licensed in Province of Alberta, Canada.
 - .2 Include:
 - .1 Layout of equipment.
 - .2 Zoning.
 - .3 Complete wiring diagram, including schematics of modules.
- .3 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .2 Instructions: submit manufacturer's installation instructions.
 - .3 Manufacturer's Field Reports: manufacturer's field reports specified.
- .4 Closeout Submittals:
 - .1 Submit maintenance and engineering data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals in accordance with ANSI/NFPA 20.
 - .2 Authority of Jurisdiction will delegate authority for review and approval of submittals required by this Section.
 - .3 Submit to Authority of Jurisdiction 2 sets of approved submittals and drawings immediately after approval but no later than 15 working days to prior to final inspection.
 - .4 Submit following:
 - .1 Manufacturer's Data for:
 - .2 System wiring diagrams:
 - .3 Design data: Power Calculations:
 - .4 Instructions for operation:
 - .5 Schedules:

.6 Test Reports:

1.4 QUALITY ASSURANCE

.1 Qualifications:

.1 Installer: company or person specializing in fire alarm system installations with 5-years documented experience approved by manufacturer.

.2 Provide services of representative or technician from manufacturer of system, experienced in installation and operation of type of system being provided, to supervise installation, adjustment, preliminary testing, and final testing of system and to provide instruction to project personnel.

.3 System:

.1 To TB OSH Chapter 3-04.

.2 Subject to Fire Commissioner of Canada (FC) approval.

.3 Subject to FC inspection for final acceptance.

.4 To Canadian Forces Fire Marshal approval.

.4 System shall be verified in accordance with CAN/ULC-S537.

.5 Contractor responsible for retaining a Professional Engineer of Alberta sealed F.A. Verification Certificate from an independent agency as per ABC requirements. Include a P.C. sum of \$2,500 for attendance to a professional engineer.

.6 Extra Materials:

.1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.

.2 Include:

.1 glass rods for manual pull box stations if applicable.

.7 Maintenance Service:

.1 Provide one year's free maintenance with two inspections by manufacturer during warranty period. Inspection tests to conform to CAN/ULC-S536. Submit inspection report to Departmental Representative.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling and unloading:

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

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

.2 Waste Management and Disposal:

.1 Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

Part 2 Products**2.1 SUSTAINABLE REQUIREMENTS**

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

2.2 MATERIALS

- .1 Equipment and devices: ULC listed and labelled and supplied by single manufacturer.
- .2 Power supply: to CAN/ULC-S524.
- .3 Audible signal devices: to CAN/ULC-S525.
- .4 Visual signal devices: to CAN/ULC-S526.
- .5 Control unit: to CAN/ULC-S527.
- .6 Manual pull stations: to CAN/ULC-S528.
- .7 Thermal detectors: to CAN/ULC-S530.
- .8 Smoke detectors: to CAN/ULC-S529.
- .9 Smoke alarms: to CAN/ULC-S531.

2.3 SYSTEM OPERATION

- .1 Provide complete, electrically supervised, code 3 temporal common coded, manual and automatic, zoned, annunciated, fire alarm system.
- .2 Provide separate circuits from control panel to each zone of initiating devices. Transmission of signals from more than one zone over common circuit to control panel is prohibited.
- .3 Operation of alarm initiating device on second stage to:
 - .1 Cause audible signal devices throughout building to sound continuously.
- .4 Capability to program smoke detector status change confirmation on any or zones in accordance with CAN/ULC-S527, Appendix C.

2.4 MANUAL ALARM STATIONS

- .1 Provide non-coded single action type with mechanical reset features.
 - .1 Non-coded single pole normally open contact for single stage.
 - .2 General alarm key switch for two stage system.
- .2 Stations: surface mounted and interior type as indicated.
 - .1 For surface mounting provide station manufacturer's approved back box.
 - .2 Back box finish to match station finish.
- .3 Equip each station with terminal strip with contacts of proper number and type to perform functions required.
- .4 Stations: type not subject to operation by jarring or vibration.

- .1 Break-glass-front stations are not permitted; pull-lever break-rod type is acceptable provided presence of rod is not required to reset station.
- .5 Station colour: red.
- .6 Provide station with visible indication of operation.
- .7 Restoration to require use of key.
 - .1 Keys: identical throughout system for stations and control panel(s).
- .8 Mount stations with operating lever not more than 1.2 m above finished floor.
- .9 Where weatherproof stations are required, provide stations with cast metal, weatherproof housings with hinged access doors.
 - .1 Finish housings with red enamel paint and provide permanently affixed English signage indicating "FIRE ALARM" with white letters of 19 mm high.

2.5 AUTOMATIC ALARM INITIATING DEVICES

- .1 Heat detectors: provide heat detectors designed for detection of fire by rate compensating principle.
- .2 Combination Fixed Temperature Rate-Of-Rise Detectors (Spot Type): designed for outlet box mounting and supported independently of conduit, tubing or wiring connections.
 - .1 Contacts: self-resetting after response to rate-of-rise actuation
 - .2 Operation under fixed temperature actuation to result in external indication.
 - .3 Detector units located in boiler rooms, showers, or other areas subject to abnormal temperature changes to operate on fixed temperature principle only.
- .3 Rate Compensating Detector (Spot Type): designed for surface outlet box mounting and supported independently of conduit, tubing or wiring connections.
 - .1 Detectors: hermetically sealed and automatically resetting type which will operate when ambient air temperature reaches detector setting regardless of rate of temperature rise.
 - .2 Detector operation: not be subject to thermal time lag.
- .4 Line-Type Fixed Temperature Detectors: provide thermostatic or thermistor line-type heat detection cable with weather-resistant outer covering where indicated.
 - .1 Cable: nominally rated for temperature of 88 degrees C and operate on fixed temperature principle.
- .5 Open-Area Smoke Detectors: provide detectors designed for detection of abnormal smoke densities by photoelectric principle.
 - .1 Detectors: 4-wire type.
 - .2 Provide necessary control and power modules required for operation integral with control panel.
 - .3 Detectors and associated modules: compatible with control panel and suitable for use in supervised circuit.
 - .4 Malfunction of electrical circuits to detector or its control or power units to result in operation of system trouble signals.

- .5 Equip each detector with visible indicator lamp that will flash when detector is in normal standby mode and glow continuously when detector is activated.
- .6 Provide remote indicator lamps for each detector that is located above suspended ceilings.
- .7 Each detector: plug-in type with tab-lock or twist-lock, quick disconnect head and separate base in which detector base contains screw terminals for making wiring connections.
- .8 Detector head: removable from its base without disconnecting wires. Removal of detector head from its base to cause activation of system trouble signals.
- .9 Screen each detector to prevent entrance of insects into detection chamber(s).
- .6 4-Wire Smoke Detectors: detector circuits 4-wire type capable of transmitting detector operating power over conductors separate from initiating circuit.
 - .1 Provide separate, power circuit for each smoke detection initiating circuit (zone).
 - .2 Failure of power circuit to be indicated as trouble condition on corresponding initiating circuit.
- .7 2-Wire Smoke Detectors: detector circuits of 2-wire type capable of transmitting detector operating power over initiating circuit are permitted, provided detectors used are approved by control panel manufacturer for use with control panel provided and are ULC listed as being compatible with control panel.
 - .1 Total number of detectors on any detection circuit: not exceed 80% of maximum number of detectors allowed by control panel manufacturer for that circuit.
Provide additional zones if required to meet this requirement.
- .8 Ionization Detectors: multiple chamber type responsive to both invisible and visible particles of combustion.
 - .1 Detectors: not susceptible to operation by changes in relative humidity.
- .9 Photoelectric Detectors: operate on light scattering principle using LED light source.
 - .1 Detector: respond to both flaming and smoldering fires.
- .10 Locate detectors in accordance with their listing by ULC and the requirements of NFPA 72, except provide at least 2 detectors in rooms of 54 square meters or larger in area.
- .11 Mount detectors at underside of ceiling or deck above unless otherwise indicated.
 - .1 For mounting heights greater than 3 m above floor level, reduce actual detector linear spacing from listed spacing as required by NFPA 72.
 - .2 For heights greater than 9 m space detectors no farther apart than 34% of their listed spacing.
- .12 Temperature rating of detectors: in accordance with NFPA 72.
- .13 Locate detectors minimum 300 mm to lighting fixtures and not closer than 600 mm to air supply or return diffuser.
- .14 Ensure detectors, located in areas subject to moisture or exterior atmospheric conditions or hazardous locations as defined by NFPA 70, are approved for such locations.
- .15 Provide detectors with terminal screw type connections.

- .16 Removal of detector head from its base to cause activation of system trouble signals if detectors are provided with separable heads and bases.

2.6 ALARM INITIATING DEVICE SPACING AND LOCATION

- .1 Detector spacing and location: in accordance with manufacturer's recommendations and requirements of NFPA 72.
- .2 Provide at least 2 detectors in rooms of 54 square meters or larger.
- .3 Spacing: not to exceed 9 m by 9 m per detector, and 9 linear m per detector along corridors.
- .4 Locate detectors minimum 1.5 m from air discharge or return grille, and not closer than 300 mm to lighting fixtures.
- .5 In areas without finished ceilings, mount detectors at underside of deck above unless otherwise indicated.
- .6 Mount detectors installed beneath raised floors with base within 50 mm of underside of raised floor, with detector facing downward.
 - .1 Where space under raised floor is less than 300 mm in height, mount detectors with their bases either horizontal or vertical, with detection chamber(s) located in upper half of underfloor space.
 - .2 Do not mount detectors facing upward.

2.7 AUDIBLE SIGNAL DEVICES

- .1 Provide remote system trouble 100mm bell arranged to operate in conjunction with panel's integral trouble signal.
- .2 Locate remote trouble bell as indicated.
 - .1 Provide 100 mm trouble bell at control panel arranged to operate in conjunction with panel's integral trouble signal.
 - .2 Provide trouble bell with white on red engraved identification sign which reads "FIRE ALARM SYSTEM TROUBLE".
 - .3 Lettering on identification sign: minimum 25 mm high.
- .3 Audible device(s):
 - .1 Bells: surface mounted, single stroke, polarized, 24 V dc, 100x150x250 mm, 65 db.
- .4 Do not exceed 80 percent of listed rating in amperes of notification appliance circuit. Provide additional circuits above those shown if required to meet this requirement.
- .5 Provide appliances specifically listed for outdoor use in locations exposed to weather.
- .6 Finish appliances in red enamel.
- .7 For surface mounting provide appliance manufacturer's approved back box. Back box finish to match appliance finish.

2.8 END-OF-LINE DEVICES

- .1 End-of-line devices to control supervisory current in alarm circuits and signalling circuits, sized to ensure correct supervisory current for each circuit. Open , short or ground fault in any circuit will alter supervisory current in that circuit, producing audible and visible alarm at main control panel and remotely as indicated.

2.9 VISUAL ALARM SIGNAL DEVICES

- .1 Surface-mounted assembly of stroboscopic type suitable for use in electrically supervised circuit and powered from notification appliance circuits.
- .2 Appliances: minimum of 15 candela measured as approved by ULC, but not less than effective intensity required by National Building Code of Canada for appliance spacing and location.
- .3 Protect lamps with thermoplastic lens and labelled "FIRE" in letters at least 12 mm high.
- .4 Provide visible appliances within 300 mm of each audible appliance.
- .5 Visible appliances may be part of audio-visual assembly, where more than two appliances are located in same room or corridor.

2.10 VALVE TAMPER SWITCHES

- .1 Provide switches to monitor open position of valves controlling water supply to sprinkler systems.
- .2 Switch contacts to transfer from normal position to off-normal position during first two revolutions of hand wheel or when stem of valve has moved not more than one-fifth of distance from its normal position.
- .3 Provide switch with tamper resistant cover.
- .4 Removal of the cover to cause switch to operate into off-normal position.

2.11 OFF-PREMISES FIRE ALARM

- .1 Provide auxiliary connection to base fire alarm system in accordance with NFPA 72, except as specified.
- .2 "FIRE" in minimum 50 mm block characters on both sides of box.

2.12 GROUNDING

- .1 Ground each master box by connection from grounding terminal connection of box to either driven ground rod or buried, metallic water pipe.
 - .1 Resistance to ground: not exceed 10 ohms.
- .2 Ground rods: sectional type, copper-encased steel, with minimum diameter of 19 mm and total length of 3 m.
- .3 Rods: hard, clean, smooth, continuous copper surface throughout rods length.
- .4 Copper: minimum wall thickness of 0.325mm at any point on rod.
- .5 Ground rods: not to protrude more than 75 mm above grade.

2.13 MASTER BOX PEDESTAL

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- .1 Provide pedestal constructed of galvanized sheet metal with heavy cast iron base, designed to support fire alarm box and location light.
- .2 Shaft: rectangular in cross section with hollow compartment inside, readily accessible and containing facilities for installing cable terminals.
- .3 Master box pedestal: capable of mounting no less than 10 two-point terminals.
- .4 Pedestal: red and white finish, same colours as used for fire alarm boxes.

2.14 RADIO MASTER BOX PEDESTAL

- .1 Provide round aluminum barrel pedestal with bell base, designed to support radio transmitter, location light, and antenna.
- .2 Design bell base with compartment and access plate to permit pulling and splicing of cables in base.

2.15 LOCATION LIGHT

- .1 Provide vapour tight type fixture constructed of cast aluminum housing and unbreakable, heat resistant, threaded ruby globe.
- .2 Support light with 12 mm minimum galvanized steel conduit screwed into hub on top of master box.
- .3 Locate light approximately 300 mm above master box.
- .4 Mount light in pendant position.
 - .1 Provide light with screw-in, 9-watt minimum compact fluorescent lamp with integral ballast.

2.16 CONDUIT

- .1 Rigid Steel Conduit:
 - .1 Zinc-Coated.
- .2 Intermediate Metal Conduit (IMC):
 - .1 Zinc-coated steel only.
- .3 Electrical Metallic Tubing (EMT):
- .4 Surface Metal Raceway and Fittings:
 - .1 Two-piece painted steel.
 - .2 Totally enclosed snap-cover type.

2.17 WIRING

- .1 Wire for 120 V circuits: No. 12 AWG minimum solid copper conductor.
- .2 Wire for low voltage DC circuits: No. 14 AWG minimum solid copper conductor
- .3 Wire to remote annunciators: No. 18 AWG minimum solid copper conductor.
- .4 Wire for connection to base telegraphic alarm loop: No. 12 AWG minimum solid copper conductor.

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- .5 Insulation 75 degrees C minimum with nylon jacket.
- .6 For underground or wet allocations cable from control panel to master box and to telegraphic loop: type UF.
- .7 Colour code wiring.

2.18 SURGE SUPPRESSION

- .1 Provide low voltage surge suppression devices to suppress voltage transients which might damage control panel and transmitter components.
- .2 Mount suppressors in separate enclosure(s) adjacent to control panel and transmitter unless suppressors are specifically UL approved for mounting inside control panel and transmitter provided and approved for such use by control panel and transmitter manufacturer.

2.19 LINE VOLTAGE SURGE SUPPRESSOR

- .1 Suppressor: ULC approved with maximum 330 volt clamping level and maximum response time of 5 nanoseconds.
- .2 Suppressor: multi-stage construction which includes inductors and silicon avalanche zener diodes.
- .3 Equip suppressor with light emitting diode which extinguishes upon failure of protection components.
- .4 Fuses: externally accessible.
- .5 Wire in series with incoming power source to protected equipment using screw terminations

2.20 LOW VOLTAGE SURGE SUPPRESSOR

- .1 Provide surge suppression for circuits which leave building shell.
- .2 When circuits interconnect 2 or more buildings, provide arrestor at circuit entrance to each building.
- .3 Suppressor: UL 497B listed with maximum 30 volt clamping level and maximum response time of 5 nanoseconds.
- .4 Suppressor: multi-stage construction and both differential and common mode protection.

2.21 AS-BUILT RISER DIAGRAM

- .1 Fire alarm system riser diagram: on black lamicoid sheet with bevelled edges, white lettering and designations, minimum size 600 x 600 mm.

2.22 ANCILLARY DEVICES

- .1 Remote relay unit to initiate fan shutdown.

Part 3 Execution**3.1 MANUFACTURER'S INSTRUCTIONS**

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

3.2 INSTALLATION

- .1 Install systems in accordance with CAN/ULC-S524 and TB OSH Chapter 3-04.
- .2 Locate and install manual alarm stations and connect to alarm circuit wiring.
- .3 Locate and install detectors and connect to alarm circuit wiring. Do not mount detectors within 1 m of air outlets. Maintain at least 600 mm radius clear space on ceiling, below and around detectors. Locate duct type detectors in straight portions of ducts.
- .4 Connect alarm circuits to main control panel.
- .5 Locate and install signal and visual signal devices and connect to signalling circuits.
- .6 Connect signalling circuits to main control panel.
- .7 Install end-of-line devices at end of alarm and signalling circuits.
- .8 Install remote annunciator panels and connect to annunciator circuit wiring.
- .9 Locate and install door releasing devices.
- .10 Locate and install remote relay units to control fan shut down.
- .11 Sprinkler system: wire alarm and supervisory switches and connect to control panel.
- .12 Room detection system including Halon 1301.
 - .1 Locate and install detectors. Make necessary connections between room detection panel and main fire alarm panel.
 - .2 Locate and install audible signals visual alarms.
 - .3 Locate and install detectors under raised floor. Fasten to steel brackets approximately 300 mm above sub-floor level to clear cables and conduits.
 - .4 Locate and install gas discharge stations. Connect valves on Halon system to room detection panel.
- .13 Connect fire suppression systems to control panel.

3.3 FIELD QUALITY CONTROL

- .1 Site Tests:
 - .1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical and CAN/ULC-S537.
 - .2 Fire alarm system:
 - .1 Test each device and alarm circuit to ensure manual stations, thermal and smoke detectors, sprinkler system, transmit alarm to control panel and actuate first stage alarm, general alarm.
 - .2 Check annunciator panels to ensure zones are shown correctly.
 - .3 Simulate grounds and breaks on alarm and signalling circuits to ensure proper operation of system.
 - .4 Class A circuits.

.5 Class B circuits.

.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.

.3 Verification requirements in accordance with Section 01 33 29 - Sustainable Design Reporting, include:

- .1 Materials and resources.
- .2 Storage and collection of recyclables.
- .3 Construction waste management.
- .4 Resource reuse.
- .5 Recycled content.
- .6 Local/regional materials.
- .7 Low-emitting materials.

3.4 TRAINING

- .1 Arrange and pay for on-site lectures and demonstrations by fire alarm equipment manufacturer to train operational personnel in use and maintenance of fire alarm system.

3.5 CLEANING

- .1 Proceed in accordance with Section 01 74 00 – Cleaning.
- .2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION