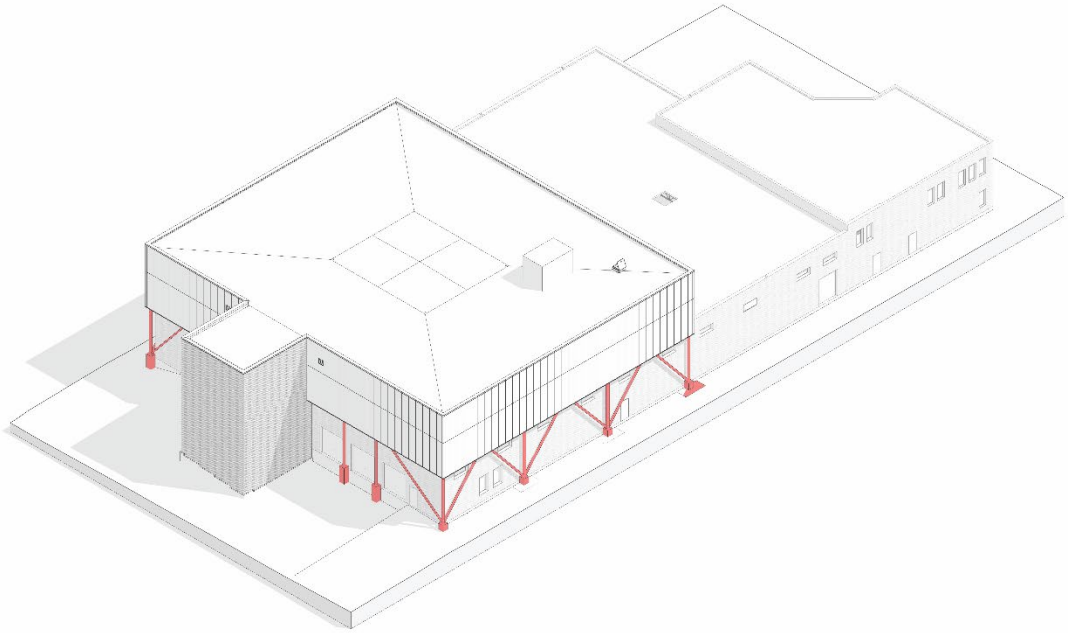
2ND FLOOR ADDITION AT
56 EDLICAN DRIVE, VAUGHAN

FOR

ACCORD PLASTICS



PROJECT MANUAL

ISSUED FOR TENDER
04 MARCH 2024

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Reports

Geotechnical Investigation Report, dated 16 March 2022, prepared by Soil Engineers Ltd (9 pages)

Test Pit Investigation Report, dated 25 April 2023, prepared by Canada Engineering Services Inc (1 page)

Hazardous Building Materials Assessment (Pre-Construction), dated 17 November 2023, prepared by Pinchin (61 pages).

3d Scan of existing building – provided for information only, can be accessed via the following website: https://my.matterport.com/show/?m=SrG3RWrM3z8

1 General

1.1 DESCRIPTION OF WORK INCLUDES

.1 Work under this Contract covers the following:

Work includes, but is not limited to:

- New ground floor structural elements + upgrades to existing structure to support new 2nd floor addition;
- Fire rating to all new existing/new structure supporting 2nd floor addition;
- 2nd floor addition of approximately 12,000 sq ft;
- New freight elevator and exit stair core addition beyond north wall of existing building;
- New mezzanine link and exit stair connection to 2nd floor addition;
- New mechanical process equipment (chiller) and below slab water chamber and compressed air system;
- Modification/extension of all base building services to serve new 2nd floor addition
- New mechanical/electrical systems/distribution to serve 2nd floor addition;
- Interior alterations as required to accommodate new 2nd floor addition;
- Exterior landscaping improvements (by cash allowance)

1.2 RELATED SECTIONS

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1.3 CONTRACTS

.1 Construction Work under single CCDC 2 -2020 Stipulated Price Contract and Supplemental Conditions.

1.4 GENERAL REQUIREMENTS

.1 The requirements of the Articles of Agreement, Conditions of the Contract, Division 1 apply to and form all Sections of the Contract Documents and the Work.

.2 Work in this Specification is divided into descriptive sections which are not intended to identify absolute contractual limits between Subcontractors, nor between the Contractor and their Subcontractors. The Contractor is responsible for organizing division of labour and supply of materials essential to complete the Contract. The Consultant assumes no liability to act as an arbiter to establish subcontract limits between Sections or Divisions of Work.

.3 Specifications, Schedules and Drawings are complementary and items mentioned or indicated on one may not be mentioned or indicated on the others.

.4 Contractor shall be responsible for materials, products, operations, or methods mentioned in the specifications or indicated on the drawings and shall provide to the quality or subject to the qualifications noted. Perform, according to the conditions stated, each operation prescribed and provide labour, materials, products, equipment and services to complete the Work.

.5 Where the singular or masculine is used in the Contract Documents, it shall be read and construed as if the plural, feminine or neuter had been used when the context or the statement so requires and as required to complete the Work, and the rest of the sentence, clause, paragraph, or Article shall be construed as if all changes in grammar, gender or terminology thereby rendered necessary had been made.

.6 The terms “exposed” or “exposed to view” refers to surfaces that are within the line of vision of persons from any accessible viewpoint, both within and without the building. Where any part of a surface is exposed to view, all other portions of that surface shall also be considered as exposed to view.

1.5 WORK SEQUENCE

.1 Construct Work in suitable manner to accommodate Accord Plastics (Accord or the Owner) continuous use of premises during construction, as described below.

.2 Cooperation with Accord in scheduling operations to minimize conflict and to facilitate Accord’s ongoing usage.

.3 All of the Work is to proceed to the schedule submitted by the awarded Contractor and accepted by Accord. The Contractor’s schedule will recognize the following restrictions:

.1 The Contractor must perform their activities respecting the requirements set forth in the specifications Division 01 - Section 01 11 00 “Summary of Work” and will safeguard the operations of Accord. All services are to be left in good repair and operating while the Work is undertaken.

.2 Safe access through the intended Project access route and fire/emergency routes must be maintained. Throughout the construction period, the Contractor is to include for any hoarding, covered walkway, etc., necessary for this purpose. The construction activities are to be scheduled so as to minimize any complete shutdown of the manufacturing/production and delivery areas.

.3 The building is completely operational at all times.

1.6 CONTRACTOR’S USE OF PREMISES

.1 The Contractor shall maximize use of premises as much as possible to allow for:

.1 Accord usage, specifically manufacturing/production.

.2 Assume full responsibility for protection from construction hazards of Accord’s staff at all times when they are on the site.

.3 Assume full responsibility for the protection of the existing buildings, systems and services, and utilities from damage due to the Work of the Contractor or any Subcontractors employed on the site. After obtaining the approval of the Consultant, make good all damage to Owner's satisfaction and at no cost to Owner.

.4 Site storage:

.1 Allocate an area on site within the limits of the Work acceptable to Accord for storage of Products brought to the site by all trades. Materials and equipment to be stored on site in storage containers (i.e. C Can Containers) or on site in a weatherproof storage enclosure.

.2 Do not encumber site with materials or equipment items are stored on site.

.3 Keep storage area tidy at all times and do not use other parts of the property for storage.

.4 Assume full responsibility for protection and safekeeping of products stored on premises.

.5 Move any stored products or equipment which interfere with operations of Accord at no cost to Accord.

.5 Refer to Section 01 14 00 for additional work restrictions relevant to the Work.

1.7 DOCUMENTS AT THE SITE

.1 Keep the following documents on Site, stored securely and in good order and available to Accord and Consultant in hard copy:

.1 Current Contract Documents, including Drawings, Specifications and addenda.

.2 Change Orders, Change Directives, and Supplementary Instructions.

.3 Reviewed Shop Drawings, Product data and samples.

.4 Field test reports and records.

.5 Construction progress schedule.

.6 Meeting minutes.

.7 Manufacturer's certifications.

.8 Permits, inspection certificates and other documents required by authorities having jurisdiction.

.9 Current as-built drawings.

.10 Material Safety Data Sheets (MSDS) for all controlled Products.

1.8 OCCUPANCY AND USE OF PREMISES

.1 The Contractor and all Subcontractors are expected to understand that all areas of the building remain occupied during the Work and that the Work is to be executed in such a manner as to provide the minimum interference with the partial use of the premises by the occupants, and the maximum safety of the occupants during the Work. The Contractor and all Subcontractors will take reasonable measures for the control of noise during working hours.

.2 The Contractor shall maintain normal building operation and traffic flow, with minimum inconvenience from noise and dust to the tenants of the facilities.

.3 The Contractor shall organize the work at each facility so as to minimize any disruption in the ordinary use of the facility by the tenants, ensure minimum

interference with the occupation, use and enjoyment of the facility by the tenants and minimize any reduction in comfort at the facility.

.4 All noise and vibration generating operations, such as jack hammering, drilling, compacting and the use of other such equipment, that will interfere with the occupied portions of the building shall be confined to the hours as stipulated in Section 01 14 00.

.5 The Work shall be confined to the area defined on the drawings except that services connections, sanitary and storm connections, and certain portions of landscaping, hard paving and curb work shall be executed on Municipal property under regulations of authorities having jurisdiction

.6 It is essential that the existing building be maintained weather tight at all times. The Contractor shall therefore furnish all temporary protection, enclosures, tarpaulins, etc., as may be required to weatherproof any openings made by the Work. The Contractor and all Subcontractors must seal off or temporarily dam all open roof edges, etc. to prevent any water present on existing roof areas, from entering the occupied floor(s).

.7 The Contractor is to ensure that throughout the duration of the construction, the Owner's power requirements must not be affected by the service of the construction. Provide at minimum, 7 business day advance notice there is any planned utilities shut down in accordance with requirements of Section 01 14 00.

1.9 SETTING OUT

.1 Be responsible for setting out the Work. Prior to setting out the Work, verify dimensions and elevations shown on the Contract Documents and report to Consultant any unsatisfactory conditions that may adversely affect the proper completion of the Work.

.2 Accurately set out the Work from levels and lines. Where Work of this Contract is dependent upon grades and elevations of existing structures or facilities, such grades or elevations shall take precedence over those determined by reference to established elevations. Advise Consultant of any discrepancies.

.3 During any activity of the Work, layout and check all features, including but not limited to the following:

.1 Establish and maintain temporary bench marks set required to perform the Work..

.2 Provide general dimensions, lines and elevations required to perform the Work.

1.10 BUILDING DIMENSIONS

.1 Report any inconsistencies, ambiguities, discrepancies, omissions, and errors between Site conditions and Contract Documents to Consultant prior to the commencement of Work. If inconsistencies, ambiguities, discrepancies, omissions, and errors are not reported and clarified, the most stringent requirement shall govern, as determined by Consultant.

.2 Check all dimensions at the site before fabrication and installation commences and report discrepancies to the Consultant.

.3 Where dimensions are not available before fabrication commences, ensure that dimensions required are agreed upon between the parties concerned.

.4 Prior to commencing work, ensure that clearances required by jurisdictional authorities can be maintained.

.5 Ensure that the necessary job dimensions are taken and Subcontractors are coordinated for the proper execution of the Work. Assume complete responsibility for the accuracy and completeness of all dimensions, and for coordination of all elements of the Project.

.6 Verify that the Work, as it proceeds, is executed in accordance with dimensions and positions indicated which maintain levels and clearance to adjacent Work, as set out by requirements of the Contract Documents, and ensure that Work installed in error is rectified without extra cost to the Owner before construction continues.

.7 Verify dimensions of shop fabricated portions of the Work at the site before shop drawings and fabrications are commenced. Accord will not accept claims for extra expense by reason of non-compliance with this requirement.

.8 Check and verify dimensions referring to Work and interfacing of services. Dimensions, when pertaining to the Work of other Sections (Subcontractors), shall be verified with the Section (Subcontractor) concerned. Ensure that Subcontractors performing various Sections cooperate for the proper performance of the Work.

.9 Do not scale directly from the Drawings. If there is ambiguity or lack of information, immediately inform Consultant. Any change through the disregarding of this clause shall be the responsibility of the Contractor.

.10 All details and measurements of any Work which is to fit or conform to Work installed shall be taken at the site.

.11 Leave areas clear where space is indicated to be reserved for future equipment, including access to such future equipment.

.12 Whether shown on the Drawings or not, leave adequate space and provision for servicing of equipment and removal and reinstallation of replaceable items such as motors, coils and tubes as recommended by equipment manufacturer.

1.11 EXISTING SITE CONDITIONS

.1 Make a careful examination of the site and investigate and be satisfied as to all matters relating to the nature of the Work to be undertaken, as to the means of access and egress thereto and therefrom, as to the obstacles to be met with, as to the extent of the Work to be performed and any and all matters which are referred to in the Contract Documents. Claims for additional costs will not be entertained with respect to conditions which could reasonably have been ascertained by an inspection prior to tender closing.

.2 Report any inconsistencies, ambiguities, discrepancies, omissions, and errors between Site conditions and Contract Documents to the Consultant prior to the commencement of Work. If inconsistencies, ambiguities, discrepancies, omissions, and errors are not reported and clarified, the most stringent requirement shall govern, as determined by the Consultant.

1.12 SUPPLEMENTARY DEFINITIONS

.1 In the Specifications, references such as “shown on the Drawings”, “specified”, “scheduled”, “called for” and the like shall be deemed to include work required by any of the Contract Documents.

.2 In the Specifications the expression Section(s) is synonymous with Subcontractor(s) if the context permits. The expression “all Sections” shall be deemed to include the Contractor.

1.13 EXAMINATION

.1 Each Section (Subcontractor) shall examine surfaces prepared by other Sections (Subcontractors) which affect its work and shall ensure that defects are corrected. Commencement of Work shall imply acceptance of prepared Work.

.2 All Sections (Subcontractors) shall check and verify with the Contractor all dimensions, especially those pertaining to work of more than just their Section (Subcontractors work).

.3 All details and measurements of any work which is to fit to, or conform with, work already installed by other Sections (Subcontractors, shall be taken at the job site by the Sections (Subcontractors) concerned.

1.14 SUPPLY AND/OR INSTALLATION

.1 Unless the word “only” suffixes “supply” or “install” or other variations of those words according to the Section wherein they are used, it is the express intent of this Contract that “supply and install” is implied.

.2 Unless otherwise specified, Work shall be installed in accordance with the manufacturer’s printed directions and recommendations.

1.15 SATISFACTION / APPROVAL

.1 The expression “to the satisfaction or approval of Accord” shall be implied throughout the Specifications in regard to all materials and workmanship.

.2 “Submit for approval” means that the item in question is to be submitted to the Accord for approval and that a written acceptance of it is authorization for its use in the Work shall be obtained before it is incorporated in the Work. Sections (Subcontractors) shall submit items for approval to Accord via the Contractor.

.3 The terms “approved”, “review”, “reviewed”, “accepted”, “acceptance”, “acceptable”, “satisfactory”, “selected”, “directed”, “instructed”, “required”, “submit”, “permitted”, “approved alternative”, “approved equal”, or similar words or phases are used in standards or elsewhere in Contract Documents, it shall be understood, that words “by (to) Accord” follow, unless context provides otherwise.

.4 The term ‘or approved alternate’ or similar language following a list of products, systems, or manufacturers used in the Contract Documents shall be construed to mean approved by Consultant. Specified products to be Base Bid. Contractor to follow substitution procedures specified in this Section for submitting proposed products, systems, and manufacturers and obtain Consultant’s approval of the same prior to proceeding with ordering proposed products and systems or engaging manufacturers. Contractors who purchase products and systems or engage manufacturers prior to Consultant’s review and acceptance do so at their own risk.

.5 An “approved method” means that which has the manufacturer’s recommendation or which is generally accepted as good trade practice.

1.16 EXISTING SERVICES

.1 The Contractor is responsible for ensuring all “Existing Services” (including but not limited to structural elements, water pipes, drains, electrical cables and fixtures, communications cables and fixtures, security cables and fixtures, HVAC ducting, cables and fixtures, etc.) are not interrupted and / or damaged by the construction work. The Contractor must take all precautions to ensure that services buried underground or contained in a floor or contained in other

elements are identified on the drawings provided by Accord and have been clearly identified on the Work Site.

.2 Accord will not be liable for any loss, damage, delay or claim whatsoever resulting or arising from the absence in whole or part of services not shown on drawings.

1.17 EMERGENCIES

.1 Notify Accord Project Team immediately should an emergency arise on the Site, including personal injuries and accidents. This notification shall be by telephone or email immediately after the occurrence.

.2 Provide an incident report including complete details on extent of emergency, cause and the action being taken.

1.18 FIELD MARKING

.1 Do not use wick pen to mark face of products to be installed in the Work. Such pen marks will show through applied paint or vinyl coatings and the like in due course. The Contractor will be held responsible and required to remedy such defects, classified as “latent defects” regardless of when they occur.

1.19 SECURITY

.1 Be responsible for security of all areas affected by Work of this Contract until taken over by Accord. Take steps to prevent entry to the Work by unauthorized persons and guard against theft, fire and damage by any cause. Provide safe and secure access to and egress from existing premises at all times.

.2 Take acceptable precautions to guard Work site, premises, materials and the public during and after working hours due to the Work of this Contract.

END OF SECTION

1 GENERAL

1.1 NORMAL BUSINESS HOURS

.1 The building is occupied and is to be considered “fully operational” from 6am Monday to 6am Friday, 24 hours per day.

1.2 PROJECT DELIVERIES

.1 All deliveries are to be communicated to Site Staff for coordination purposes. It is preferred that deliveries are performed outside shift change hours (6am and 6pm, Monday to Friday morning).

1.3 NOISY, PAINTING, GLUING, SUBSTANCES WITH VOC’S AND / OR STRONG ODOURS AND TARING (SEALANTS, ROOFING, ETC.)

.1 Painting, gluing, working with substances that contain volatile organic compounds (VOC’s) and /or have strong odours and tarring work (sealants, roofing, etc.) are to be performed outside normal business hours.

.2 The Contractor shall minimize any reduction in comfort at the facility.

1.4 PARKING

.1 The Owner will make 5 parking spaces on site available to the Contractor. Location of parking spaces will be confirmed with Owner.

.2 Determine and make arrangement as required for loading and unloading of equipment and products at times that will not affect public traffic flow and that will be permitted by the City of Vaughan. Conform to City by-laws with regard to parking restrictions and other conditions.

1.5 SITE PROTECTION

.1 Dust barriers must be used at all times during dusty work. Poly sheet dust barriers are to be sealed tight to floor and ceiling and / or to the filter mediums on return air grills etc.

.2 Clean up after all work must be performed immediately and the area(s) are to be left in a clean and safe manner. Failure to clean properly may result in the Contractor being charged for cleaning services obtained by the Building Management and the Building Management may terminate the Contractor’s access.

1.6 ADVANCE NOTIFICATION

.1 Seven (7) business days advance notification is required for any work affecting the building occupants such as the following:

.1 Mold remediation (removal) work / asbestos abatement (removal) work.

.2 Scanning and core drilling.

.3 Notification of start time for painting.

.4 Notification of exterior work.

.5 Notification of any building system shutdown (i.e. power, water, etc.).

.6 Notification of any loss of use area (i.e. washroom shutdown, lunchroom, etc.).

1.7 BREAKER PANELS

.1 Electrical panels must not be touched without first informing and obtaining written permission from Consultant and the Building Management.

.2 Whenever electrical power is shut off the Contractor must “Lock Out” and “Tag Out” any electrical panels or electrical breakers affected.

.3 Panel schedules to be updated each time a change to it is made.

1.8 DOORS

.1 For security purposes the building doors are to be close at all times.

.1 Exit doors must not be propped open for any reason.

.2 All fire doors must be kept closed at all times.

1.9 PROTOCOL FOR SCANNING, CORE DRILLING

.1 Prior to starting the scan work the contractor hired to carry out the work must provide a copy of their health and safety plan to Accord.

.2 The plan must include a copy any of required license(s), a description of the process to be used and any information needed to design safety limits of the work zone. In addition, the plan must include a process to protect the work zone from inadvertent entry, a list of potential hazards that may be encountered by the workers, training and / or instruction that the workers have received to address the hazards and a contingency plan in case of an emergency.

.3 X-Raying is not allowed without prior authorization.

1.10 CORE DRILLING

.1 If dry core drilling will be performed appropriate dust control measure must be identified and used. If wet core drilling will be performed, water control measures must be identified and must be used.

.2 Before commencing the core drilling operation, the Contractor must ensure that it is safe to start drilling. The area must be secured, dust controls are in place, the equipment is set up as intended by the manufacturer, and all safety devices are present and functioning. The location selected to perform the core drilling must be appropriate and will not impact on the structural integrity of the building. The intended path of the coring unit must be free of all embedded power or communication wires, conduits, rebar, pipes and / or structures that could be damaged or disabled.

.3 All sources of asbestos are not to be disturbed. If this is not possible, the appropriate precautions must be taken to prevent the asbestos from becoming airborne which may include the use of either, a type 1, type 2 or type 3 process to comply with the asbestos designated substance regulations O. Reg 838 as am. O. Reg 510/92.

.4 All coring debris must be cleaned up and disposed of and the site returned to its original state after the coring is completed.

.5 If the coring debris contains asbestos, it must be cleaned up following the requirements of the designated substance specifications included in the Contract Documents.

1.11 DESIGNATED SUBSTANCES

.1 Handling and removal of any designated substances shall follow all applicable legislative requirements. Refer to project specific Designated Substances Report.

1.12 MAINTANING LIFE SAFETY SYSTEMS IN OCCUPIED FACILITIES

.1 Maintain operational life safety systems and public access to exits in occupied areas during all stages of the Work.

.2 Determine nature and exact locations of existing fire and smoke sensors prior to the commencement of the Work. Avoid direct or indirect jarring while working in adjacent areas and exercise caution to avoid triggering these devices.

.3 Be responsible for costs incurred by Owner on account of false fire alarms activated as a result of the execution of the Work, without adequate precautions.

1.13 PROJECT CONDITIONS, GENERAL

.1 Most of the project will be performed during regular business hours in an operational business setting. Areas will be occupied during normal business hours. At end of each shift, broom clean and leave areas clean and in normal working condition.

.2 All items removed shall be replaced / returned / reinstalled during same shift.

.3 The Contractor shall not be responsible for moving furniture and equipment in areas of Work unless specifically specified in the Scope of Work. The Contractor shall be responsible for repairs or replacements of any damaged furniture.

.4 The Contractor shall cooperate / coordinate with moving contractors retained by Accord, and / or agencies.

1.14 CONTINUITY OF SERVICE

.1 Where equipment and systems are normally required to operate through the course of the Work, notify the Accord at least 2 weeks prior to the necessary interruption of mechanical or electrical service throughout course of Work

.2 Keep duration of interruptions to a minimum not to exceed 4 hours. Interruptions lasting longer than 4hrs will require approval from the Owner.

END OF SECTION

1.1 CASH ALLOWANCES

.1 Refer to the CCDC 2 – 2020Paragraph GC 4.1 Cash Allowances and CCDC 2 – 2020 Supplementary Conditions Paragraph GC 4.1 Cash Allowances for the base details.

.2 Progress payments for Work and Products authorized under allowances will be made in accordance with the payment terms set out in Conditions of the Contract.

.3 Progress payments on accounts of Work authorized under cash allowances shall be included in the Consultant's monthly certificate for payment.

.4 Cash allowances, unless otherwise specified, cover the net cost to the Contractor of services, products, construction machinery and equipment, freight, handling, unloading, storage, installation where indicated, and other authorized expenses incurred in performing the Work. Cash allowances shall not be included by a Subcontractor in the amount for their Sub-contract work.

.5 Supply only allowances shall include:

.1 Net cost of products.

.2 Delivery to Site.

.3 Applicable taxes and duties, excluding HST.

.6 Supply and install allowances shall include:

.1 Net cost of products.

.2 Delivery to Site.

.3 Unloading, storing, handling or products on Site.

.4 Installation, finishing and commissioning of products.

.5 Applicable taxes and duties, excluding HST.

.6 The amount of each cash allowance does not include Contractor’s overhead and profit, and other related costs, which shall be included in the Contract Price and not in the cash allowance.

.7 Inspection and testing allowances shall include:

.1 Net cost of inspection and testing services.

.2 Applicable taxes and duties, excluding HST.

.8 Other costs related to work covered by cash allowances are not covered by the allowance but shall be included in the Contract Price.

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

.10 Accord, through Consultant, may request Contractor to identify potential Suppliers or Subcontractors, as applicable, and to obtain at least three competitive prices for each cash allowance item.

.11 Submit, before application for final payment, copies of all invoices and statements from suppliers and Subcontractors for work which has been paid from cash allowances.

.12 Accord, through Consultant, will determine by whom and for what amount each cash allowance item will be performed. Obtain Accord’s prior written approval in the form of a Cash Allowance Disbursement Authorization (CADA) before entering into a subcontract, amending an existing subcontract, or performing own forces work included in a cash allowance. Upon issuance of the CADA, the Contractor’s responsibilities for a cash allowance item shall be the same as for work of the Contract.

.13 The “Cash Allowances” expected and the amount of each allowance is listed on the Rate Bid Form included in the Bid package.

END OF SECTION

1 GENERAL

1.1 ALTERNATIVES AND SUBSTITUTIONS

.1 Refer to the Rate Bid Form included in the Bid package - Alternate Prices.

.2 Requests for substitutions will not be accepted prior to the Notification of Award. Where the Specifications include the “or approved alternate” clause, substitutions will be considered by Accord and Consultant provided that:

.1 The materials and / or products specified are not available.

.2 Substitute products to those specified, which are brought to the attention of, and considered by Project Team after the Contract Award as "equivalent" to those specified will result in a credit to the Contract Price.

.3 Substitute products to those specified which are brought to the attention of, and considered by Project Team after the Contract Award as "superior" to those specified will result in a change to the Contract Price.

.4 The proposed substitutions have been investigated and complete data are submitted in accordance with the Specifications. Proposed substitutions to show the material and product names and complete data and specifications and state what difference, if any, will be made to the Contract Price for each substitution, should it be accepted.

.5 Data relating to changes in the Contract Schedule, if any, and relation to other Work have been submitted.

.6 Same warranty is given for the substitution as for the original product specified.

.7 All claims are waived for additional costs related to the substitution which may subsequently arise. Installation of the accepted substitution is coordinated into the Work and that full responsibility is assumed when substitutions affect other work. Make any necessary changes required to complete the Work. Revisions to the drawings for incorporation of the substitutions shall be made by the Consultant and all costs associated with the revisions shall be borne by the Contractor.

.8 Should the proposed substitution be accepted either in part or in whole, the Contractor will assume full responsibility when the substitution affects any other work or work of other Sections (Subcontractors). Drawing changes required as a

.9 result of the substitution will be executed by the Consultant at the Contractor's expense.

.10 Proposed substitutions must satisfy all design conditions and other specified requirements. Properties included but not limited to the following as applicable, will be considered:

.1 Physical dimension requirements must satisfy the space limitations,

.2 Static and dynamic weight limitations,

.3 Structural properties,

.4 Audible noise levels,

.5 Vibration generation,

.6 Interchangeability of parts and / or components,

.7 Accessibility for maintenance,

.8 Possible removal or replacement,

.9 Colours,

.10 Textures,

.11 Compatibility with other materials, products, assemblies and components.

.3 Substitutions to methods or process described in the Specifications or drawings, may be proposed for the consideration of the Consultant.

.4 Ensure that such substitutions are in accordance with the following requirements:

.1 Time spent by the Consultant in evaluating the substitution shall not be the basis for a claim by the Contractor for extensions;

.2 Clearly indicate how the proposed substitutions would be advantageous to the Owner or in the opinion of the Contractor would improve the operation of the installation;

.3 The cost of all changes in the work of Other Contractors, necessitated by the substituted methods or processes, if accepted, is borne by the Contractor;

.4 The substituted methods or processes fit into space allotted for the specified methods or processes. Revisions to the drawings for incorporation of the substitutions shall be made by the Consultant and all costs associated with the revisions shall be borne by the Contractor.

.5 Substitutions will not be considered if:

.1 They are indicated or implied on shop drawings or product data without formal request;

.2 Acceptance will require substantial revision of the Specifications and Drawings.

.3 Contractor fails to order a specified Product or order a Product by a specified manufacturer in adequate time to meet Contractor's construction schedule

.6 Do not substitute products or methods or processes into the Work unless such substitutions have been specifically approved for the Work by the Consultant.

.7 Approved substituted products shall be subject to Consultant's sole discretion. Approved substituted products shall only be installed after receipt of the Consultant's written approval.

.8 The cost of changes in the Work of a Contractor necessitated by the use of proposed material and / or product substitution is to be borne by the Contractor proposing the substitution.

.9 The Contract Price will be adjusted accordingly to any and all credits arising from the substitutions mentioned above.

1.2 SUBMISSION REQUIREMENTS FOR PROPOSED SUBSTITUTIONS

.1 Include with each proposed Substitution the following information:

.1 Identification of the Substitution, including product name and manufacturer's name, address, telephone numbers, and web site.

.2 Reason(s) for proposing the Substitution.

.3 A statement verifying that the Substitution will not affect the Contract Price and Contract Time or, if applicable, the amount and extent of a proposed increase or decrease in Contract Price and Contract Time on account of the Substitution.

.4 A statement verifying that the Substitution will not affect the performance (or warrant) of other parts of the Work.

.5 Manufacturer's Product literature for the Substitution, including material descriptions, compliance with applicable codes and reference standards, performance and test data, compatibility with contiguous materials and systems, and environmental considerations.

.6 Product samples as applicable.

.7 A summarized comparison of the physical properties and performance characteristics of the specified Product and the Substitution, with any significant variations clearly highlighted.

.8 Availability of maintenance services and sources of replacement materials and parts for the Substitution, as applicable, including associated costs and time frames.

.9 If applicable, estimated life cycle cost savings resulting from the Substitution.

.10 Details of other projects and applications where the Substitution has been used.

.11 Identification of any consequential changes in the Work to accommodate the Substitution and any consequential effects on the performance of the Work as a whole. A later claim for an increase to the Contract Price or Contract Time for other changes in the Work attributable to the Substitution will not be considered.

1.3 METHODS OR PROCESSES SUBSTITUTIONS

.1 The Contractor may suggest, for the consideration of the Project Team, substitutions to methods or processes described in the Specifications and / or shown on the Drawings. Any application for such substitutions must indicate how such substitutions are advantageous to the Owner or to the better fulfillment of the Contract. There shall be no obligation on the parties concerned to accept any such suggestions. Requests for alternatives must be made in duplicate and be accompanied by catalogue cuts, specifications and methods of installation.

.2 Time spent by the Consultant in evaluating the substitution shall not be the basis for a claim by the Contractor for extensions to the Contract Time.

.3 The Contractor will be responsible for substitutions to methods or processes concerning such work, and the warranty covering all parts of the Work shall not be affected.

.4 The cost of all changes in the work of other Sections (Subcontractors) necessitated by the use of substituted methods or processes, is to be borne by the Section (Subcontractor) proposing the substitution.

.5 Said methods or processes must fit into the space allotted for the specified methods or processes.

1.4 CREDITS ARISING FROM SUBSTITUTIONS

.1 Any and all credits arising from the substitutions mentioned will be credited to the Contract and the Contract Price will be adjusted accordingly.

1.5 RELATED CHANGES

.1 The Contractor will advise Subcontractors and suppliers and make all necessary changes to the related Work occasioned by Owner’s acceptance of alternatives.

END OF SECTION

1 GENERAL

1.1 MODIFICATIONS TO CONTRACT

.1 Supplemental Instruction: As issued by the Consultant, consistent with the intent of the Contract Documents, and will not involve an adjustment in Contract Price or Contract Time.

.2 Proposed Change: As issued by the Consultant, will notify the Contractor of an impending or proposed change to the Work, and will require submission of a quotation from the Contractor and all affected Subcontractors for each item noted. Submit quotation within the time period stipulated on the form, and indicate separate line item for labour and materials in each case. Work outlined in a Proposed Change must not proceed without the issuance of a Change Order signed by Accord.

.3 Change Directive: Will be issued by the Consultant where an immediate response is required to an on-site condition. This form will authorize the Contractor to proceed with the change, with the stipulation that accurate accounts of costs be recorded, and may contain an upset cost, as agreed upon in advance by Accord and the Contractor.

.4 Change Order: Will be issued by the Consultant upon review and approval of quotations for a Proposed Change, or a Change Directive, and authorizes the Contractor to proceed with the change(s) proposed. A Change Order will amend the Contract Price, and/or the Contract Time.

.5 Extras shall not be granted due to the Contractor’s unfamiliarity with the site or due to the Contractor’s lack of thorough investigation prior to bid submission.

.6 Any additions to the Work under this contract shall conform to all construction standards and conditions laid out herein, whether or not such conditions are expressly stated in Accord's acceptance of the addition(s).

.7 The Contractor shall not proceed with Work in addition to the Contract Documents until the formal change process has been completed.

.8 Any request for additional time submitted with a Change Order shall be substantiated with supporting documentation and analysis, such as time impact analysis and critical path analysis. The Contractor shall establish how the critical path has shifted. The Contractor shall also submit a recovery plan demonstrating how the Contractor will recover the schedule.

1.2 CHANGE ORDER PROCEDURES

.1 Upon issuance by the Consultant to the Contractor of a proposed change in the Work, and unless otherwise requested in the proposed change or unless otherwise agreed:

.1 Submit to the Consultant a fixed price quotation for the proposed change in the Work within 5 days after receipt of the proposed change in the Work.

.2 If requested in the proposed change, provide a detailed breakdown of the price quotation including the following to the extent applicable, with appropriate supporting documentation:

.1 Estimated labour costs, including hours and applicable hourly rates based on the accepted schedule of labour rates.

.2 Estimated Product costs, including Supplier quotations, estimated quantities and unit prices.

.3 Estimated Construction Equipment costs.

.4 Enumeration of all other estimated costs included in the price quotation.

.5 Estimated credit amounts for labour and Products not required on account of the proposed change.

.6 Where applicable, Subcontractor quotations, also including a detailed

breakdown of all of the above.

.7 Include in the quotation the increase or decrease to the Contract Time, if any, for the proposed change, stated in number of days.

.8 Include in the quotation the number of days for which the quotation is valid.

.2 The quotation will be evaluated by the Consultant and Accord and, if accepted by Accord, be documented in the form of a signed Change Order.

1.3 FEES FOR OVERHEAD AND PROFIT – CHANGE ORDERS

.1 Refer to the CCDC 2 – 2020 Paragraph GC 6.2 Change Order and CCDC 2 – 2020 Supplementary Conditions Paragraph SC GC 6.2 – Change Order - for details.

1.4 CHANGE DIRECTIVE PROCEDURES

.1 Refer to the CCDC 2 – 2020 Paragraph GC 6.3 Change Directive and CCDC 2 – 2020 Supplementary Conditions Paragraph SC GC 6.3 – Change Directive - for details.

1.5 FEES FOR OVERHEAD AND PROFIT – CHANGE DIRECTIVES

.1 Refer to the CCDC 2 – 2020 Paragraph GC 6.3 Change Directive and CCDC 2 – 2020 Supplementary Conditions Paragraph SC GC 6.3 – Change Directive - for details.

END OF SECTION

1.1 SCHEDULE OF VALUES

.1 Prior to the first application for payment, submit for Consultant's review an initial schedule of values. Modify the initial schedule of values if and as requested by Consultant. Obtain Consultant's written acceptance of the initial schedule of values prior to the first application for payment.

.2 Together with the first and all subsequent applications for payment, submit updated versions of the schedule of values to indicate the values, to the date of application for payment, of work performed and Products delivered to Place of the Work.

.3 Provide the schedule of values in an electronic spreadsheet format acceptable to the Consultant.

.4 A work breakdown structure that is sufficiently detailed and comprehensive to facilitate Consultant's evaluation of applications for payment at an appropriate level of detail.

.5 Provisions for approved Change Orders [allowances,] [unit price work] [and] [assignable contracts] so that the breakdown amounts indicated in the schedule of values aggregate to the current total Contract Price. Also provide for indicating the estimated value of Change Directives within the schedule of values, separately from the current total Contract Price.

.6 For each item in the work breakdown structure, provide as a minimum the following information, under headings as indicated:

.1 Performed to Date: The value of Work performed and Products delivered to Place of the Work up to the date of the application for payment, stated as a percentage of the Contract Price and in dollars.

.2 Previously Performed: The value of Work performed and Products delivered to the Place of the Work for which payment has been previously certified, stated in dollars.

.3 Current Period: The value of Work performed and Products delivered to Place of the Work for which Contractor is currently applying for payment, stated in dollars.

.4 Balance to Complete: The value of Work not yet performed and Products not yet delivered to Place of the Work, stated in dollars.

1.2 CASH FLOW PROJECTION

.1 Prior to the first application for payment submit, for *Consultant*'s review, a forecast of approximate monthly progress payments for each month of the *Contract Time*.

.2 Submit revised cash flow forecasts when required due to significant changes in rate of progress of the *Work* or significant changes in the *Contract Price*.

1.3 WORKERS' COMPENSATION CLEARANCE

.1 Submit proof of workers' compensation clearance with each application for payment.

1.4 STATUTORY DECLARATIONS

.1 Submit a statutory declaration in the form of CCDC 9A – Statutory Declaration of Progress Payment Distribution by Contractor with each application for payment except the first.

END OF SECTION

1 GENERAL

1.1 COORDINATION

.1 Coordination of the work of all Sections of the specifications as required to complete the Project is the responsibility of the Contractor.

.2 Cooperation:

.1 Provide forms, templates, anchors, sleeves, inserts and accessories required to be fixed to or inserted into work and set in place or instruct separate Sections (Subcontractors) as to their locations.

.2 Supply items to be “Built-In” as and when required together with templates, measurements, shop drawings and other related information and assistance.

.3 Pay the cost of extra work and make up time lost as a result of failure to provide necessary information and items to be “Built-In” in adequate time.

.3 Coordination:

.1 Ensure that Subcontractors cooperate with each other including Other Contractors employed by Accord, so that Work will be carried out expeditiously and will be satisfactory in all respects at completion.

.2 Ensure that Subcontractors examine Contract Documents with particular emphasis to work of other Sections which may affect the performance of their own work.

.3 Ensure Subcontractors cooperate with other Sections whose work attaches to or is affected by their own work, and ensure that minor adjustments are made to make adjustable work fit to fixed work.

.4 Ensure that Subcontractors requiring foundations or openings to be left for the installation of their Work furnish the necessary information to the Sections concerned in ample time so that proper provisions can be made.

.5 Pay particular attention to applied fireproofing requirements. Coordinate work to remove/reinstate services that may impede the application of continuous applied fireproofing to the required thickness for the scheduled fire resistance rating.

.6 Where supports or openings are to be left for the installation of various parts of the Work furnish the necessary information to those concerned in ample time so that proper provision can be made for such items. Have cutting, drilling and other remedial work, and the subsequent patching or other work required for failing to comply with this requirement, performed at a later date at no additional cost to the Owner.

.7 Ensure that items to be “Built-In” are supplied as and when required by Sections (Subcontractors) building in the items together with templates, measurements or shop drawings and other related information and assistance.

.8 Ensure coordination of products supplied in metric and imperial units into the overall layout.

.9 Placing, installation, application and connection of work by Accord’s own forces or by Other Contractors on and to the Contractor's work shall not relieve the Contractor of their responsibility to provide and maintain the specified warranties.

.10 Ensure that setting drawings, templates, and all other information necessary for the location and installation of materials, fixtures, equipment, holes, sleeves, inserts, anchors, accessories, fastenings, connections, and access panels are provided by each Section whose work requires cooperative location and installation by other Sections, and that such information is communicated to the applicable installer. Have cutting, fixing and making good to the work of Other

Contractors, Sub-trades required for, and make up time lost as result of, failure to comply with this requirement, at no additional cost to Accord.

.11 Coordinate with removals/installations specified in other Divisions and Other Contracts.

.12 Properly coordinate the work of the various Sections and trades to assure the best arrangement of pipes, conduits, ducts and mechanical, electrical and other equipment, in the available space. Under no circumstances will any extra payment be allowed due to the failure by the Contractor to coordinate the Work. If required, in critical locations, prepare interference and/or installation drawings showing the work of the various Sections as well as the existing installation, and submit these drawings to the Consultant for review before the commencement of Work.

.13 In case of damage to active services or utilities, notify Consultant and respective authorities immediately and make all required repairs under direction of Consultant and respective authorities. Carry out repairs to such damaged services and utilities continuously to completion, including working beyond regular working hours.

.14 Under no circumstances will any extra payment be allowed due to the failure by the Contractor to coordinate the Work. If required, in critical locations, prepare interference and/or installation drawings showing the work of the various Sections as well as the existing installation, and submit these drawings to TCHC Project Team and Consultant for review before the commencement of Work.

.4 Other Contractors:

.1 The Contractor is responsible to correlate and coordinate all work with that of Other Contractors having separate contracts with Accord in order to complete the Work as expeditiously as possible.

.2 Prior to commencement of work, ensure that all Sections (Subcontractors) are fully conversant with the extent of the work, the conditions and materials on the project, the schedule of completion, restrictions to safety, and access.

.3 Inform all Sections (Subcontractors) that each is responsible for checking all Sections of the specification for work pertaining to their Section (Subcontractor's work).

.5 Authorities and inspectors:

.1 City Inspector: Coordinate and cooperate with City Inspector as required to review specific site work to meet Building Permit requirements.

.6 Administrative Coordination:

.1 Coordinate work of this section to ensure information and material are promptly provided to ensure orderly and expeditious progress of the work, and to comply with schedule for completion.

END OF SECTION

1.1 CONSTRUCTION START-UP MEETING

.1 Promptly after Contract award, Contractor shall establish the time and location of a construction start-up meeting to review and discuss administrative procedures and responsibilities. Contractor shall notify Consultant] at least 5 Working Days before the meeting.

.2 Senior representatives of Owner, Consultant, subconsultants, and Contractor, including Contractor's project manager and site superintendent, and major Subcontractors shall be in attendance.

.3 Consultant's representative will chair the meeting and record and distribute the minutes.

.4 Agenda will include but not be limited to the following topics as are pertinent to the Contract.

.1 Introduction of all parties.

.2 Project communications

.3 Contract Documents for construction purposes.

.4 Project Scope and Requirements (Described by Consultants)

.5 Project Schedule - Identify all critical points on construction schedule for positive action.

.6 Schedule of Values and Cashflow Projections

.7 Consultant / Payment Certifier / Contract Administrator (CA) Roles and Responsibilities

.8 Change Order Process

.9 Project Meetings

.10 Contractors Use of Premises

.1 Required, maintained on site

.2 Temporary utilities.

.3 Existing utility services.

.4 Temporary barriers and enclosures.

.5 Site security.

.6 Cleaning and waste management.

.7 Establish site arrangements and temporary facilities.

.8 Temporary controls

.11 Cash allowances and cash allowance disbursement authorization (CADA).

.12 Submissions and submittal procedures

.13 Authorities Having Jurisdiction (AHJ)

.14 Job Site Documents

.15 Close out procedures and submittals

.5 Kick-Off Meeting minutes:

.1 Consultant will record and distribute to all participants and interested parties, the pre-construction meeting minutes within (5) business days of the date of the meeting.

1.2 CONSTRUCTION PROGRESS MEETINGS

.1 Schedule regular bi-weekly construction progress meetings for the duration of the Work. Contractor shall prepare meeting agendas, chair the meetings, and record and distribute the minutes.

.2 Arrange for and provide physical space for meetings.

.3 Contractor shall record in the meeting minutes significant decisions and identify action items and action dates by attendees or the parties they represent.

.4 Contractor shall distribute copies of minutes within three Working Days after each meeting to attendees and any affected parties who may not be in attendance.

.5 Ensure that Subcontractors attend as and when appropriate to the progress of the Work.

.6 Agenda for each meeting shall include the following, as a minimum:

.1 Approval of minutes of previous meeting.

.2 Work progress since previous meeting.

.3 Field observations, including any problems, difficulties, or concerns.

.4 Construction progress schedule.

.5 Submittals schedule.

.6 Proposed changes in the Work.

.7 Requests for information.

.8 Site safety issues.

.9 Other business.

END OF SECTION

1.1 SUMMARY

.1 This Section specifies Contractor's responsibilities for preparation and submission of schedules and other documentation related to tracking construction progress.

.2 The purpose of submitting progress schedules is to:

.1 Inform Owner and Consultant of actual progress versus planned progress, and

.2 Provide assurance that scheduling issues are being proactively identified and addressed in a timely manner, and that planned progress is being maintained as closely as possible.

1.2 CONSTRUCTION PROGRESS SCHEDULE

.1 Format and Content:

.1 Prepare schedule in the form of a Critical Path Method (CPM) Gantt chart using Microsoft Project or equivalent software as agreed.

.2 Provide a work breakdown structure identifying key activities, work packages, and major milestones, including long delivery Products, inspection and testing activities, preparation and review of mock-ups, Owner decisions for cash allowances, shutdown or closure activities, delivery of Owner supplied Products, Owner performed work, demonstration and training activities, and similar items, at a sufficient level of detail to effectively manage construction progress.

.3 Indicate milestone dates for Ready-for-Takeover and Substantial Performance of the Work.

.2 Submission:

.1 Submit initial schedule to *Owner* and *Consultant* within 15 *Working Days* after *Contract* award via email as .pdf file.

.2 Submit updated progress schedule monthly to Owner and Consultant, indicating actual and projected start and finish dates with report date line and progress, critical path, float, and baseline comparison to current progress.

1.3 SUBMITTALS SCHEDULE

.1 Format and Content:

.1 Prepare schedule identifying all required *Shop Drawing*, *Product* data, and sample submissions, including samples required for testing.

.2 Prepare schedule in electronic format.

.3 Provide a separate line for each required submittal, organized by

Specifications section names and numbers, and further broken down by individual *Products* and systems as required.

.4 For each required submittal, show planned earliest date for initial submittal, earliest date for return of reviewed submittal by *Consultant* and latest date for return of reviewed submittal without causing delay.

.5 Allow time in schedule for resubmission of submittals, should resubmission be necessary.

.2 Submission:

.1 Submit initial schedule to Consultant within 15 Working Days after Contract award via email.

.2 Submit updated submittals schedule monthly to Owner and Consultant.

1.4 SCHEDULE MANAGEMENT

.1 A schedule submitted as specified and accepted by Consultant shall become the baseline schedule and shall be used as the baseline for updates.

.2 At each regular progress meeting, review and discuss current construction progress and submittals schedules with Consultant and Owner, including activities that are behind schedule and planned measures to regain schedule slippage in key areas on or near the critical path.

.3 Activities considered behind schedule are those with start or completion dates later than the dates shown on the baseline schedule.

1.5 RECORDING ACTUAL SITE CONDITIONS ON AS-BUILT DRAWINGS

.1 Obtain from *Consultant* an electronic copy of the construction *Drawings* for the purpose of creating as-built drawings. Record information in electronic form, clearly identifying as-built deviations from the originally obtained construction *Drawings*.

.2 Clearly label each drawing as “AS-BUILT DRAWING”. Record information concurrently with construction progress. Do not conceal *Work* until required information is recorded.

.3 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 pipes, ducts, conduits, outlets, fixtures, access panels, and appurtenances, referenced to visible and accessible features of construction.

.4 Field changes of dimension and detail.

.5 Changes made by Change Orders and Supplemental Instructions

.6 References to Shop Drawings, where Shop Drawings show more detail.

.4 Do not use as-built drawings for construction purposes.

1.6 PROGRESS PHOTOGRAPHS

.1 Arrange for periodic digital photography to document and provide a photographic record of the progress of the *Work*.

.2 Identify each photograph by project name and date taken.

.3 Submission: Submit .jpg format files in standard resolution via project web site monthly.

.4 Do not use progress or any other *Project* photographs for promotional purposes without *Owner*'s written consent.

END OF SECTION

1.1 ADMINISTRATIVE

.1 Submit specified submittals to Consultant for review. Submit with reasonable promptness and in orderly sequence so as to not cause delay in the Work. Failure to submit in ample time is not considered sufficient reason for an extension of Contract Time or for Product substitutions or other deviations from the Drawings and Specifications.

.2 Where required by authorities having jurisdiction, provide submittals to such authorities for review and approval.

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

.4 Present Shop Drawings, Product data, and samples in SI metric units. Where items or information is not produced in SI Metric, converted values are acceptable.

.5 Review submittals, provide verified field measurements where applicable, and affix Contractor's review stamp prior to submission to Consultant. Contractor's review stamp represents that necessary requirements have been determined and verified, and that the submittal has been checked and coordinated with requirements of the Work and Contract Documents.

.6 Verify field measurements and that affected adjacent work is coordinated.

.7 Submittals not meeting specified requirements will be returned with comments.

.8 Reproduction of construction Drawings to serve as background for Shop Drawings is not permitted.

.9 Do not propose Substitutions or deviations from Contract Documents via Shop Drawing, Product data and sample submittals. Proposed alternates must follow the procedures outlined in Sectio 01 25 00.

1.2 SHOP DRAWINGS AND PRODUCT DATA

.1 Indicate Products, methods of construction, and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of the Work.

.2 Where Products attach or connect to other Products, indicate that such items have been coordinated, regardless of Section under which adjacent items will be supplied and Installed. Indicate cross-references to Drawings, Specifications and other already reviewed Shop Drawings.

.3 Accompany submittals with a transmittal information including:

- .1 Date.
- .2 *Project* title and number.
- .3 *Contractor*'s name and address.
- .4 Identification of each submittal item and quantity.
- .5 Other pertinent data.

.4 *Shop Drawing* submittals shall 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, date, and signature of *Contractor*'s authorized representative

responsible for *Shop Drawing* review, indicating that each *Shop Drawing* has been reviewed for compliance with *Contract Documents* and, where applicable, that field measurements have been verified.

.5 Details of appropriate portions of the *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 Relationships to other parts of the *Work*.

.6 *Product* data submittals shall include material safety data sheets (MSDS) for all controlled Products.

.7 Submit electronic copy of *Shop Drawings* where specified in the technical *Specifications*

.8 Submit electronic copy of Product data sheets or brochures where specified in the technical *Specifications*.

.9 Where a submittal includes information not applicable to the *Work,* clearly identify applicable information and strike out non-applicable information.

.10 Supplement standard information to include details applicable to *Project*.

.5 Allow 10 *Working Days* for *Consultant*'s review of each submittal and incorporate in submittals schedule specified in Section 01 32 00 – Construction Progress Documentation. Allow additional 5 *Working Days* where sub-*Consultant r*eview is required.

.6 If upon *Consultant*'s review no errors or omissions are discovered, or if only minor corrections are required as indicated, submittal will be returned and fabrication or installation of *Work* may proceed.

.7 If upon *Consultant*'s review significant errors or omissions are discovered, a so noted copy will be returned for correction and resubmission. Do not commence fabrication or installation.

.8 *Consultant*'s notations on submittals are intended to ensure compliance with *Contract Documents* and are not intended to constitute a change in the *Work* requiring change to the *Contract Price* or *Contract Time*. If *Contractor* considers any *Consultant*'s notation to be a change in the *Work*, promptly notify *Consultant* in writing before proceeding with the *Work*.

.9 Resubmit corrected submittals through same procedure indicated above, before any fabrication or installation of the *Work* proceeds. When resubmitting, notify *Consultant* in writing of any revisions other than those requested by *Consultant*.

1.3 SAMPLES

.1 Submit samples for *Consultant*'s review in triplicate where specified in the technical *Specifications*. Label samples as to origin, *Project* name, and intended use.

.2 Deliver samples prepaid to *Consultant*'s business address.

.3 Notify *Consultant* in writing of any deviations in samples from requirements of *Contract Documents*.

.4 Where a required colour, pattern or texture has not been specified, submit full range of available *Products* meeting other specified requirements.

.5 *Consultant* selection from samples is not intended to change the *Contract Price* or *Contract Time*. If a selection would affect the *Contract Price* or *Contract Time*, notify *Consultant* in writing prior to proceeding with the *Work*.

.6 Resubmit samples as required by *Consultant* to comply with *Contract Documents*.

.7 Reviewed and accepted samples will establish the standard against which installed *Work* will be reviewed.

END OF SECTION

1.1 REFERENCE STANDARDS

.1 “Reference standards” means consensus standards, trade association standards, guides, and other publications expressly referenced in Contract Documents.

.2 Where an edition or version date is not specified, referenced standards shall be deemed to be the latest edition or revision issued by the publisher at the time of bid closing. However if a particular edition or revision date of a specified standard is referenced in an applicable code or other regulatory requirement, the regulatory referenced edition or version shall apply.

.3 Reference standards establish minimum requirements. If Contract Documents call for requirements that differ from a referenced standard, the more stringent requirements shall govern.

.4 If compliance with two or more reference standards is specified and the standards establish different or conflicting requirements, comply with the most stringent requirement. Refer uncertainties to Consultant for clarification.

.5 Within the Specifications, reference may be made to the following standards writing, testing, or certification organizations by their acronyms or initialisms:

.1 AA - Aluminum Association

.2 ACI - American Concrete Institute

.3 AISC - American Institute of Steel Construction

.4 ANSI - American National Standards Institute

.5 ASME - American Society of Mechanical Engineers

.6 ASTM - American Society for Testing and Materials

.7 AWMAC - Architectural Woodwork Manufacturers Association of Canada

.8 AWPA - American Wire Producers Association

.9 CaGBC - Canadian Green Building Council

.10 CGSB - Canadian General Standards Board

.11 CISC - Canadian Institute of Steel Construction

.12 CPCI - Canadian Prestressed Concrete Institute

.13 CSA - Canadian Standards Association

.14 CSSBI - Canadian Sheet Steel Building Institute

.15 CWB – Canadian Welding Bureau

.16 ICEA - Insulated Cable Engineers Association

.17 IEEE - Institute of Electrical and Electronics Engineers

.18 IGMAC – Insulating Glass Manufacturers Association of Canada

.19 LEED - Leadership in Energy and Environmental Design

.20 MPP – Master Painters Institute

.21 MSS - Manufacturers Standardization Society of the Valve and Fittings Industry

.22 NAAMM - National Association of Architectural Metal Manufacturers

.23 NEMA - National Electrical Manufacturers Association

.24 NFPA - National Fire Protection Association

.25 NHLA - National Hardwood Lumber Association

.26 NLGA - National Lumber Grades Authority

.27 SSPC – The Society for Protective Coatings

.28 TTMAC - Terrazzo, Tile and Marble Association of Canada

.29 ULC - Underwriters' Laboratories of Canada

1.2 INDEPENDENT INSPECTION AND TESTING AGENCIES

.1 Except as otherwise specified, Owner will retain and pay for independent inspection and testing agencies to inspect, test, or perform other quality control reviews of parts of the Work.

.2 Retain and pay for inspection and testing that is for Contractor's own quality control or is required by regulatory requirements.

.3 Section 01 21 00 – Allowances specifies a cash allowance for independent inspection and testing services to be retained and paid for by Contractor. Cash allowance excludes any inspection and testing that is for Contractor's own quality control or is required by regulatory requirements.

.4 Employment of inspection and testing agencies by Contractor or Owner does not relieve Contractor from responsibility to perform the Work in accordance with Contract Documents.

.5 Allow and arrange for inspection and testing agencies to have access to the Work, including access to off site manufacturing and fabrication plants.

.6 For inspection and testing required by Contract Documents or by authorities having jurisdiction, provide Consultant and inspection and testing agencies with timely notification in advance of required inspection and testing.

.7 Submit test samples required for testing in accordance with submittals schedule specified in Section 01 32 00 – Construction Progress Documentation.

.8 Provide labour, Construction Equipment and temporary facilities to obtain and handle test samples on site.

1.3 INSPECTION AND TESTING AGENCY REPORTS

.1 For inspection and testing required by *Contract Documents* or by regulatory requirements, and performed by *Contractor* retained inspection and testing agencies, submit to *Consultant* copies of reports. Submit within 3 days after completion of inspection and testing.

.2 For inspection and testing performed by *Owner* retained inspection and testing agencies, copies of inspection and testing agency reports will be provided to *Contractor*.

1.4 MOCK-UPS

.1 Prepare mock-ups of *Work* as specified in the technical *Specifications*. If a mock-up location is not indicated in the *Drawings* or *Specifications*, locate where directed by *Consultant*.

.2 Modify mock-up as required until *Consultant* approval is obtained.

.3 Approved mock-ups establish an acceptable standard for the *Work*.

.4 Protect mock-ups from damage until the *Work* they represent is complete.

.5 Unless otherwise specified in the technical *Specifications*, approved mock-ups forming part of the *Work* may remain as part of the *Work*.

.6 Remove mock-ups only when the *Work* they represent is complete or when otherwise directed by *Consultant*.

END OF SECTION

1 GENERAL

1.1 TEMPORARY WORK

.1 Accept responsibility for all temporary structures and comply with applicable rules and regulations. Pay all taxes and all other charges.

.2 The expression "provide" shall be deemed to include the provision, installation and finishing, maintenance, servicing and removal of the work described. All Work damaged by temporary installations shall be repaired and made good at no expense to the Owner.

1.2 TEMPORARY UTILITIES - GENERAL

.1 Provide temporary utilities as specified and as otherwise necessary to perform the Work expeditiously.

.2 Remove temporary utilities after use.

1.3 TEMPORARY WATER SUPPLY

.1 Separate from water required for fire protection with adequate pressure at every floor, except hose extensions which shall be provided by Subcontractors requiring them.

.2 Water supply shall be potable, available from existing service. Be responsible for the careful and reasonable use of any Owner supplied water.

.3 If large quantity of water is required for the Work, a water meter shall be provided to monitor Contractor's water usage. Provide proof to Consultant of no drop in water pressure in water supply for affected tenant (s) (i.e. Contractors using hydrodemolition method to remove concrete in a project or similar instances).

1.4 TEMPORARY HEATING AND VENTILATION

.1 *Contractor* may connect to and use *Owner*'s existing supply of natural gas for temporary use during construction, subject to existing available volume and pressure. Usage at no cost to *Contractor*.

.2 Vent construction heaters in enclosed spaces to the outside or use flameless type of construction heaters.

.3 Provide temporary heat for the *Work* as required to:

.1 Facilitate progress of *Work*.

.2 Protect the *Work* against dampness and cold.

.3 Prevent moisture condensation on surfaces, freezing, or other damage to finishes or stored *Products*.

.4 Maintain specified minimum ambient temperatures and humidity levels for storage, installation and curing of *Products*.

.5 After building is enclosed, maintain interior temperature of minimum 10 degrees C.

.4 Provide temporary ventilation for the *Work* as required to:

.1 Prevent accumulations of fumes, exhaust, vapours, gases and other hazardous, noxious, or volatile substances in enclosed spaces, as required to maintain a safe work environment meeting applicable regulatory requirements.

.2 Ensure that hazardous, noxious, or volatile substances do not migrate to *Owner* occupied spaces.

.3 Ventilate temporary sanitary facilities.

.4 New permanent building heating and ventilation systems may be used during

construction, at Contractor's option. If used during construction:

.1 *Owner* will pay utility costs resulting from the use of permanent systems.

.2 Operate systems in a non-wasteful and energy efficient manner. Be responsible for any system damage.

.3 Just prior to *Substantial Performance of the Work*, replace filters, and perform other required maintenance to ensure systems are in as near as new condition as possible. Refer also to Division 15 requirements.

.4 Ensure that systems manufacturers' warranties do not commence until the date of *Substantial Performance of the Work* or, if manufacturers' warranties do commence earlier when systems are put into use, arrange for necessary extension of manufacturers' warranties or provide equivalent coverage under *Contractor*'s warranty.

END OF SECTION

1.1 CONTRUCTION FACILITIES - GENERAL

.1 Provide temporary construction facilities as necessary for performance of the *Work* and in compliance with applicable regulatory requirements.

.2 Maintain temporary construction facilities in good condition for the duration of the *Work*.

.3 Remove temporary construction facilities from *Place of the Wor*k when no longer required.

1.2 CONSTRUCTION PARKING

.1 Limited parking will be permitted at *Place of the Work* for up to 5 vehicles during normal working hours, provided it does not disrupt continuing operation of the facility. Outside of normal working hours, parking for an additional 10 vehicles can be provided.

1.3 VEHICULAR ACCESS

.1 Provide and maintain adequate access to Place of the Work.

.2 Existing roads at Place of the Work may be used for access to Place of the Work, provided Contractor assumes responsibility for any damage caused by construction traffic, and prevents or promptly cleans up any mud tracking or material spillage.

1.4 SITE OFFICES

.1 Space within the existing building will be made available to the Contractor for use as a Site Office. It shall be the Contractor's responsibility to keep the space clean, and hand over to Owner at end of project in the same state as originally provided.

1.5 SANITARY FACILITIES

.1 The Contractor will be granted access to a dedicated sanitary facility within the existing building. It shall be the Contractor's responsibility to clean and maintain their dedicated sanitary facility, and return to Owner at project completion in the same condition it was originally granted.

1.6 FIRE PROTECTION

.1 Provide and maintain temporary fire protection systems and equipment during construction. Contractor shall provide firewatch as required; costs for firewatch shall be included in base bid price.

1.7 ELEVATORS

.1 Permanent elevators may be used by construction personnel and for transporting Products, at *Contractor*'s option. If used during construction:

.1 Provide protective coverings for finish surfaces of cars and entrances.

.2 Just prior to *Substantial Performance of the Work*, perform required maintenance to ensure elevators are in as near as new condition as possible.

.3 Ensure that elevator manufacturer's warranty does not commence until the date of *Substantial Performance of the Work* or, if manufacturer's warranty does commence earlier when elevators are put into use, arrange for necessary extension of manufacturer's warranty or provide equivalent coverage under *Contractor*'s warranty.

END OF SECTION

1.1 BARRIERS AND ENCLOSURES - GENERAL

.1 Provide temporary barriers and enclosures necessary to protect the public and building occupants and to secure *Place of the Wor*k during performance of the *Work*.

.2 Comply with applicable regulatory requirements.

.3 Maintain temporary barriers and enclosures in good condition for the duration of the *Work*.

.4 Remove temporary barriers and enclosures from *Place of the Work* when no longer required.

1.2 FENCING

.1 Erect temporary security and safety site fencing, minimum 1.8m high, using self-supporting wire fence sections enclosing applicable portions of site as necessary to maintain safety and security. Maintain site fencing in good repair until removed.

1.3 WEATHER ENCLOSURES

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

.2 Provide weather enclosures to protect floor areas where walls are not finished and to enclose work areas that require temporary heating.

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

1.4 DUST TIGHT PARTITIONS

.1 Provide dust tight wood stud and plywood and/or steel stud and gypsum board partitions to localize interior building areas from dust and noise generating activities.

.2 Erect, maintain, and relocate partitions as required to facilitate construction operations and *Owner*'s operational requirements.

1.5 FIRE ROUTES

.1 Maintain fire access routes, including overhead clearances, for use by emergency response vehicles.

1.6 PROTECTION OF BUILDING FINISHES

.1 Provide necessary temporary barriers and enclosures to protect [existing and] completed or partially completed finished surfaces from damage during performance of the *Work*.

END OF SECTION

1.1 TEMPORARY CONTROLS - GENERAL

.1 Provide temporary controls as necessary for performance of the *Work* and in compliance with applicable regulatory requirements.

.2 Maintain temporary controls in good condition for the duration of the *Work*.

.3 Remove temporary controls and *Construction Equipment* used to provide temporary controls from *Place of the Work* when no longer required.

1.2 DUST AND PARTICULATE CONTROL

.1 Implement and maintain dust and particulate control measures in accordance with applicable regulatory requirements.

.2 Execute *Work* by methods that minimize dust from construction operations and spreading of dust on site or to adjacent properties.

.3 Provide temporary enclosures to prevent extraneous materials resulting from sandblasting or similar operations from contaminating air beyond immediate work area.

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

.5 Use appropriate covers on trucks hauling fine, dusty, or loose materials.

1.3 DEWATERING

.1 Provide temporary drainage and pumping as necessary to dewater excavations, trenches, foundations, and other parts of the *Work*. Maintain such areas free of water arising from groundwater or surface run-off, as required to keep them stable, dry, and protected from damage due to flooding.

.2 Maintain standby equipment necessary to ensure continuous operation of dewatering system.

.3 Do not pump water containing suspended materials or other harmful substances into waterways, sewers or surface drainage systems. Treat or dispose of such water in accordance with applicable regulatory requirements

1.4 SITE DRAINAGE

.1 Maintain grades to ensure proper site drainage.

.2 Prevent surface water runoff from leaving the site.

.3 Prevent precipitation from infiltrating or from directly running off stockpiled materials. Cover stockpiled materials with an impermeable liner during periods of work stoppage including at end of each *Working Day*.

.4 Control surface drainage from cuts and fills, from borrow and waste disposal areas, from stockpiles, staging areas, and other work areas as required to prevent erosion and sedimentation.

.5 Control surface drainage by ensuring that gutters are kept open and water is not directed across or over pavements or sidewalks, except through pipes or properly constructed troughs. Ensure that runoff from unfinished areas is intercepted and diverted to suitable outlets.

1.5 EROSION AND SEDIMENT CONTROL

.1 Minimize amount of bare soil exposed at one time. Stabilize disturbed soils as quickly as practical to minimize erosion. Remove accumulated sediment resulting from construction activity from adjoining surfaces, drainage systems, and watercourses, and repair damage caused by soil erosion and sedimentation.

.2 Provide and maintain appropriate temporary measures such as silt fences, straw bales, ditches, geotextiles, drains, berms, terracing, riprap, temporary drainage piping,

sedimentation basins, vegetative cover, dikes, and other measures that may be required to prevent erosion and migration of silt, mud, sediment, and other debris.

.3 Do not disturb existing embankments or embankment protection.

.4 Periodically inspect erosion and sediment control measures to detect evidence of erosion and sedimentation. Promptly take corrective measures when necessary.

.5 If soil and debris from site accumulate in ditches or other low areas, remove accumulation and restore area to original condition.

1.6 POLLUTION CONTROL

.1 Take measures to prevent contamination of soil, water, and atmosphere through uncontrolled discharge of noxious or toxic substances and other pollutants, potentially causing environmental damage.

.2 Be prepared, by maintaining appropriate materials, equipment, and trained personnel on site, to intercept, clean up, and dispose of spills or releases that may occur. Promptly report spills and releases that may occur to:

.1 authority having jurisdiction,

.2 person causing or having control of pollution source, if known, and

.3 *Owner* and *Consultant*.

.4 Contact manufacturer of pollutant, if known and applicable, to obtain material safety data sheets (MSDS) and ascertain hazards involved and precautions and measures required in cleanup or mitigating actions.

.5 Take immediate action to contain and mitigate harmful effects of the spill or release.

END OF SECTION

1.1 GENERAL

.1 Provide *Products* that are not damaged or defective, and suitable for purpose intended, subject to specified requirements. If requested by *Consultant*, furnish evidence as to type, source and quality of *Products* provided.

.2 Unless otherwise specified, maintain uniformity of manufacture for like items throughout.

.3 Permanent manufacturer's markings, labels, trademarks, and nameplates on *Products* are not acceptable in prominent locations, except where required by regulatory requirements or for operating instructions, or when located in mechanical or electrical rooms.

1.2 PRODUCT AVAILABILITY AND DELIVERY TIMES

.1 Promptly upon Contract award and periodically during construction, review and confirm *Product* availability and delivery times. Order *Products* in sufficient time to meet the construction progress schedule and the *Contract Time*.

.2 If a specified *Product* is no longer available, promptly notify *Consultant*. *Consultant* will take action as required.

.3 If delivery delays are foreseeable, for any reason, promptly notify *Consultant*.

.1 If a delivery delay is beyond *Contractor*'s control, *Consultant* will provide direction.

.2 If a delivery delay is caused by something that was or is within *Contractor*'s control, *Contractor* shall propose actions to maintain the construction progress schedule for *Consultant*'s review and acceptance.

1.3 STORAGE, HANDLING, AND PROTECTION

.1 Store, handle, and protect *Products* during transportation to *Place of the Work* and before, during, and after installation in a manner to prevent damage, adulteration, deterioration and soiling.

.2 Comply with manufacturer's instructions for storage, handling and protection.

.3 Store packaged or bundled *Products* in original and undamaged condition with manufacturer's seals and labels intact. Do not remove from packaging or bundling until required in *Work*.

.4 Comply with the requirements of the workplace hazardous materials information system (WHMIS) regarding use, handling, storage, and disposal of hazardous materials, including requirements for labeling and the provision of material safety data sheets (MSDS).

.5 Store *Products* subject to damage from weather in weatherproof enclosures.

.6 Store sheet *Products* on flat, solid, supports and keep clear of ground. Slope to shed moisture.

.7 Remove and replace damaged *Products*.

END OF SECTION

1.1 SURVEYOR QUALIFICATIONS

.1 Engage a registered land surveyor, licensed to practice in *Place of the Work*.

1.2 SUBMITTALS

.1 Submit name and address of registered land surveyor performing survey work.

.2 Submit to *Owner* and *Consultant* the survey of the *Work* prepared and issued by a registered land surveyor on completion of the building footings and foundations and on completion of the *Work*.

1.3 SURVEY REFERENCE POINTS

.1 Locate and confirm permanent reference points prior to starting site work. Preserve and protect permanent reference points on site during construction.

.2 Do not change or relocate reference points without prior written notice to *Consultant*.

.3 Report to *Consultant* when a reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations. Require registered land surveyor to replace reference points in accordance with original survey.

1.4 SURVEY REQUIREMENTS

.1 Establish sufficient permanent benchmarks on site, referenced to established benchmarks by survey control points.

.2 Confirm that existing survey reference points are in accordance with *Owner*'s survey and property limits.

.3 Establish initial lines and levels for building layout.

.4 Maintain a complete, accurate log of control and survey work as it progresses. Record locations with horizontal and vertical data in project record documents.

1.5 EXISTING UTILITIES AND STRUCTURES

.1 Before commencing excavation, drilling or other earthwork, establish or confirm location and extent of all existing underground utilities and structures in work area.

.2 Promptly notify *Consultant* if underground utilities, structures, or their locations differ from those indicated in *Contract Documents* or in available project information. *Consultant* will provide appropriate direction.

.3 Record locations of maintained, re-routed and abandoned utility lines.

1.6 VERIFICATION OF EXISTING CONDITIONS

.1 Where work specified in any Section is dependent on the work of another Section or Sections having been properly completed, verify that work is complete and in a condition suitable to receive the subsequent work. Commencement of work of a Section that is dependent on the work of another Section or Sections having been properly completed, means acceptance of the existing conditions.

.2 Verify that ambient conditions are suitable before commencing the work of any Section and will remain suitable for as long as required for proper setting, curing, or drying of *Products* used.

.3 Ensure that substrate surfaces are clean, dimensionally stable, cured and free of contaminants.

.4 Notify *Consultant* in writing of unacceptable conditions.

END OF SECTION

1.1 SUMMARY

.1 Except where otherwise specified in technical *Specifications* or otherwise indicated on *Drawings*, comply with requirements of this Section.

1.2 MANUFACTURER'S INSTRUCTIONS

.1 Install, erect, or apply *Products* in strict accordance with manufacturer's instructions.

.2 Notify *Consultant*, in writing, of conflicts between *Contract Documents* and manufacturer's instructions where, in *Contractor*'s opinion, conformance with *Contract Documents* instead of the manufacturer's instructions may be detrimental to the *Work* or may jeopardize the manufacturer's warranty.

.3 Do not rely on labels or enclosures provided with *Products*. Obtain written instructions directly from manufacturers.

.4 Provide manufacturer's representatives with access to the *Work* at all times. Render assistance and facilities for such access so that manufacturer's representatives may properly perform their responsibilities.

1.3 CONCEALMENT

.1 Conceal pipes, ducts, and wiring in floors, walls and ceilings in finished areas:

.1 after review by *Consultant* and authority having jurisdiction, and

.2 where locations differ from those shown on *Drawings*, after recording actual locations on as-built drawings.

.2 Provide incidental furring or other enclosures as required.

.3 Notify *Consultant* in writing of interferences before installation.

1.4 FASTENINGS - GENERAL

.1 Provide metal fastenings and accessories in same texture, colour and finish as adjacent materials.

.2 Prevent electrolytic action and corrosion between dissimilar metals and materials by using suitable non-metallic strips, washers, sleeves, or other permanent separators to avoid direct contact.

.3 Use non-corrosive fasteners and anchors for securing exterior work [and in spaces where high humidity levels are anticipated].

.4 Space anchors within individual load limit or shear capacity and ensure they provide positive permanent anchorage.

.5 Keep exposed fastenings to a minimum, space evenly and install neatly.

.6 Do not use fastenings or fastening methods that may cause spalling or cracking of material to which anchorage is made.

1.5 FASTENINGS - EQUIPMENT

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

.2 Bolts shall not project more than one diameter beyond nuts.

1.6 FIRE RATED ASSEMBLIES

.1 When penetrating fire rated walls, ceiling, or floor assemblies, completely seal voids with fire-stopping materials, smoke seals, or both, in full thickness of the construction element as required to maintain the integrity of the fire rated assembly.

1.7 LOCATION OF FIXTURES, OUTLETS AND DEVICES

.1 Consider location of fixtures, outlets, and devices indicated on *Drawings* as approximate.

.2 Locate fixtures, outlets, and devices to provide minimum interference, maximum usable space, and as required to meet safety, access, maintenance, acoustic, and regulatory, including barrier free, requirements.

.3 Promptly notify *Consultant* in writing of conflicting installation requirements for fixtures, outlets, and devices. If requested, indicate proposed locations and obtain approval for actual locations.

1.8 PROTECTION OF COMPLETED WORK AND WORK IN PROGRESS

.1 Adequately protect parts of the *Work* completed and in progress from any kind of damage.

.2 Promptly remove, replace, clean, or repair, as directed by *Consultant,* work damaged as a result of inadequate protection.

.3 Do not load or permit to be loaded any part of the *Work* with a weight or force that will endanger the safety or integrity of the *Work*.

1.9 REMEDIAL WORK

.1 Notify *Consultant* of, and perform remedial work required to, repair or replace defective or unacceptable work. Ensure that properly qualified workers perform remedial work. Coordinate adjacent affected work as required.

END OF SECTION

1.1 REQUEST FOR CUTTING, PATCHING AND REMEDIAL WORK

.1 Submit written request in advance of cutting, coring, or alteration which affects or is likely to affect:

.1 Structural integrity of any element of the Work.

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

.3 Efficiency, maintenance, or safety of any operational element.

.4 Visual qualities of sight-exposed elements.

.5 Work of *Owner* or other contractors.

.6 Warranty of *Products* affected.

.2 Include in request:

.1 Identification of *Project*.

.2 Location and description of affected work, including drawings or sketches as required.

.3 Statement on necessity for cutting or alteration.

.4 Description of proposed work, and *Products* to be used.

.5 Alternatives to cutting and patching.

.6 Effect on work of *Owner* or other contractors.

.7 Written permission of affected other contractors.

.8 Date and time work will be executed.

1.2 PRODUCTS

.1 Unless otherwise specified, when replacing existing or previously installed Products in the course of cutting and patching work, use replacement Products of the same character and quality as those being replaced.

.2 If an existing or previously installed Product must be replaced with a different Product, submit request for substitution in accordance with Section 01 25 00 - Substitution Procedures.

1.3 PREPARATION

.1 Inspect existing conditions in accordance with Section 01 71 00 - Examination and Preparation.

.2 Provide supports to ensure structural integrity of surroundings; provide devices and methods to protect other portions of the *Work* from damage.

.3 Provide protection from elements for areas that may be exposed by uncovering work.

1.4 EXISTING UTILITIES

.1 When breaking into or connecting to existing services' utilities, execute the Work at times directed by local governing authorities, with a minimum of disturbance to the Work, pedestrian and vehicular traffic, and ongoing Owner operations.

.2 Maintain excavations free of water.

.3 Keep duration of interruptions to a minimum.

.4 Carry out interruptions after regular working hours of occupants, preferably on weekends, unless Owner's prior written approval is obtained.

.5 Protect and maintain existing active services. Record location of services, including depth, on as-built drawings.

.6 Construct or erect barriers in accordance with Section 01 56 00 - Temporary Barriers and Enclosures as required to protect pedestrian and vehicular traffic.

1.5 CUTTING, PATCHING, AND REMEDIAL WORK

.1 Coordinate and perform the *Work* to ensure that cutting and patching work is kept to a minimum.

.2 Perform cutting, fitting, patching, and remedial work [including excavation and fill,] to make the affected parts of the *Work* come together properly and complete the *Work*.

.3 Provide openings in non-structural elements of the *Work* for penetrations of mechanical and electrical work.

.4 Perform cutting by methods to avoid damage to other work

.5 Provide proper surfaces to receive patching, remedial work, and finishing.

.6 Perform cutting, patching, and remedial work using competent and qualified specialists familiar with the *Products* affected, in a manner that neither damages nor endangers the *Work*.

.7 Do not use pneumatic or impact tools without *Consultant*'s prior approval.

.8 Ensure that cutting, patching, and remedial work does not jeopardize manufacturers' warranties.

.9 Refinish surfaces to match adjacent finishes. For continuous surfaces refinish to nearest intersection. For an assembly, refinish entire unit.

.10 Fit work to pipes, sleeves, ducts, conduit, and other penetrations through surfaces with suitable allowance for deflection, expansion, contraction, acoustic isolation, and firestopping.

.11 Maintain fire ratings of fire rated assemblies where cutting, patching, or remedial work is performed. Completely seal voids or penetrations of assembly with firestopping material to full depth or with suitably rated devices.

END OF SECTION

1.1 REGULATORY REQUIREMENTS

.1 Comply with applicable regulatory requirements when disposing of waste materials.

.2 Obtain permits from authorities having jurisdiction and pay disposal fees where required for disposal of waste materials and recyclables.

1.2 GENERAL CLEANING REQUIREMENTS

.1 Provide adequate ventilation during use of volatile or noxious substances. Do not rely on building ventilation systems for this purpose.

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

.3 Prevent cross-contamination during the cleaning process.

.4 Notify the *Consultant* of the need for cleaning caused by *Owner* or other contractors.

1.3 PROGRESSIVE CLEANING AND WASTE MANAGEMENT

.1 Maintain the *Work* in a tidy and safe condition, free from accumulation of waste materials and construction debris.

.2 Provide appropriate, clearly marked, containers for collection of waste materials and recyclables. Location of containers to be agreed with Owner.

.3 Remove waste materials and recyclables from work areas, separate, and deposit in designated containers at end of each *Working Day*. Collect packaging materials for recycling or reuse.

.4 Remove waste materials and recyclables from *Place of the Work* at regular intervals.

.5 Clean interior building areas prior to start of finish work and maintain free of dust and other contaminants during finishing operations.

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

1.4 FINAL CLEANING

.1 Before final cleaning, arrange a meeting at *Place of the Work* to determine the acceptable standard of cleaning. Ensure that *Owner*, *Contractor* and cleaning company are in attendance.

.2 Remove from *Place of the Work* surplus *Products*, waste materials, recyclables, *Temporary Work*, and *Construction Equipment* not required to perform any remaining work.

.3 Remove dust from lighting reflectors, lenses, lamps, bulbs, and other lighting surfaces.

.4 Vacuum clean and dust exposed wall, floor, and ceiling surfaces, behind grilles, louvres and screens, above suspended ceiling tiles.

.5 Clean mechanical, electrical, and other equipment. Replace filters for mechanical

equipment if equipment is used during construction.

.6 Remove waste material and debris from crawlspaces and other accessible concealed spaces.

.7 Remove stains, spots, marks, and dirt from exterior facades.

.8 Clean exterior and interior window glass and frames.

.9 Clean and sweep roofs, clear roof drains and downspouts.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Dispose of waste materials and recyclables at appropriate municipal landfills and recycling facilities in accordance with applicable regulatory requirements.

.2 Do not burn or bury waste materials at Place of the Work.

.3 Do not dispose of volatile and other liquid waste such as mineral spirits, oil, paints and other coating materials, paint thinners, cleaners, and similar materials together with dry waste materials or on the ground, in waterways, or in storm or sanitary sewers. Collect such waste materials in appropriate covered containers, promptly remove from Place of the Work, and dispose of at recycling facilities or as otherwise permitted by applicable regulatory requirements.

.4 Cover or wet down dry waste materials to prevent blowing dust and debris.

END OF SECTION

1.1 READY-FOR-TAKEOVER

.1 The prerequisites to attaining Ready-for-Takeover of the Work are described in the General Conditions of the Contract.

1.2 INSPECTION AND REVIEW BEFORE READY-FOR-TAKEOVER

.1 Contractor's Inspection: Before applying for the Consultant's review to establish Ready-for-Takeover of the Work:

.1 Ensure that the specified prerequisites to Ready-for-Takeover of the Work are completed.

.2 Conduct an inspection of the Work to identify defective, deficient, or incomplete work.

.3 Prepare a comprehensive and detailed list of items to be completed or corrected.

.4 Provide an anticipated schedule and costs for items to be completed or corrected.

.2 Consultant's Review: Upon receipt of the Contractor's application for review, together with the Contractor's list of items to be completed or corrected, the Consultant will review the Work. The Consultant will advise the Contractor whether or not the Work is Ready-for-Takeover and will provide the Contractor with a list of items, if any, to be added to the Contractor's list of items to be completed or corrected. Provide the Consultant with a copy of the Contractor's revised list.

.3 Maintain the list of items to be completed or corrected and promptly correct or complete defective, deficient and incomplete work. The Contractor's inspection and Consultant's review procedures specified above shall be repeated until the Work is Ready-for-Takeover and no items remain on the Contractor's list of items to be completed or corrected.

.4 When the Consultant determines that the Work is Ready-for-Takeover, the Consultant will notify the Contractor and the Owner in writing to that effect.

1.3 PREREQUISITES TO FINAL PAYMENT

.1 After Ready-for-Takeover of the Work and before submitting an application for final payment in accordance with the General Conditions of Contract:

.1 Correct or complete all remaining defective, deficient, and incomplete work.

.2 Remove from the Place of the Work all remaining surplus Products, Construction Equipment, and Temporary Work.

.3 Perform final cleaning and waste removal necessitated by the Contractor's work performed after Ready-for-Takeover, as specified in Section 01 74 00 – Cleaning and Waste Management.

1.4 PARTIAL USER OCCUPANCY

.1 If partial Owner occupancy of a part of the Work is required before the date of

Ready-for-Takeover of the entire Work of the Contract, the provisions of this Section shall apply, to the extent applicable, to that part of the Work that the Owner intends to occupy.

1.5 SUBSTANTIAL PERFORMANCE OF THE WORK

.1 The prerequisites to, and the procedures for, attaining substantial performance of the Work, or similar such milestone as provided for in the lien legislation applicable to the Place of the Work, shall be:

.1 independent of those for attaining Ready-for-Takeover of the Work, and

.2 in accordance with the lien legislation applicable to the Place of the Work.

END OF SECTION

1.1 OPERATION AND MAINTENANCE MANUAL

.1 Prepare a comprehensive operation and maintenance manual, in the language of the Contract, using personnel qualified and experienced for this task.

.2 Submit an initial draft of the operation and maintenance manual for *Consultant*'s review. If required by *Consultant*'s review comments, revise manual contents and resubmit for *Consultant*'s review. If required, repeat this process until *Consultant* accepts the draft manual in writing.

.3 Submit final version to *Owner* in electronic format.

1.2 OPERATION AND MAINTENANCE MANUAL FORMAT

.1 Provide electronic copy of manual in PDF format.

.2 Provide electronic copy of Shop Drawings in manual as CAD files in.dwg format on electronic media acceptable to Owner.

1.3 OPERATION AND MAINTENANCE MANUAL – GENERAL CONTENT

.1 Table of contents for each volume.

.2 Introductory information including:

.1 Date of manual submission.

.2 Complete contact information for *Consultant*, subconsultants, other consultants, and *Contractor*, with names of responsible parties.

.3 Schedule of *Products* and systems indexed to content of volume.

.3 For each *Product* or system, include complete contact information for *Subcontractors*, *Suppliers* and manufacturers, including local sources for supplies and replacement parts.

.4 *Product* Data: mark each sheet to clearly identify specific products, options, and component parts, and data applicable to installation. Delete or strike out inapplicable information. Supplement with additional information as required.

.5 Reviewed *Shop Drawings*.

.6 Permits, certificates, letters of assurance and other relevant documents issued by or required by authorities having jurisdiction.

.7 Warranties.

.8 Operating and maintenance procedures, incorporating manufacturer's operating and maintenance instructions, in a logical sequence.

.9 Training materials as specified in Section 01 79 00 - Demonstration and Training.

1.4 OPERATION AND MAINTENANCE MANUAL - EQUIPMENT AND SYSTEMS CONTENT

.1 Each Item of Equipment and Each System: include description of unit or system

and component parts. Give function, normal operation characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.

.2 Panel Board Circuit Directories: provide electrical service characteristics, controls, and communications.

.3 Include installed colour coded wiring diagrams.

.4 Operating Procedures: include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.

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

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

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

.8 Include sequence of operation by controls manufacturer.

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

.10 Provide installed control diagrams by controls manufacturer.

.11 Provide Contractor's coordination drawings, with installed colour coded piping diagrams.

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

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

.14 Include testing and balancing reports.

.15 Include additional content as specified in technical Specifications sections.

1.5 OPERATION AND MAINTENANCE MANUAL - PRODUCTS AND FINISHES CONTENT

.1 Include *Product* data, with catalogue number, options selected, 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 Include an outline of requirements for routine and special inspections and for regular maintenance to ensure that on-going performance of the building envelope will meet the initial building envelope criteria.

.4 Include additional content as specified in technical *Specifications* sections.

1.6 OPERATION AND MAINTENANCE MANUAL - WARRANTIES CONTENT

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

.2 List each warrantor with complete contact information.

.3 Verify that documents are in proper form and contain full information. Ensure that warranties are for the correct duration and are in *Owner*'s name.

1.7 CONTRACTOR'S AS-BUILT DRAWINGS

.1 Submit final as-built drawings in the form specified in Section 01 32 00 – Construction Progress Documentation to Consultant.

1.8 PROJECT RECORD DRAWINGS

.1 Transfer all information marked up on the as-built drawings during the progress of the *Work* to a master set of record drawing files provided by *Consultant*, in CAD format.

.2 Mark revised drawings as "RECORD DRAWINGS".

.3 Submit completed record drawings in electronic form to *Owner*.

1.9 SPARE PARTS, MAINTENANCE MATERIALS, AND SPECIAL TOOLS

.1 Supply spare parts, maintenance materials, and special tools in quantities specified in technical *Specifications* sections.

.2 Ensure spare parts and maintenance materials are new, not damaged nor defective, and of same quality, manufacturer, and batch or production run as installed *Products*.

.3 Provide tags for special tools identifying their function and associated *Product*.

.4 Deliver to and store items at location directed by *Owner* at *Place of the Work*. Store in original packaging with manufacturer's labels intact and in a manner to prevent damage or deterioration.

.5 Catalogue all items and submit to *Consultant* an inventory listing organized by *Specifications* section. Include *Consultant* reviewed inventory listing in operation and maintenance manual.

END OF SECTION

1.1 SUMMARY

.1 Demonstrate and provide training to *Owner*'s personnel on operation and maintenance of equipment and systems prior to scheduled date of *Ready-for-Takeover of the Work*.

.2 *Owner* will provide list of personnel to receive training and will coordinate their attendance at agreed upon times.

.3 Coordinate and schedule demonstration and training provided by *Subcontractors* and *Suppliers*.

1.2 SUBMITTALS

.1 Submit proposed dates, times, durations, and locations for demonstration and training of each item of equipment and each system for which demonstration and training is required. Allow sufficient time for training and demonstration for each item of equipment or system, or time as may be specified in technical *Specifications*.

.2 *Consultant* and *Owner* will review submittal and advise *Contractor* of any necessary revisions.

.3 Submit report(s) within 5 *Working Days* after completion of demonstration and training:

.1 identifying time and date of each demonstration and training session,

.2 summarizing the demonstration and training performed, and

.3 including a list of attendees.

1.3 PREREQUISITES TO DEMONSTRATION AND TRAINING

.1 Testing, adjusting, and balancing has been performed in accordance with *Contract Documents*.

.2 Equipment and systems are fully operational.

.3 Copy of completed operation and maintenance manual is available for use in demonstration and training.

.4 Conditions for demonstration and training comply with requirements specified in technical *Specifications*.

1.4 DEMONSTRATION AND TRAINING

.1 Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, and maintenance of each item of equipment and system.

.2 Review operation and maintenance manual in detail to explain all aspects of operation and maintenance.

.3 Prepare and insert additional information in operation and maintenance manual if required.

END OF SECTION

1.1 GENERAL

.1 The Contractor must provide all labour, materials, products, equipment and services for commissioning of all building systems to ensure building is operating according to requirements of Contract Documents.

1.2 CONTRACTOR RESPONSIBILITIES

.1 Prepare each system ready for commissioning. Verify systems installation is complete and in operation.

.2 Coordinate commissioning with and assist commissioning agency.

.3 Perform and document verification, performance testing, adjusting, and balancing operations.

.4 Cooperate with commissioning agency and provide access to equipment and systems.

.5 Provide personnel and operate systems at designated times, and under conditions required for proper commissioning.

.6 Make instruments available to commissioning agency to facilitate spot checks during commissioning.

.7 Participate in commissioning meetings.

.8 Complete commissioning forms as requested by commissioning agency.

.9 Correct deficiencies identified in commissioning process.

.10 Incorporate commissioning data into operation and maintenance manual.

.11 Ensure that commissioning agency participates in demonstration and training as specified in Section 01 79 00 – Demonstration and Training.

END OF SECTION

1 General

1.1 SUMMARY

.1 Review drawings, site conditions, and other specification sections to ascertain the extent and nature of work of this section.

.2 The Work of this Section includes, but is not limited to the following:

.1 Demolish and removal of the following, where indicated on the Drawings:

.1 Soil and sod;

.2 Tress, stumps and roots;

.3 Cast-in-place concrete;

.4 Pre-cast concrete pavers

.5 Pressure treated step retaining walls;

.6 Pressure treated timber curbs;

.7 Wrought iron, wood and metal fencing;

.8 Light standards;

.9 Steel handrails.

.2 Dispose of demolished materials except where required to be salvaged or reused.

.3 Refer to demolition notes indicated on all disciplines Drawings.

.4 Payment for salvage, stockpiling, sealing, disposal, recycling, excavating and backfilling will be included in above removal items.

.5 Measure removal of waste, and materials designated for alternate disposal from site in tonnes.

.3 Drawings contain details that suggest directions for solving some of the major demolition and removal requirements for this project; Contractor is required to develop these details further by submitting a demolition plan prepared by a professional engineer employed by the Contractor.

1.2 REFERENCE STANDARDS

.1 American National Standards Institute (ANSI):

.1 ANSI A10.8-2011, Scaffolding Safety Requirements

.2 Canadian Standards Association (CSA):

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

.3 National Fire Protection Association (NFPA):

.1 NFPA 241-09, Standard for Safeguarding Construction, Alteration, and Demolition Operations

.4 Provincial Legislation:

.1 Legislation specific to Authority Having Jurisdiction for work governed by this Section.

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

.1 Material Safety Data Sheets (MSDS).

.6 Transport Canada (TC)

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

1.3 DEFINITIONS

.1 Demolish: Detach items from existing construction and legally dispose of them off site, unless indicated to be removed and salvaged or removed and reinstalled.

.2 Remove and Salvage: Detach items from existing construction and deliver them to Owner ready for reuse.

.3 Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.

.4 Existing to Remain: Existing items of construction that are not removed and that are not otherwise indicated as being removed, removed and salvaged, or removed and reinstalled.

.5 Hazardous Materials: dangerous substances, dangerous goods, hazardous commodities and hazardous products, may include but not limited to: asbestos PCB's, CFC's, HCFC's poisons, corrosive agents, flammable substances, ammunition, explosives, radioactive substances, or other material that can endanger human health or well being or environment if handled improperly.

.6 Waste Audit (WA): detailed inventory of materials in building. Indicates quantities of reuse, recycling and landfill.

.1 Involves quantifying by volume/weight amounts of materials and wastes generated during construction, demolition, deconstruction, or renovation project.

.2 Indicates quantities of reuse, recycling and landfill.

.7 Waste Reduction Workplan (WRW): written report which addresses opportunities for reduction, reuse, or recycling of materials. WRW is based on information acquired from WA.

1.4 ADMINISTRATIVE REQUIREMENTS

.1 Site Meetings.

.1 Convene pre-demolition meeting one week prior to beginning work of this Section in accordance with Division 01, to:

.1 Verify project requirements.

.2 Review installation and substrate conditions.

.3 Co-ordination with other building subtrades.

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

.2 Arrange for site visit with Consultant, to examine existing site conditions adjacent to demolition work, prior to start of Work.

.3 Hold project meetings weekly, unless otherwise agreed upon by the Consultant and the Contractor.

.4 Reporting Requirements: Contractor to complete.

.5 Provide verbal reporting on status of waste diversion activity at each meeting.

.6 Consultant will provide written notification of change of meeting schedule established upon contract award 24 hours prior to scheduled meeting.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Division 01.

.2 Shop Drawings:

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

.2 Submit for approval drawings, diagrams or details showing sequence of demolition work and supporting structures and underpinning, where required by authorities having jurisdiction.

.3 Certificates:

.1 Submit copies of certified receipts from authorized disposal sites and reuse and recycling facilities for material removed from site on monthly basis.

.2 Written authorization from Consultant is required to deviate from haulers and receiving facilities listed in Waste Reduction Workplan.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Store and manage hazardous materials in accordance with Division 01.

.2 Storage and Protection.

.1 Protect in accordance with Section 31 23 33 Excavation, Trenching and Backfilling.

.2 Protect existing items designated to remain and items designated for salvage. In event of damage to such items, immediately replace or make repairs to approval of Consultant and at no cost to the Owner.

.3 Remove and store materials to be salvaged, in manner to prevent damage.

.4 Store and protect in accordance with requirements for maximum preservation of material.

.5 Handle salvaged materials as new materials.

.3 Develop Waste Reduction Workplan related to Work of this Section and in accordance with Division 01.

1.7 SITE CONDITIONS

.1 Site Environmental Requirements.

.1 Ensure that selective demolition work does not adversely affect adjacent watercourses, groundwater and wildlife, or contribute to excess air and noise pollution.

.2 Do not dispose of waste of volatile materials including but not limited to, mineral spirits, oil, petroleum based lubricants, or toxic cleaning solutions into watercourses, storm or sanitary sewers.

.1 Ensure proper disposal procedures are maintained throughout the project.

.3 Do not pump water containing suspended materials into watercourses, storm or sanitary sewers or onto adjacent properties.

.4 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authorities, as directed by Consultant.

.5 Protect trees, plants and foliage on site and adjacent properties where indicated.

2 Products

2.1 EQUIPMENT

.1 Leave machinery running only while in use, except where extreme temperatures prohibit shutting machinery down.

3 Execution

3.1 PREPARATION

.1 Inspect site with Consultant and verify extent and location of items designated for removal, disposal, alternative disposal, recycling, salvage and items to remain.

.2 Locate and protect utilities. Preserve active utilities traversing site in operating condition.

.3 Notify and obtain approval of utility companies before starting demolition.

3.2 REMOVAL OF HAZARDOUS WASTES

.1 Remove contaminated or dangerous materials 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.

3.3 REMOVAL OPERATIONS

.1 Remove items as indicated.

.2 Do not disturb items designated to remain in place.

.3 Removal of pavements, curbs and gutters:

.1 Square up adjacent surfaces to remain in place by saw cutting or other method approved by Consultant.

.2 Protect adjacent joints and load transfer devices.

.3 Protect underlying and adjacent granular materials.

.4 Prevent contamination with base course aggregates, when removing asphalt pavement for subsequent incorporation into hot mix asphalt concrete paving,

.5 Excavate at least 300mm below pipe invert, when removing pipes under existing or future pavement area.

.6 Remove designated trees during site demolition.

.1 Obtain written approval of Consultant prior to removal of trees not designated.

.7 Stockpile topsoil for final grading and landscaping:

.1 Provide erosion control and seeding if not immediately used.

.8 Disposal of Material:

.1 Dispose of materials not designated for salvage or reuse on site at authorized facilities approved in Waste Reduction Workplan.

3.4 STOCKPILING

.1 Label stockpiles, indicating material type and quantity.

.2 Designate appropriate security resources/measures to prevent vandalism, damage and theft.

.3 Locate stockpiled materials convenient for use in new construction to eliminate double handling wherever possible.

.4 Stockpile materials designated for alternate disposal in location which facilitates removal from site and examination by potential end markets, and which does not impede disassembly, processing, or hauling procedures.

3.5 REMOVAL FROM SITE

.1 Remove stockpiled material as directed by Consultant, when it interferes with operations of project.

.2 Remove stockpiles of like materials by alternate disposal option once collection of materials is complete.

.3 Transport material designated for alternate disposal using approved facilities and haulers listed in Waste Reduction Workplan, and in accordance with applicable regulations.

.4 Dispose of materials not designated for alternate disposal in accordance with applicable regulations.

.1 Disposal Facilities: approved and listed in Waste Reduction Workplan.

3.6 RESTORATION

.1 Restore areas and existing works outside areas of demolition to conditions that existed prior to beginning of Work.

.2 Use soil treatments and procedures which are not harmful to health, are not injurious to plants, and do not endanger wildlife, adjacent water courses or ground water.

3.7 CLEANING

.1 Progress Cleaning: Clean in accordance with Division 01.

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

.2 Remove debris, trim surfaces and leave work site clean, upon completion of Work

.3 Use cleaning solutions and procedures which are not harmful to health, are not injurious to plants, and do not endanger wildlife, adjacent water courses or ground water.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Division 01.

.3 Waste Management: separate waste materials for reuse or recycling in accordance with Division 01.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.8 PROTECTION

.1 Repair damage to adjacent materials or property caused by selective site demolition.

END OF SECTION

1 General

1.1 SUMMARY

.1 Review drawings, site conditions, and other specification sections to ascertain the extent and nature of work of this section.

.2 The Work of this Section includes, but is not limited to the following:

.1 Demolish and removal of the following where indicated on the Drawings:

.1 Concrete slabs;

.2 Masonry

.3 Structural steel;

.4 Drywall/steel stud partitions/assemblies

.5 Doors, frames and associated hardware;

.6 Roofing and roof ballast

.7 Exterior mechanical equipment and cap weather tight.

.2 Disconnect/cap existing service in areas of demolition.

.3 Trace, demolish and remove decommissioned mechanical and electrical services found during demolition. Remove decommissioned services to the area of demolition to the source, leaving no buried services in walls and floors, unless otherwise approved by written notice from the Owner.

.4 Dispose of demolished materials except where required to be salvaged or reused.

.5 Refer to demolition notes indicated on all disciplines Drawings.

.3 Drawings contain details that suggest directions for solving some of the major demolition and removal requirements for this project; Contractor is required to develop these details further by submitting a demolition plan prepared by a professional engineer employed by the Contractor.

1.2 REFERENCE STANDARDS

.1 American National Standards Institute (ANSI):

.1 ANSI A10.8-2011, Scaffolding Safety Requirements

.2 Canadian Standards Association (CSA):

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

.3 National Fire Protection Association (NFPA):

.1 NFPA 241-09, Standard for Safeguarding Construction, Alteration, and Demolition Operations

.4 Provincial Legislation:

.1 Legislation specific to Authority Having Jurisdiction for work governed by this Section.

1.3 DEFINITIONS

.1 Demolish: Detach items from existing construction and legally dispose of them off site, unless indicated to be removed and salvaged or removed and reinstalled.

.2 Remove and Salvage: Detach items from existing construction and deliver them to Owner ready for reuse.

.3 Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.

.4 Existing to Remain: Existing items of construction that are not removed and that are not otherwise indicated as being removed, removed and salvaged, or removed and reinstalled.

1.4 EXAMINATION

.1 Visit and examine the site and note all characteristics and irregularities affecting Work of this Section. Submit a pre-demolition inspection report. Ensure the Owner of premises being inspected is represented at inspection.

.2 Where appropriate prepare a photographic or video record of existing conditions, particularly of existing work scheduled to remain.

.3 Where applicable, examine adjacent tenancies not part of the scope of work. Determine extent of protection required to areas and related components not subject to demolition.

1.5 SUBMITTALS

.1 Provide required information in accordance with Division 01.

.2 Action Submittals: Provide the following submittals before starting any work of this Section:

.1 Prepare schedule in conjunction with overall project schedule, and outline proposed methods in writing. Obtain approval before commencing demolition work, and indicate the following:

.1 Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity

.2 Interruption of utility services

.3 Coordination for shutoff, capping, and continuation of utility services

1.6 QUALITY ASSURANCE

.1 Conform to requirements of all authorities having jurisdiction.

.2 Comply with applicable requirements of CSA S350-M "Code of Practice for Safety in Demolition of Structures".

.3 Work of this Contract shall be executed by an approved company having a minimum of five (5) years continuous experience and able to deploy adequate equipment and skilled personnel to complete work expediently in an efficient and orderly manner.

.4 Perform cutting and coring, where applicable, by a firm specializing in this type of work, able to produce evidence of successful completion of similar work over a period of at least five (5) years immediately prior to date of contract.

.5 Apply for, secure, arrange and pay for all permits, notices and inspections necessary for proper execution and completion of work in this Section.

.6 Professional Engineer Qualifications: Procure the services of a professional engineer who is experienced in providing relevant engineering services to perform the following:

.1 Review portions of the Work requiring structural performance, prepare plan of action, engineer temporary shoring and bracing, and Provide site administration and inspection for work of this Section.

1.7 PROTECTION

.1 Prevent movement or settlement of adjacent work. Provide and place bracing or shoring and be responsible for safety and support of such work. Be liable for any such movement or settlement, and any damage or injury caused.

.2 Cease operations and notify Consultant if safety of any adjacent work or structure appears to be endangered. Take all precautions to support the structure. Do not resume operations until reviewed with the Consultant.

.3 Prevailing weather conditions and weather forecasts shall be considered. Demolition work shall not proceed when weather conditions constitute a hazard to the workers and site.

.4 Prevent damage of surrounding vegetation by construction. Install tree protection barriers to trees that are scheduled to remain.

.5 Prevent debris from blocking surface drainage inlets and mechanical and electrical systems which remain in operation.

.6 Temporarily suspended work that is without continuous supervision shall be closed to prevent entrance of unauthorized persons.

1.8 REMAINING AND ADJACENT STRUCTURES

.1 Do not interfere with, encumber, endanger or create nuisance, from any cause due to demolition work, to public property or any adjacent attached and/or detached structures in possession of Owner or others, which are to remain, whether occupied or unoccupied during this work.

.2 Make good damage to such structures resulting from work under this Section at no cost to Owner. Make good adjacent building surfaces damaged by work of this Section.

1.9 PROTECTION OF SERVICES AND STRUCTURES

.1 Take necessary precautions to guard against movement, settlement or collapse of existing adjacent utility services, public property and/or structures, whether to remain or not. If these or other unforeseen conditions develop, take immediate emergency measures, report to Consultant, confirm in writing, and await instructions before proceeding with any further related demolition work.

.2 Prior to saw cutting or core drilling of existing concrete slabs, use ground penetrating radar (GPR) to detect utilities and structural reinforcing. Concrete X-Rays can be used when access to both sides of concrete slab is accessible for placement of required x-ray film.

1.10 EXISTING SERVICES

.1 Prior to start of demolition disconnect all electrical service lines in the areas to be demolished. Post warning signs on all electrical lines and equipment which must remain energized to serve other areas during period of demolition. Disconnect electrical service lines in demolition areas to the requirements of local authority having jurisdiction.

.2 In each case, notify the affected utility company in advance and obtain approval where required before commencing with the work on main services.

.3 Arrange with utility companies for locating of such services and for disconnection of existing services owned by utility companies and which will be disconnected by said utility companies, provided such services do not interfere with adjacent tenancy operators.

.4 Remove sewer and water lines where required within existing building as deemed necessary, and cap to prevent leakage, in accordance with authorities having jurisdiction.

.5 Existing services are to be maintained where required for normal tenant operation during regular hours of operation and/or as deemed necessary by Owner.

1.11 DECOMMISSIONED SERVICES

.1 Remove fully decommissioned electrical and mechanical service lines, plumbing, ducting, fixtures and all fasteners and supports for decommissioned items.

.1 Remove sewer and water lines where required within existing building as deemed necessary, and cap to prevent leakage, in accordance with authorities having jurisdiction.

.2 Patch and repair surfaces affected by this selective demolition to match existing adjacent surfaces, as approved by the Consultant.

1.12 EXISTING WARRANTIES

.1 Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

2 Products

2.1 DEBRIS, SALVAGED MATERIAL AND EQUIPMENT DISPOSAL

.1 All materials and or equipment salvaged from demolition work becomes property of demolition Contractor unless designated otherwise.

.2 At no cost to Owner repair or replace material and/or equipment scheduled to remain which is damaged by demolition work. Do not sell any salvaged material or equipment directly from project site.

.3 Remove waste debris continually and entirely from project site during demolition work. Do not load vehicles transporting such debris beyond their safe capacity or in a manner which might cause spillage on public or private property. If spillage does occur, clean up immediately to prevent traffic hazards or nuisance.

2.2 PROTECTION

.1 Temporary Protection:

.1 Erect temporary hoarding protection, to enclose openings in exterior walls, and/or provide security to partially occupied interior spaces, as indicated in Division 01.

.2 Erect temporary dust screens to prevent dust and debris to enter areas of the building which are not scheduled for demolition. Remove temporary dust screens when no longer required.

2.3 REPAIR MATERIALS

.1 Use repair materials identical to existing materials:

.1 If identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.

.2 Use a material whose installed performance equals or surpasses that of existing material.

.3 Comply with material and installation requirements specified in individual Specification Sections.

.2 Floor Patching and Levelling Compounds: Cement based, trowelable, self-levelling compounds compatible with specified floor finishes; as indicated in Section 03 35 00.

.3 Concrete Unit Masonry: Lightweight concrete masonry units, and mortar, cut and trimmed to fit existing opening to be filled. Provide standard hollow core units, square end units and bond beam units as indicated on drawings.

.4 Gypsum Board Patching Compounds: Joint compound to ASTM C475, bedding and finishing types thinned to provide skim coat consistency to patch and prepare existing gypsum board walls ready for new finishes in accordance with Section 09 29 00.

.5 Fireproofing: Patch and repair all fireproofing damaged during demolition of adjacent surfaces with compatible fireproofing materials. Provide test reports from fireproofing

manufacture warranting installation, adhesion and compatibility between existing and new fireproofing materials.

2.4 EXISTING MATERIALS

.1 Items to be retained for re-use in new construction include, but are not limited to the following:

.1 Confirm with Consultant any materials that appear to be in re-usable condition prior to disposal.

.2 Confirm with Consultant any materials scheduled for re-use that are not in re-usable condition prior to installation.

3 Execution

3.1 GENERAL

.1 Exercise caution in dismantling, disconnecting of work adjacent to existing work designated to remain.

.2 Carry out demolition in a manner to cause as little inconvenience to the adjacent properties as possible.

.3 Carry out demolition in an orderly and careful manner.

.4 Demolition by explosives is not permitted.

.5 Selling or burning of materials on site is not permitted.

.6 Sprinkle exterior debris with water to prevent dust. Do not cause flooding, contaminated run-off or icing. Do not allow waste material, rubbish, and windblown debris to reach and contaminate adjacent properties.

.7 Lower waste materials in a controlled manner; do not drop or throw materials from heights.

.8 At end of each day's work, leave in safe condition so that no part is in danger of toppling or falling.

3.2 PREPARATION

.1 Although possible (with additional precautions), openings through existing concrete columns and beams are generally not permitted; the structural engineer must be contacted for such proposed openings for specific additional requirements.

.2 For all openings to be located through existing structural components, the following requirements for coring or sawcutting openings through existing reinforced concrete floor slabs, roof slab and shear walls for mechanical and electrical services must be followed:

.1 Prior to installation of openings, a testing agency is to be engaged to accurately scan the areas of the proposed openings to locate existing reinforcing steel, electrical conduit and cast-in mechanical services (i.e. pipes). Electromagnetic scanning or ground-penetrating radar are acceptable methods of scanning for these purposes. Note that x-ray technology will not be permitted as this will be an occupied building during construction.

.2 During/after conducting the scanning procedures, the testing agency is to clearly and accurately mark the surfaces of the concrete elements identifying individual existing reinforcing bars and electrical/mechanical services.

3.3 SAFETY AND SECURITY

.1 Maintain security of the building at all times during demolition work.

.2 Provide and maintain fire prevention equipment and alarms accessible during demolition.

3.4 ACCESS ROUTES

.1 Restrict operations to designated access routes.

.2 Do not obstruct roads, parking lots, sidewalks, hydrants and the like.

3.5 SELECTIVE DEMOLITION

.1 Provide necessary shoring and supports to assure safety of structure prior to cutting and coring.

.2 Where practical, sawcut and remove material as required.

.3 Where sawcutting is not appropriate, use suitable hand tools.

.4 Demolish, cut-out and remove from site all other work noted on drawings or required to permit new construction.

.5 Do not allow water to accumulate or flow beyond work area. Provide receptacles and mop-up as work proceeds.

.6 Fill all openings in concrete block walls with concrete masonry units, coursing to match existing, prepare ready to receive new finishes to match existing.

.1 Provide bond beams in new openings cut into existing concrete masonry unit walls.

.2 Provide finished end masonry units to patch and repair for new jamb sections in existing concrete masonry unit walls.

.7 Fill all openings in gypsum board walls with gypsum board and steel framing to match existing, skim coat to make wall smooth and even.

.8 Demolish existing flooring and wall finishes, and adhesive remnants as follows:

.1 Floor and wall substrate shall be smooth, free from ridges and depressions, and adhesive remnants that could telegraph through new flooring and wall finishes.

.9 Demolish completely all ceiling panels and grid as indicated.

.10 Patch and repair all walls, floor and ceilings damaged during demolition with material matching adjacent walls, prepare ready for new finishes.

.1 Prepare existing surfaces schedule to receive new finish by grinding, filling, over-coating, stripping, washing, etching, shot blasting or other chemical or mechanical means, as required to ensure satisfactory installation of new finish.

3.6 PATCHING AND REPAIRING

.1 Floors and Walls:

.1 Where walls or partitions that are demolished extend from one finished area into another, patch and repair floor and wall surfaces in the new space.

.2 Provide an level and smooth surface having uniform finish colour, texture, and appearance.

.3 Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform colour and appearance.

.4 Patch with durable seams that are as invisible as possible.

.5 Provide materials and comply with installation requirements specified in other Sections of these Specifications.

.6 Patch any existing areas adjoining / adjacent to new construction in good workmanship, filling and finishing gaps between finishes to allow new work to blend seamlessly with existing work.

.7 Where patching occurs in a painted surface, apply primer and intermediate paint coats over patch and apply final paint coat over entire unbroken surface

containing patch. Provide additional coats until patch blends with adjacent surfaces.

.8 Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.

.2 Exterior Walls:

.1 Where existing doors and/or windows are schedule to be removed during demolition, patch and repair exterior walls using similar wall construction techniques as adjacent wall construction. Ensure compatibility between insulation, air barrier and vapour retarder, providing continuous air and vapour control and wall R-Value between existing and new construction. Provide exterior and interior finish materials, matching existing adjacent materials, to provide an even-plane surface of uniform appearance.

.3 Parging:

.1 Patch and repair existing parging damaged or spalling, in areas identified on the Drawings, using single-component, sand/cement blend designed for coating or parging vertical surfaces.

3.7 EQUIPMENT

.1 The Testing Agency shall provide and operate all necessary equipment for conducting accurate scans of existing reinforced concrete components for which openings are required.

.2 Equipment and methodology to be capable of scanning concrete elements to a maximum of 400 mm thickness.

3.8 EXCESSIVE DEMOLITION

.1 Where excessive demolition occurs, be responsible for cost of replacing such work.

.2 Consultant shall determine extent of such 'over-demolition' and method of rectification.

3.9 COMPLETION

.1 Leave project site as directed, reasonably clean and presentable, free from above grade debris, any salvaged material and/or equipment except those designated to remain.

.2 Maintain access to exits clean and free of obstruction during removal of debris.

END OF SECTION

1 General

1.1 SUMMARY

.1 Work of this Section includes the supply and installation of the following concrete floor treatments, as well as testing and measurement for floor flatness and levelness.

.1 Liquid-Applied Penetrating Sealer;

.2 Cementitious Topping, Patching and Flash Patching Materials.

1.2 REFERENCE STANDARDS

.1 American Society for Testing and Materials (ASTM):

.1 ASTM C309-11, Standard Specification for Liquid Membrane-Forming Compound for Curing Concrete.

.2 ASTM C979/C979M-10, Standard Specification for Pigments for Integrally Colored Concrete.

.2 American Concrete Institute (ACI):

.1 ACI 117-2010, Specifications for Tolerances for Concrete Construction and Materials and Commentary

.2 ACI 302.1R-15, Guide for Floor and Slab Construction

.3 Canadian Standards Association (CSA):

.1 CSA A23.1-14/A23.2-14, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.

.4 International Concrete Repair Institute (ICRI):

.1 ICRI 310.2R-2013, Guideline for Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays and Concrete Repair

1.3 ADMINISTRATION REQUIREMENTS

.1 Coordination:

.1 Coordinate a meeting between the Contractor, Subcontractor responsible for concrete placement, and the Consultant to determine site quality control testing section borders and sample measurement line locations, method of measurement, and accuracy requirements of the measuring devices.

.2 Pre-Construction Meetings:

.1 Pre-Construction Conference: Arrange a site meeting, to coincide with regular bi-weekly site meetings, attended by the Contractor, the Subcontractor's representative and foreman for this project, the Consultant, materials supplier(s), and other relevant personal before commencement of work for this Section.

.2 Prepare an outline agenda for meeting in accordance with Division 01.

1.4 SUBMITTALS

.1 Provide submittals in accordance with Division 01.

.2 Action Submittals: Provide the following submittals before starting any work of this Section:

.1 Product Data: Submit manufacturer’s product data for each materials specified including recommended application rates and methods of installation.

1.5 PROJECT CLOSEOUT SUBMISSIONS

.1 Operation and Maintenance Data:

.1 Submit detailed cleaning and maintenance instructions for concrete densifier products, and instruct Owner in proper care and maintenance of specified floor finishes, including a complete list of floor care products that will be required for ongoing maintenance, in accordance with Division 01.

1.6 QUALITY ASSURANCE

.1 Subcontractor executing work of this Section shall employ installers having a minimum of five (5) years continuous experience in successful installation of work of type and quality shown and specified. Submit proof of experience upon Consultant's request.

.2 Ensure proper use of proprietary materials in strict accordance with the material manufacturer's directions.

1.7 SITE CONDITIONS

.1 Environmental Requirements:

.1 Ensure that adequate temporary heating is provided as required for cold weather work.

.2 Provide adequate moisture, sun shades and wind barriers to prevent too rapid drying of concrete during hot weather.

.2 Protection:

.1 Ensure that finished concrete floor areas are protected from abrasion from foot or wheeled traffic, and from damage caused by spillage of oil or other harmful materials.

1.8 WARRANTY

.1 Provide a written warranty from the manufacturer against defects of materials for a period of one (1) year, beginning with date of substantial completion of the project..

2 Products

2.1 MATERIALS

.1 Liquid-Applied Penetrating Sealer (SLR-02):

.1 Clear water based silane micro emulsion penetrating concrete sealer, formulated to prevent water and chloride intrusion into concrete surfaces.

.1 Basis of Design Materials:

.1 Planiseal WR 40 by Mapei Inc.

.2 Cipadm S-40 by CPD Construction Products

.3 Sikagard SN40 by Sika Canada Inc.

.4 Hydrozo Silane 40 VOC by BASF.

.5 or approved equivalent.

.2 Patching and Flash Patching Materials:

.1 Cementitious based, polymer modified, fine aggregate, single component, rapid curing, early strength floor patching compounds having high adhesion, for application in thicknesses to a minimum of 1/8” to 1”.

.2 Basis of Design Materials:

.1 SikaQuick 1000 by Sika Canada Ltd.

.2 Planitop 18ES by MAPEI Canada Inc.

.3 Meadow-Crete H by W.R. Meadows of Canada

.4 or approved equivalent.

.3 Joint Sealant: Refer to Section 07 92 00.

3 Execution

3.1 EXAMINATION

.1 Before commencing work, ensure that surfaces are acceptable to receive and maintain concrete finishing, and that specified installation will be achieved.

3.2 SURFACE PREPARATION

.1 All surfaces must be clean, sound, frost free and dry (maximum depth of penetration is achieved when substrates are dry, with no damp patches).

.2 Any existing coatings, surfaces treatments, accumulated pollutants, dust, dirt, oil and efflorescence must be removed. A substrate clogged with dirt or oil will not permit proper sealer penetration.

3.3 FINISHING FLOORS AND SLABS

.1 Finish floors and slabs in accordance with CSA A23.1 and ACI 302.1R recommendations for screeding, re-straightening, and finishing operations for concrete surfaces; do not wet concrete surfaces.

3.4 INSTALLATION

.1 Installation - Liquid-Applied Penetrating Sealer:

.1 Vertical Surfaces:

.1 Apply using a brush, roller or low pressure spray, working from top to bottom by maintaining a 305mm (12”) parallel curtain (run down).

.2 When applying the material on a vertical surface, avoid accumulation and run-off of the material. In the event of material accumulation or run-off lines being formed, redistribute the material on the surface or remove by sponging.

.3 Apply flood coat in two (2) passes, “wet on wet” with the second pass at right angles to the first. Material coverage should not be greater than 2.5 m2/L total (100 ft2/US gal.), unless otherwise recommended by the Manufacturer.

.2 Horizontal Surfaces:

.1 Apply using a roller or low pressure spray, ensuring that product penetrates the substrate and does not “pond” or “puddle” on the surface.

.2 If ponding occurs, redistribute or remove the excess material on the surface before material starts to dry and form a film that will prevent penetration of excess material.

.3 Material coverage should not be greater than 4.4 m2/L (180 ft2/US gal.), unless otherwise recommended by the Manufacturer.

.4 Apply flood coat in two (2) passes, “wet on wet” with the second pass at right angles to the first.

.5 Complete and correct coverage of surfaces is crucial to the success of such sealers

.3 Control Joints:

.1 Install bond breaker of silica sand, polyethylene film strip or foam filler in bottom of joints.

.2 Cementitious Levelling Treatments and Cementitious Topping, Patching and Flash Patching Materials:

.1 Leak Prevention:

.1 Fill cracks and voids in subfloor where leakage of slurry could occur using suitable quick setting patch material or caulk, as recommended by underlayment manufacturer.

.2 Prime substrate according to manufacturer's recommendations.

.3 Installation shall not begin until building is enclosed and ventilated.

.4 Mix levelling treatments and cementitious topping, patching and flash patching materials in accordance with Manufacturer's written instructions.

.5 Pour levelling treatments and cementitious topping, patching and flash patching materials to recommended thickness and immediately spread and screen to desired surface finish and level.

.3 Control Joints – Interior Surfaces:

.1 Follow existing control joints in concrete levelling and topping finishes to prevent cracking. When concrete levelling and topping finishes are firm enough not to be torn or damaged by cutting, cut 5mm (3/16") wide control joints into surface of concrete with abrasive blade power saw.

.2 Once levelling and topping finishes are cured, fill control joints with joint sealant.

.1 Completely clean side joint surfaces of dirt, oil, grease, and similar contaminants, and mask floor surfaces at joints while installing joint sealant.

.2 Prime side joint surfaces with compatible primer if surfaces are not completely dry.

3.5 PATCHING AND REFINISHING

.1 Before completion of project, patch and refinish defective surfaces to match surrounding areas with no discernible variation in appearance.

END OF SECTION

1 General

1.1 SUMMARY

.1 This Section includes supply and installation of single wythe unit masonry assemblies, complete with mortar and grout, masonry joint reinforcement, ties, anchors, and miscellaneous masonry accessories.

.1 Standard Concrete Masonry Units

.2 Fire Resistant Concrete Masonry Units

.3 Architectural Concrete Masonry Units

.4 Architectural Trim Units

.5 Clay Brick Veneer Masonry Units

.6 Mortar, and Grout

.7 Reinforcing steel

.8 Masonry joint reinforcement

.9 Ties and anchors

.10 Miscellaneous masonry accessories

1.2 REFERENCE STANDARDS

.1 American Concrete Institute: (ACI):

.1 ACI 530.1-99/ASCE 6-99/TMS 602-99, Commentary on Specification for Masonry Structures

.2 Canadian Standards Association (CSA):

.1 CAN/CSA A82, Fired Masonry Brick Made From Clay or Shale.

.2 CSA A165 Series-04 (R2009), CSA Standards on Concrete Masonry Units

.3 CSA A179-04 (R2009), Mortar and Grout for Unit Masonry

.4 CSA A370-04 (R2009), Connectors for Masonry

.5 CAN/CSA A371-04 (R2009), Masonry Construction for Buildings

.6 CSA S304.1-04 (R2010), Design of Masonry Structures

.7 CSA W186-M1990 (R2012), Welding of Reinforcing Bars in Reinforced Concrete Construction

.3 American Society for Testing of Materials (ASTM):

.1 ASTM A123/A123M-09, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

.2 ASTM A153/A153M-09, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

.3 ASTM A496/A496M-07, Standard Specification for Steel Wire, Deformed, for Concrete Reinforcement

.4 ASTM A563-07a, Standard Specification for Carbon and Alloy Steel Nuts

.5 ASTM A653/A653M-11, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

.6 ASTM A1011/A1011M-12, Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength

.7 ASTM C67-11, Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile.

.8 ASTM C207-06(2011), Standard Specification for Hydrated Lime for Masonry Purposes

.9 ASTM C270-12, Standard Specification for Mortar for Unit Masonry.

.10 ASTM C494-11, Standard Specification for Chemical Admixtures for Concrete.

.11 ASTM E488/E488M-10, Standard Test Methods for Strength of Anchors in Concrete Elements

.12 ASTM E514/E514M-11, Standard Test Method for Water Penetration and Leakage Through Masonry

.13 ASTM E2556/E2556M-10, Standard Specification for Vapour Permeable Flexible Sheet Water Resistive Barriers Intended for Mechanical Attachment.

.14 ASTM F593-02(2008)e1, Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs

.15 ASTM F594-09e1, Standard Specification for Stainless Steel Nuts

.4 Ontario Concrete Masonry Block Association (OCBA):

.1 OCBA Metric Technical Manual

.5 Underwriters Laboratories of Canada (ULC):

.1 ULC List of Equipment and Materials for Fire Rated Construction

1.3 ADMINISTRATIVE REQUIREMENTS

.1 Pre-Construction Conference: Arrange a site meeting, to coincide with regular bi-weekly site meetings, attended by the Contractor, the Subcontractor's representative and foreman for this project, the Consultant, materials supplier(s), and other relevant personal before commencement of work for this Section; agenda for meeting will include; but not be limited to, the following:

.1 Confirmation of specifications and details for the project;

.2 Required mortar, grout and concrete testing, batch control and grouting procedures;

.3 Confirmation of appearance of exposed block lintels;

.4 Confirmation of reinforcement at corners and wall intersections;

.5 Coordination of interior crack control measures;

.6 Confirmation of trowelled or tooled joints to concealed and exposed masonry faces.

.2 Coordination: Coordinate components of the work of this Section with work performed by other Sections including; but not limited to, the following:

.1 Steel Support Angles and Brackets:

.1 Coordinate requirements for structural steel support angles and brackets supplied and installed onto the building structure by Structural.

.2 Provide requirements for supply of loose steel lintels and shelf angles installed by this section to Section 05 50 00.

.2 Masonry Anchors:

.1 Coordinate supply of anchor sections connecting to structural frame installed by Structural.

.2 Include additional products for coordination furnished, but not installed, under this Section.

1.4 SUBMITTALS

.1 Provide submittals in accordance with Division 01.

.2 Samples: Submit samples of the following; Concrete block, mortar, masonry reinforcement, ties and anchors for Consultant's approval before commencing work of this section.

.3 Shop Drawings: Submit shop drawings indicating the following:

.1 Indicate sizes, profiles, coursing, and locations of special shapes for concrete masonry units and clay masonry veneer units.

.2 Detail corner units, end dam units, and other special applications for fabricated flashings.

.4 Informational Submittals: Provide the following submittals when requested by the Consultant:

.1 Submit ULC Assembly Listings and Materials cut sheets for fire rated assemblies as follows:

.1 Not later than thirty (30) working days following Award of Contract, submit copies of ULC Assembly and Materials Listing for indicating ULC Number and how assembly meets the rating criteria for assemblies listed on drawings.

.2 Use the same system and material as would be required for a tested assembly for the project; ULC Listings are tested with the specific materials indicated; substitutions will not be permitted unless evidence of equivalency is confirmed.

.3 Submit manufacturer's product data for materials and prefabricated devices, providing descriptions are sufficient for identification at job site; include manufacturer's printed instructions for installation.

.5 Certificates: Submit statements of material properties indicating compliance with specified requirements for each type and size of the following:

.1 Masonry Units:

.1 Include material test reports substantiating compliance with requirements.

.2 Include ULC Listings for fire resistance rated materials and construction equivalent to assemblies with indicated on drawings indicating fire resistance ratings.

.2 Cementitious Materials:

.1 Include brand, type, and name of manufacturer for site mixed mortar materials.

.2 Include description of type and proportions of ingredients for pre-blended, dry mortar mixes.

.3 Include description of type and proportions of ingredients for grout mixes.

.3 Accessories:

.1 Reinforcing bars

.2 Joint reinforcement

.3 Anchors, ties, and metal accessories

.4 Site Quality Control Submissions: Submit detailed description of methods, materials, and proposed unit masonry cleaning techniques.

1.5 SITE CONDITIONS

.1 Protection of Masonry: Protect masonry and other work from marking and other damage and as follows:

.1 Cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work during construction until permanent flashings and membranes are completed.

.2 Cover partially completed masonry when construction is not in progress to prevent wetting of inside wythes of construction and contribution to efflorescence.

.3 Extend cover a minimum of 610mm (24”) down both sides and hold cover securely in place.

.4 Secure cover a minimum of 610mm (24”) down face next to un-constructed wythe and hold cover in place where one (1) wythe of multi-wythe masonry walls is completed in advance of other wythes.

.5 Provide adequate bracing for masonry during construction and until permanent lateral supports are in place.

.6 Do not apply uniform floor or roof loads for a minimum of twelve (12) hours and concentrated loads for a minimum of three (3) days after building masonry walls or columns.

1.6 DELIVERY, STORAGE, HANDLING AND PROTECTION

.1 Delivery and Acceptance Requirements: Deliver pre-blended, dry mortar mix in moisture resistant containers designed for lifting and emptying into dispensing silo; store dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in a metal dispensing silo with weatherproof cover.

.2 Storage and Handling Requirements: Store masonry units on elevated platforms in a dry location and as follows:

.1 Stack materials on floors of building so that structural design loads are not exceeded; coordinate with Consultant.

.2 Cover tops and sides of stacks with waterproof sheeting securely tied to pallets if units are not stored in an enclosed location; do not install masonry units that become wet until they are dry.

.3 Store cementitious materials on elevated platforms, under cover, and in a dry location; do not use cementitious materials that have become wet or damp.

.4 Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

2 Products

2.1 CONCRETE MASONRY UNITS (BLK-01)

.1 Standard concrete blocks: Autoclave or bubble cure process, high pressure steam cured, modular, conforming to CSA A165 Series-04 (R2009), with lineal shrinkage and moisture movement not to exceed 0.035% and shall be as follows;

.1 Classification: S/15/A/M, 75% solid for all locations where structural members bear on concrete block.

.2 H/15/A/M, for all other block work.

.3 Size: Modular to sizes indicated on Drawings and schedules.

.4 Special shapes:

.1 Provide square units for exposed corners.

.2 Provide purpose made shapes for lintels and bond beams.

.3 Provide additional special shapes required for project.

.4 Manufacture special shapes at same time and with the same batch as standard concrete block to be used.

.2 Fire Resistant Concrete Masonry Units: Manufactured in accordance with CSA A165 Series-04 (R2009) as modified below:

.1 Classification:

.1 1 Hour Fire Rating: H/15/A/O

.2 Concrete Composition – 2 Hour Fire Rating: Type $L_2$20S Concrete.

.3 Size: Modular to sizes indicated on Drawings.

.4 Where concrete block walls are required as fire separations or barriers, they shall conform to the local Building Code with respect to equivalent thickness and type of concrete. Consult with Consultant for locations and special conditions.

2.2 CLAY MASONRY VENEER BRICK (BRK-01)

.1 Pattern: Running Bond

.2 Characteristics

.1 Size shall be Metric Modular, 57mm height x 190mm length x 90mm depth and complies with ASTM C-1405, Grade S, Type I & II, Class Exterior, Division Solid.

.3 Must meet ASTM C-84 (UL723) requirements and rated zero flame spread, zero smoke developed and zero fuel contribution. Also will not release any toxic or noxious fumes when burned at 2000°F (1093°C)

.4 Shapes: Provide where shown or scheduled and where required to complete masonry work as indicated, including corners, intersections, ends, control joints, and other special conditions, all of one manufacturer. Glazed finish required on exposed surfaces, including returns into door/window openings.

.5 Acceptable Products:

.1 Basis of design: 1-17D Dark Red Smooth Ironspot Modular as manufactured by Endicott, or equivalent as manufactured by Taylor or Hebron.

2.3 MORTAR MATERIALS

.1 Mortar materials shall conform to CSA A179.

.2 Water: Potable (clean, exempt of ice, oils, acid, alkalis, organic matter, sediments or any other harmful matter).

.3 Aggregate: Meeting CSA A179, and as follows:

.1 Use same brands of materials and source of aggregate for entire project.

.2 Use washed aggregate consisting of natural sand or crushed stone for mortar that is exposed to view.

.3 Use aggregate graded with 100% passing the No. 16 (1.18-mm) sieve for joints less than 6 mm thick.

.4 Cement: Normal portland, in accordance with CSA A3000-08, Type GU.

.5 Grout: In accordance with CSA A179, Table 3.

.6 Hydrated Lime: ASTM C207, Type S.

2.4 MORTAR MIXES

.1 Mixing:

.1 Prepare and mix mortar materials under strict supervision and in small batches for immediate use only.

.2 Mix proprietary mortars in strict accordance with CSA A179. Do not use re-tempered mortars for coloured mortars.

.2 For Exterior Wythe of Cavity/Composite Walls (non load-bearing, above grade):

.1 Use Type 'N', 1:1:6 pre-mixed, pre-coloured, Portland cement/lime/sand mortar, 'Betomix Plus' by Daubois Inc., or Maxi-Mix silo. Use non-staining "white" cement where required to achieve colour as selected later by the Consultant.

.3 For Interior Reinforced or Non-Reinforced Block Walls:

.1 Use Type 'S', premixed 'Bloc Mix' by Daubios Inc., or approved equivalent by Maxi-Mix.

.4 Mortar pigment (for exterior wythe of cavity/composite walls):

.1 'Bay Ferrox' by Bayer Inc. or approved alternative by Elementis Pigments. Colour to later selection by Consultant.

2.5 MASONRY REINFORCEMENT, TIES AND ANCHORS

.1 Masonry Joint Reinforcement: In accordance with to CSA A371 and ASTM A496, with corrosion protection in accordance with CSA S304.1 and CSA A370, and as follows:

.1 Interior Walls: Hot dip galvanized, carbon steel.

.2 Exterior Walls: Stainless steel.

.3 Lengths: A minimum of 3048mm (10’) with prefabricated corner and tee units.

.2 Connectors: In accordance with to CSA A370-04 (R2009) and CSA S304.1-04(R2010) with hot dip galvanized finish.

.3 Single Wythe Masonry Joint Reinforcement: Either ladder or truss type with single pair of side rods.

.4 Ties and anchors specified in this section shall be designed in accordance with CSA A370-04 (R2009) for non-conventional masonry connectors as follows:

.1 Deflection: Maximum 1.6mm (1/16”) including free play, when acted upon by a lateral load of 0.45 kN, in all possible positions of adjustment.

.2 Positive restraint at position of maximum adjustment.

.3 Free play of multi-component ties maximum 0.8mm (1/32”) when assembled in all possible configurations.

.4 Anchors shall allow vertical adjustment but resist tension and compression forces perpendicular to plane of wall.

.5 Wall Ties (masonry veneer/insulated cavity/masonry backup): Single screw, Type 304 stainless steel veneer tie for concrete/CMU construction featuring a dual-diameter barrel with factory-installed EPDM washers to seal both the face of the insulation and the air/vapor barrier, and thermal wings to decrease thermal transfer through cavity insulation. Provide 3/16” diameter, type 304 stainless steel 2X-Hook to wire tie. Length of tie/hook to suit thickness of cavity insulation and air space as detailed.

.1 Acceptable product: 2-Seal Thermal Concrete Wing Nut Anchor by Blok-Lok or equivalent.

.6 Lateral Partition Supports (Top of Wall Anchors):

.1 Angle Support: Fabricated from 3mm (1/8”) core metal thickness angled steel plate having 75mm (3”) long legs fastened to deck structure to allow vertical movement of masonry assembly; hot dip galvanized; coordinate with Section 07 84 00 for firestopping insulation and smoke seals.

.1 Basis of Design Materials: Blok-Lok BL-LSA1 & 2 (or approved equivalent).

.2 Plate Support: Fabricated from 3mm (1/8”) core metal thickness stainless steel plate with 10mm (3/8”) diameter metal 150mm (6”) long welded to plate having closed end plastic tube fitted over rod that allows rod to move in and out of tube.

.3 Anchor Bolts: Where required provide Headed or L-shaped steel bolts in accordance with ASTM A307-10, Grade A; with ASTM A563-07a hex nuts and, where indicated, flat washers; hot-dip galvanized in accordance with ASTM A153, Class C.

.7 Galvanizing for Masonry Reinforcement, Ties and Anchors:

.1 Hot Dip Hardware and Bolts: In accordance with ASTM A153/A153M-09, Class B-2 regardless of location.

.2 Hot Dip Sheet Steel: In accordance with ASTM A653, Coating Designation Z600, regardless of location.

.3 Structural Shapes and Pipes: In accordance with ASTM A123, Grade 85, regardless of location.

.8 Rebar Positioners: 9 gauge diameter wire, hot dipped galvanized.

.1 Basis of Design Materials: Blok-Lok BL-RB Rebar Positioners (or approved equivalent).

.9 Fastening Into Solid Concrete or Solidly Grouted Installation: Two component, injectable adhesive specifically manufactured for use in installing dowels or threaded anchor rods and inserts into new or existing concrete or grout, and as follows:

.1 Epoxy Composition: Sealed packaging containing resin, hardener, cement and water; components.

.2 Curing Time: Rapid set, high strength and stiffness; maximum time 45 minutes at 20 deg C.

.3 Basis-of-Design Materials: Hilti Inc., HIT HY150 System (or approved equivalent).

.10 Fastening through Hollow Wall Installation: Two-component, injectable adhesive specifically manufactured for use in installing dowels or threaded anchor rods and inserts, with cylindrical mesh screen tube into new or existing masonry cavity wall, and as follows:

.1 Epoxy Composition: Sealed packaging containing resin, hardener, cement and water.

.2 Curing Time: Rapid set, high strength and stiffness; maximum time 60 minutes at 20 deg C.

.3 Basis-of-Design Materials: Hilti Inc., HIT HY20 System (or approved equivalent).

2.6 MISCELLANEOUS MASONRY ACCESSORIES

.1 Packing Insulation: As indicated in Section 07 20 00.

.2 Firestopping: As specified under Section 07 84 00.

.3 Sealants: As specified under Section 07 92 00, and as follows:

.1 Vertical Sealant: Colour to match brick

.2 Horizontal Sealant: Colour to match mortar

.4 Maintenance Cleaners: Manufacturer's recommended maintenance cleaners.

.5 Support Angle: Hot dip galvanized, in accordance with CSA A370 and ASTM A153.

.6 Fasteners: Galvanized fasteners meeting the requirements of ASTM A325, and as recommended by manufacturer.

.7 Compressible Joint Filler: Pre-moulded filler strips in accordance with ASTM D1056-07, Grade 2A1; compressible up to 35%; of width and thickness indicated; formulated from neoprene, urethane or PVC.

.8 Bond Breaker Strips: #15 asphalt saturated, organic roofing felt in accordance with CSA A123.3-05 (R2010).

.9 Weep hole vents: Flexible ultra-violet resistant polypropylene-copolymer plastic, ‘Cell-Vent’ by Blok-Lok, ‘Mortar Maze Cell Vents’ by Advanced Building Products Inc. or approved alternative. Provide at 600mm intervals at through-wall flashing/base course and as vents at high level below sill/horizontal interruptions to encourage air movement within cavity. Stagger high level vents in relation to base vents.

.10 Metal through wall flashings: Prefinished metal flashings in accordance with Section 07 62 00, continuous strips with a 19 mm folded drip edge.

.11 Membrane through wall flashing: Reinforced SBS rubberized asphalt compound laminated to cross-laminated polyethylene film, 40 mils thick; 'Airshield Thru Wall Flashing' by W.R. Meadows or approved alternative, complete with primer and adhesive recommended by flashing manufacturer. Refer also to Specification 07 27 39.

2.7 MASONRY COATINGS

.1 Proprietary Masonry Cleaner: Masonry manufacturer's recommended cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discolouring or damaging masonry surfaces.

.1 Clear coating.

.2 Verify acceptability of cleaner for cleaning masonry with mortar joints and for kinds of masonry units specified.

3 Execution

3.1 EXAMINATION

.1 Examine conditions for compliance with requirements for installation tolerances and other conditions affecting performance of work.

.1 Prepare written report listing conditions detrimental to performance of work and submit to the Consultant.

.2 Verify that reinforcing dowels are properly placed.

.2 Examine rough-in and built-in construction for piping systems to verify actual locations of piping connections before installation of unit masonry.

.3 Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION - GENERAL

.1 Thickness: Build single wythe walls to actual widths of masonry units, using units of widths indicated on Drawings.

.2 Single wythe masonry construction shall conform with the Ontario Concrete Block Association (OCBA) requirements for water resistant single wythe masonry construction.

.3 Use full size units without cutting except as follows:

.1 Cut units with motor driven saws if cutting is required to provide a continuous pattern or to fit adjoining construction.

.2 Provide clean, sharp, un-chipped edges.

.3 Allow units to dry before laying unless wetting of units is specified.

.4 Install cut units with cut surfaces and cut edges concealed where possible; obtain Consultant's acceptance where cut edges must be exposed.

.4 Select and arrange units for exposed unit masonry to produce a uniform blend of colours and textures; mix units by drawing units diagonally down multiple rows from at least three different pallets as masonry units are placed. "Exposed" means visible in complete work, unpainted and painted.

.1 Large variations in colour or texture between adjacent blocks of material will cause the Consultant to reject the installation, and the installer to rebuild the assembly at no additional cost to Contract.

.5 Wet masonry before laying when recommended by manufacturer; allow units to absorb water so they are damp but not wet at time of laying.

.6 Maintain dimensions, lines and levels.

.7 Keep exposed faces free from stains, chips and cracks.

.8 Keep tolerance in plane of 3mm in 2440mm (1/8" in 96"). Do not use chipped, cracked or deformed units in exposed work.

.9 Buttering corners of units, throwing mortar droppings into joints, will not be permitted. Do not shift or tap units after mortar has taken initial set, where adjustments must be made after mortar has started to set, remove mortar and replace with fresh supply.

3.3 LAYING MASONRY WALLS

.1 Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement type joints, returns, and offsets; avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

.2 Bond Pattern for Exposed Masonry: Lay exposed masonry in bond as indicated on the Drawings; do not use units with less than 100mm (4") horizontal face dimensions at corners or jambs. Lay masonry in running bond where not otherwise indicated on the Drawings.

.3 Lay concealed masonry with all units in a wythe in running bond or bonded by lapping a minimum of 100mm (4"), and as follows:

.1 Bond and interlock each course of each wythe at corners.

.2 Do not use units with less than nominal 100mm (4") horizontal face dimensions at corners or jambs.

.4 Stopping and Resuming Work:

.1 Stop work by racking back units in each course from those in course below; do not tooth.

.2 Clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry when resuming work.

.5 Built-In Work:

.1 Build in items specified in this and other Sections as construction progresses.

.2 Fill in solidly with masonry around built-in items.

.3 Fill space between steel frames and masonry solidly with mortar.

.4 Place a layer of metal lath, wire mesh, or plastic mesh in the joint below and rod mortar or grout into core where built-in items are to be embedded in cores of hollow masonry units.

.5 Protect built-in items from damage arising from work of this Section.

.6 Grouting Hollow Concrete Masonry Units – Load Barring Application:

.1 Fill cores in hollow concrete masonry units with grout 610mm (24”) under bearing plates, beams, lintels, posts, and similar items.

.2 Use concrete or fine grout where indicated, and also for vertical core filling, lintel beams, bond beams and other filled cores where reinforcing steel is indicated.

.3 Use fine grout where the space being grouted is 50mm (2”) or less in its least dimensions; use concrete in all other applications that call for grout.

.4 Use square end concrete masonry units wherever a full or half concrete masonry unit will receive concrete fill.

.5 Use full mortar bedding of cross webs for cores that are filled.

.6 Fill cores in lifts of 1220mm (4’) maximum; provide cleanout openings for lifts in excess of 4’ where Consultant has accepted larger lifts.

.7 Consolidate core fill during placement by vibration or puddling.

.8 Stop concrete core fill 38mm (1-1/2”) below top surface of lift whenever filling will be stopped for more than a 1 hour time duration.

.9 Fill all cores of roof parapets with concrete.

.10 Secure vertical reinforcement in position at top and bottom of core, and a maximum 4’ spacing, refer to Drawings for location of vertical reinforcement.

.11 Fill voids solid with mortar so that ties and anchors are set in full mortar bed where masonry walls abut steel or concrete columns.

.7 Build non-load bearing interior partitions full height of storey to underside of solid floor or roof structure above, leaving a gap to allow for structural deflection, and as follows:

.1 Fasten lateral partition supports to structure above and build into top of partition; grout cells of concrete masonry units solidly around plastic tubes of anchors and push tubes down into grout to provide 13mm (½”) clearance between end of anchor rod and end of tube; space anchors at 1220mm (4’) O.C.

3.4 MORTAR BEDDING AND JOINTING

.1 Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place; do not deeply furrow bed joints or slush head joints.

.2 Lay block work as follows:

.1 Provide special shapes and sizes as required such as halves, jambs, lintels, solids, corners, semi-solids, etc.

.2 Webs to align plumb over each other with thick ends of webs up. Leave no cells open in exposed work. Reinforce all block.

.3 Minimize cutting block. Cut exposed work with power driven abrasive cutting disc or diamond cutting wheel for flush mounted electrical outlets, grilles, pipes, conduit, etc., leaving 3mm (1/8") maximum clearance.

.4 Do not wet concrete masonry units before or during laying.

.5 Locate corners accurately. Use full bed of mortar for first course. Bed face shells and cross and end web fully in mortar. Stagger joints in every course. Align joints plumb over each other in every other course.

.6 Bond intersecting block walls in alternate courses. Where block abuts concrete, bond each block course with dovetail anchors, ties and dovetail slot. Do not break bond of corridor walls or other walls of exposed units where partitions intersect and if bonding would show through on intersect with prefabricated intersection masonry reinforcement in each course.

.7 Take special care in erecting block walls to which other sections will be applying finishes or attaching equipment to ensure tolerances required for work of other sections can be met with reasonable construction procedures. (e.g. thin-set application of ceramic tile.)

.8 Provide bullnose block at all exposed block corners.

.9 Build block lintels, ensure that lintel jointing coincides with regular bond.

.3 Set trim units in full bed of mortar with full vertical joints, and as follows:

.1 Fill dowel, anchor, and similar holes.

.2 Clean soiled surfaces with fibre brush and soap powder and rinse thoroughly with clear water.

.3 Lay trim units so that joints are even and so that average distance between joint centrelines is equal to the nominal modular dimension of adjacent masonry. Lay trim units in running bond, unless otherwise indicated on the Drawings.

.4 Set trim units in accordance with manufacturers recommended installation practices and materials. Review manufacturer's written recommendations with the Consultant before proceeding.

.5 Use chipped or blemished units only where the defect will be concealed; reject all defective and broken units or units with chipped edges or corners.

.6 Install cut units with cut surfaces and, where possible, cut edges concealed. Where complex cutting is required, place mortar along the cut edge and trowel smooth to provide a consistent 50mm (2”) wide gap.

.4 When mortar is "thumbprint" hard, tool all joints (exposed or concealed) concave except at blockwork designated to receive ceramic tile finish which blockwork shall be struck flush.

.1 Use sufficient force to press mortar tight against masonry units on both sides of joints.

.2 Remove excess material or burrs left after jointing. Use trowel or rub with burlap bag.

.5 Lay all joints 10mm (3/8") thick unless otherwise specified or otherwise indicated. Fill all joints solidly with mortar except where specifically designated to be left open.

.6 Stagger joints in every course. Align joints plumb over each other in every other course. Vertical and horizontal joints to be uniform in thickness.

3.5 PARTITIONS (OTHER THAN LOAD-BEARING)

.1 Carry following partitions up through ceiling to structure above, unless noted or specified otherwise; corridor partitions, partitions around staircases and shafts, partitions around washrooms, and any other partitions so indicated on drawings. Terminate all other partitions at first coursing joint above finished ceiling.

.2 Except around staircases and shafts, terminate through partitions within 19mm (3/4") of structure above, i.e. floor, roof decking depending under which partitions occur, and

where such partitions occur directly under and parallel to structural framing carry these partitions up to within 19mm (3/4") of bottom of such structural framing.

.3 Around staircases and shafts, wedge and grout masonry solidly to structure above. Laterally support other partitions as required by building code. Where tops of partitions are exposed to view, lateral supports shall be concealed.

.4 Where walls and partitions are pierced by structural members, ducts or pipes, fill voids with mortar to within 19mm (3/4") of such members flush with wall fins.

.5 Fill spaces between partition and structure, ducts and pipes with compressed glass fibre or mineral wool insulation completely from one side of wall to other.

3.6 CONTROL JOINTS

.1 Provide vertical through wall control joints 7620mm (25') O.C. maximum (except as otherwise shown or specified) in continuous walls having no openings, intersections or columns. Control joints as shown on Drawings.

.2 Locate control joints at high stress concentrations and at points of weakness such as at abrupt changes in work height, wall thickness changes such as at chases and at pilasters and maximum of 3658mm (12') from corners.

.3 Construct joint as detailed and generally as follows:

.1 Place building paper against end of block on one side of control joint. Extend bond breaker full wall thickness.

.2 Fill voids between ends of block with mortar to form key and strike back exposed vertical joints 19mm (3/4") deep, install backer rod and caulk in accordance with Section 07 92 00.

.3 Reinforce joints every third course with two 6mm (1/4") diameter greased smooth rods. Locate rods 32mm (1-1/4") in from faces of block centres on joint running parallel to wall.

3.7 REINFORCEMENT AND REINFORCING TIES

.1 Reinforce all masonry walls with continuous masonry horizontal reinforcement in every second block course.

.2 Provide extra reinforcement or reinforcing ties at openings so that first and second courses above and below openings are reinforced. Extend extra reinforcement 610mm (2') beyond opening in each direction.

.3 Anchor new masonry to structural steel to concrete elements, to existing construction at maximum 406mm (16") O.C., vertically in accordance with local building code requirements.

3.8 BUILT-INS

.1 Built-in items provided by other Sections, anchor bolts, sleeves, inserts, loose steel lintels, shelf angles, access panels, and other such items.

.2 Built-in items to present neat, rigid, true and plumb installation. Leave wall openings required for ducts, grilles, pipes and other items.

.3 Fill voids between masonry and metal frames with masonry mortar.

3.9 REPOINTING OR TUCKPOINTING

.1 Repoint defective joints as follows:

.1 Cut back joints 13mm (1/2"), taking care not to damage units. Remove dust and loose materials by brushing or by water jet.

.2 If water jet is used, allow excess water to drain before repointing.

.3 Repoint with same mix as original. Pack mortar tightly in thin layers, and tool joints or strike flush as required.

3.10 CLEANING

.1 Keep work clean and free of mortar stains during laying. Allow mortar droppings which adhere to wall to dry out but not set.

.2 Rub with small piece of masonry followed by brushing to remove all traces.

.3 On completion of masonry, after mortar is thoroughly set and cured, and defective joints tucked and pointed, clean masonry thoroughly.

.4 Remove mortar with wood paddles and scrapers before wetting. Saturate masonry with clean water and flush off loose mortar and dirt. Clean block work using water, scrubbing brushes and wood paddles only.

END OF SECTION

1 General

1.1 SUMMARY

.1 Section Includes the following:

.1 Load-bearing steel framing systems and accessories for support of cladding at exterior walls.

.2 Unless otherwise specified conform to CSA-S16, Steel Structures for Building - Limit States Design and CAN/CSA-S136, Cold Formed Steel Structural Members.

1.2 REFERENCE STANDARDS

.1 Canadian Institute of Steel Construction (CISC):

.1 CISI - Specification for the Design of Cold-Formed Steel Structural Members, in accordance with CAN/CSA-S136.

.2 American Society for Testing and Materials (ASTM):

.1 ASTM A153/A123M-09, Zinc Coating (Hot-Dipped) on Iron and Steel Hardware.

.2 ASTM A568/A568M-11b, General Requirements for Steel Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled.

.3 ASTM A653/A653M-11, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

.4 ASTM C955-11c, Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Track), and Bracing or Bridging for Screw Application of Gypsum Board and Metal Plaster Bases.

.5 ASTM C1513 - Standard Specification for Steel Tapping Screws for Cold Formed Steel Framing Connections.

.3 American National Standards Institute/American Welding Society:

.1 ANSI/AWS D1.3, Structural Welding Code - Sheet Steel.

.4 Canadian Standards Association:

.1 CSA-W47.1, Certification of Companies for Fusion Welding of Steel Structures.

.2 CSA-W59-03 (R2008), Welded Steel Construction (Metal Arc Welding).

.3 CSA-S16-09, Design of Steel Structures

.4 CAN/CSA-S136-07, North American Specification for the Design of Cold-Formed Steel Structural Members

.5 Canadian General Standards Board (CGSB):

.1 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating

.2 CAN/CGSB-51.32-M77, Sheathing, Membrane, Breather Type

.6 Canadian Sheet Steel Building Institute:

.1 CSSBI 51M-1991, Lightweight Steel Framing Design Manual.

1.3 SYSTEM DESCRIPTION

.1 Design Requirements:

.1 Have work of this section designed by a professional engineer licensed to design structures and registered in the place of Work.

.2 Design cold formed metal framing system to resist pressure and suction of wind loads, snow loads, snow load build-up and temperature range, expected in the

geographical area for this project, under the local Building Code, climatic information for 30 year probability without any detrimental effects on appearance and performance.

.3 Design shall be based on Limit States Design principles using factored loads and resistances.

.4 Deflection (inward or outward) shall not be greater than L/720 of the span between points of support.

.5 Resistance strength and resistance factors shall be determined in accordance with applicable building code requirements and CAN/CSA-S136.

.6 Construct work of this section to provide for expansion and contraction of components as will be caused by ambient temperature range without causing buckling, failure of joint seals, undue stress on fasteners or other effects detrimental to appearance or performance.

.7 Section properties shall be computed on the basis of the nominal core thickness.

.8 Design bridging to prevent member rotation and member translation perpendicular to the minor axis. Provide for secondary stress affects due to torsion between lines bridging. Sheathing shall not be used to help restrain member rotation and translation perpendicular to the minor axis for wind bearing studs.

.9 Design cold formed metal framing system to support loads and superimposed loads transferred from cladding and include for design of support and attachment components between other assemblies and stud system. Responsibility for design of exterior wall loads transferred from other envelope components is part of work of this section.

.10 Design of cold formed metal framing system shall account for deflection of primary structural elements as necessary.

1.4 SUBMITTALS

.1 Provide submittals in accordance with Division 01.

.2 Shop Drawings:

.1 Prepare and submit shop and erection drawings which conform to the requirements of the CAN/CSA-S16, and as specified herein.

.2 Cold formed metal framing system must have shop drawings prepared by qualified draftsmen, checked by and bearing the seal of a professional engineer registered to design structures and practice in the place of Work.

.3 Show the size, spacing and location of connections, attachments, reinforcing and anchorage. Include necessary plans, elevations and details. Indicate size and type of fastening. For weld connections use welding symbols in compliance with AWS and indicate clearly net weld lengths.

.4 Submit typical details of connections, and any special connections for approval before preparation of shop drawings.

.5 Review of shop drawings by the Consultant and Structural Engineer will not absolve the Contractor from his responsibility of providing materials and equipment to complete and finish work of this section in accordance with the architectural and structural drawings. Departures or differences from the referenced drawings shall be approved in writing by the Consultant.

1.5 QUALITY ASSURANCE

.1 Conform to requirements of CAN/CSA-S16, Steel Structures for Buildings, and CAN/CSA-S136, Cold Formed Steel Structural Members.

.2 Work to be executed by firm thoroughly conversant with laws, by-laws and regulations which govern, and capable of workmanship of best grade of modern shop and field practice known to recognized manufacturer's specializing in this work.

.3 Work shall be executed by workers especially trained and experienced in this type of work. Have a full time, senior, qualified representative at the site to direct the work.

.4 Install system to provide for movement of components without damage, failure of joint seals, undue stress on fasteners, or other detrimental effects when subject to seasonal or cyclic day/night temperature ranges.

.5 Install system to accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.

1.6 INSPECTION AND TESTING

.1 An independent inspection and testing company appointed and paid for by the Cash Allowance may carry out inspection and testing of the structural steel stud systems in accordance with Division 01.

.2 Provide free access for inspectors to all places where work is being done.

.3 Inspectors are to ensure that materials conform to the requirements of this section.

.4 Any inspection and/or testing required because of an error by the Contractor, or due to departure from the Contract Documents shall be paid for by the Contractor.

.5 Inspection and testing of structural metal stud systems shall include, but shall not be limited to the following:

.1 Checking that mill test reports are properly correlated to materials.

.2 Sampling fabrication and erection procedures for general conformity to the requirements of the specification.

.3 Checking that the welding conforms to the requirements of CSA W47.1, CSA W59 (R2008) and/or ANSI/AWS D1.3, whichever is applicable.

.4 Checking fabricated members against specified member shapes.

.5 Visual inspection of all welded connections including sample checking of joint preparation and fit-up.

.6 Sample checking of screwed and bolted joints.

.7 Sample checking that tolerances are not exceeded during fit-up and/or erection.

.8 Additional inspection and testing of welded connections at required by CSA W59.

.9 General inspection of field cutting and alterations required by other trades.

.10 Submission of reports to the Consultant covering the work inspected with details of deficiencies discovered.

.6 The inspection and testing provided in this Section does not relieve the Contractor of his responsibility for the performance of the Contract. The Contractor shall implement his own supervisory and quality control procedures.

.7 Materials and/or workmanship not conforming to the requirements of the Contract Documents may be rejected at any time during the progress of the work, and shall be replaced and/or repaired without cost to the Owner.

1.7 DELIVERY, STORAGE, HANDLING AND PROTECTION

.1 Coordinate deliveries to comply with Construction Progress Schedule and arrange ahead for off-the-ground storage location. Do not load any area beyond the design limits.

.2 Adequately protect steel against rust and damage during manufacturing, delivery and storage.

.3 Store material on planks on a dry area and protect from damage. Make good immediately any damage done, clean scratches and the like, touch-up with specified primer.

2 Products

2.1 MANUFACTURERS

.1 Cold formed metal framing as indicated on drawings and as specified herein shall be by one of the following:

.1 Bailey Metal Products Limited, or;

.2 Canadian Steel Manufacturing, Division of British Steel Canada Inc., or;

.3 Lightsteel Inc., Boucherville, Quebec;

.4 Or Approved equivalent.

2.2 MATERIALS

.1 Faming materials shall conform to the requirements of CAN/CSA-S136.

.2 Galvanized Sheet Steel:

.1 Conform to ASTM A653/A653M, minimum Grade D, 50 PSI (345 Mpa) yield for 1.5mm (.060") material.

.3 Structural Metal Studs:

.1 Galvanized sheet steel formed to channel shape, of minimum gauge, sizes, and section properties to meet design requirements, and conforms to ASTM C955.

.4 Metal Stud Runners/Top and Bottom Tracks:

.1 Galvanized sheet steel formed to channel shape, having same width as studs, with tight fit and solid web, of minimum gauge to meet design requirements, but no less than gauge of metal studs, and conforms to ASTM C955.

.5 Metal Plates, Bridging, Gussets and Clips:

.1 Formed from galvanized sheet steel, of gauges, shapes and sizes required to meet design requirements determined for conditions encountered, and of same finish as framing members.

.6 Metal Cladding Supports:

.1 Galvanized sheet steel formed to “Z”, “C” or “L” shape, of minimum gauge, sizes, and section properties to meet design requirements, and conforms to ASTM A570.

.7 Fastenings:

.1 Self-drilling, Self-tapping Screws, Bolts, Nuts and Washers: Hot-dip galvanized to 1.25 ounce per square foot and conforms to ASTM A153/A153M-09, Class B3, '12-24 x 7/8 HWH #4STLG' by Hilti Canada, or approved equivalent.

.2 Anchorage Devices: Power driven, powder actuated, drilled expansion bolts, or screws with sleeves, as application dictates.

.3 Welding Materials: Conforms to CSA W59.

.4 Electrodes for welding shall have minimum 480 Mpa tensile strength series, (E480XXX,E480S-X).

.8 Touch-Up Primer:

.1 Ready mixed, zinc-rich primer, and conforms to CAN/CGSB-1.181, 'Sealtight Galvafroid Zinc-Rich Coating' by W.R. Meadows of Canada Limited, or 'Zinc Clad

No.7 Organic Zinc Rich Primer' by Sherwin Williams Company of Canada Ltd., or approved equivalent.

.9 Dampproof Course:

.1 No. 15 asphalt building paper conforming to CAN/CGSB-51.32-M77.

2.3 FABRICATION

.1 Fit and assemble work in shop where possible. Execute work according to details and reviewed shop drawings.

.2 Take measurements at the building for work which is to fit or be connected to steel, concrete framing or masonry, before commencing fabrication.

.3 Structural metal studs shall have one unreinforced service cut-out centred in the web of the studs and with the centreline of the cut-out a minimum of 455mm (1'-6") from the bottom of the studs. In addition to the above, provide cut-outs for internal bridging as required. All unreinforced cut-outs shall conform to dimension limitations of Table 1, in the CSSBI M50-1987 Manual.

.4 Provide pre-punched cut-outs in inner top track for anchor clearances so that deflection clearances are not reduced.

.5 Fabrication tolerances for cold formed steel framing members shall to Table 2 of the CSSBI M50-1987 Manual.

.6 Cutting of cold formed steel framing members shall be by "power saw" or "shear" methods. Cutting by "torch" method shall not be permitted.

.7 Steel thickness, exclusive of coating shall be marked on all cold formed steel framing members by embossing, or by stamping with indelible ink, or by colour coding method.

.8 Gauges and sizes of metal shall be adequate for various conditions.

2.4 CLADDING ACCOMODATION

.1 Provide an engineered designed framing support assembly to maintain dimensions to face of cladding materials indicated on drawings to include the framing supports configuration, size, spacing, and adjust as needed to accommodate support for each cladding type, in accordance with the engineering and/or contract documents including but not limited to:

.1 Insulated Metal Cladding Panels specified by Section 07 42 13.

.2 Metal Siding specified by Section 07 46 19.

.2 Tolerances

.1 Accommodate deflection of structural members as it applies to the Work.

.2 Maintain clearances at adjacent construction.

.3 Prevent load transfer to non-structural elements.

.4 Thermally isolate fasteners from metal using thermal isolation washers or other means.

.3 Effect on Wall Assemblies

.1 Framing system must not degrade complete wall assembly’s thermal resistance by reasonable amount and conform to ASHRAE 90.1 prescriptive U-value of wall assembly for appropriate climate zone.

3 Execution

3.1 EXAMINATION

.1 Verify at site that the work to receive the work of this section is free of irregularities detrimental to the installation and performance of the work and that it is located correctly and at proper levels before delivery and installation.

.2 Verify that building framing components are ready to receive work.

.3 Beginning of installation means acceptance of existing conditions.

3.2 ERECTION OF STUDS

.1 Install components in strict accordance with manufacturer's written instructions.

.2 Methods of construction may be either piece by piece (stick-built), or by fabrication into panels (panelized) either on or off site. Handling and lifting of prefabricated panels shall not cause permanent distortion to any member or collateral material.

.3 Cold formed steel framing shall be erected true and plumb within the tolerances specified herein. Temporary bracing shall be employed wherever necessary to withstand all loads to which the structure may be subject during erection and subsequent construction. Temporary bracing shall be left in place as long as required for the safety and integrity of the structure. The Contractor shall ensure that during erection a margin of safety consistent with the requirements of the National Building Code and CAN/CSA-S136 exists in the uncompleted structure.

.4 Erection Tolerances:

.1 For the purposes of erection tolerances, "camber" is defined as the deviation from straightness of a member or any portion of a member with respect to its major axis and "sweep" is defined as the deviation from straightness of a member or any portion of a member with respect to its minor axis.

.2 For wind bearing studs, out of plumbness shall not exceed 1/500th of the member length. Out of straightness (camber and sweep) shall not exceed 1/1000th of the member length.

.3 For runners/tracks, camber shall not exceed 1/1000th of the member length.

.4 Studs shall seat into top and bottom runners/tracks. The gap between the end of the stud and the web of the runner/track shall not exceed 4mm (5/32") for wind bearing studs.

.5 Where cold formed metal framing is made in prefabricated panels, align adjacent prefabricated panels to provide surface continuity at the interface.

.6 Spacing of studs shall not be more than 3mm (1/8") from the design spacing. The cumulative error in spacing shall not exceed the requirements of the finishing materials.

.5 Align floor and ceiling runners/tracks, locate to wall or partition layout. Secure in place with screws or welding at maximum 610mm (24") O.C. Coordinate installation of sealant with floor and ceiling track.

.6 Place studs to meet design requirements as indicated on approved shop drawings, and not more than 50mm (2") from abutting walls, and at each side of openings. Connect studs to tracks using clips and ties, screws, or welding. Diameter of screws shall be equal to, or exceed the minimum diameter indicated on the reviewed shop drawings. Penetration of screws beyond joined materials shall be not less than three (3) exposed threads. Thread types and drilling capability of screws shall conform to the manufacturer's written recommendations to suit design requirements and conditions. Screws to be covered by sheathing materials shall have "low profile" type heads.

.7 Field cutting of cold formed steel framing members shall be by "power saw" or "shear" methods. Cutting by "torch" method shall not be permitted.

.8 Holes that are field cut into cold formed steel framing members shall conform to the dimensional requirements of Table 1, in the CSSBI M50-1987 Manual.

.9 Brace structural metal studs as required to meet design requirements and as indicated on reviewed shop drawings.

.10 Provide continuous dampproof course to underside of bottom runner/track.

.11 Construct corners using minimum of three studs. Double studs at door, window jambs, and wall openings.

.12 Erect studs one piece full length. Splicing of studs is not permitted.

.13 Erect load bearing studs, brace, and reinforce to develop full strength to meet design requirements.

.14 Refer to drawings for height of partition framing.

.15 Coordinate placement of insulation in multiple stud spaces made inaccessible after erection.

.16 Install intermediate studs above and below openings to match wall stud spacing.

.17 Provide deflection allowance in stud bottom runner/track, directly below horizontal building framing for non-load bearing framing.

.18 Attach cross studs or furring channels to studs for attachment of fixtures anchored to walls. Install framing between studs for attachment of mechanical and electrical items, and to prevent stud rotation.

.19 Touch-up field welds and damaged galvanized surfaces with two coats of zinc rich touch-up primer.

3.3 ERECTION OF CLADDING SUPPORT

.1 Install in accordance with manufacturer's instructions and approved submittals, and in proper relationship with adjacent construction.

.1 Attach cladding support system to structural backup anchor size/frequency as per engineered shop drawings.

.2 Attach cladding panels or tiles to cladding support system per cladding panels manufacturer’s recommendations. Refer to Specifications 07 42 13 and 07 46 19.

.3 Frame as required for window, door and louvre openings. Install framing below sills and at jambs of openings to match framing at heads of openings.

3.4 PROTECTION

.1 Protect installed products until completion of project. repair or replace damaged products before Substantial Completion.

END OF SECTION

1 General

1.1 SUMMARY

.1 Supply and install all miscellaneous metal work indicated on drawings and not included in the work of other Sections in addition to items listed in this Section.

.2 Section includes the supply and installation of decorative steel railings, complete with intermediate stanchions, as detailed on the Drawings for use in the following locations:

.1 Guardrail at exterior terrace;

.2 Guardrail at mezzanines/catwalk;

.3 Guardrail/Handrails at stairs;

.4 Wall Protection barriers;

.5 Pit/roof access ladders;

.6 Corner guards

1.2 RELATED REQUIREMENTS

.1 Read carefully all other Sections and review drawings to determine extent of metal work supplied and installed, or installed by others.

.2 Be responsible for co-ordinating this section with all related sections.

1.3 REFERENCE STANDARDS

.1 American Society for Testing and Materials (ASTM):

.1 ASTM A53/A53M-12, Standard Specification for Pipe, Steel, Black and Hot Dipped, Zinc Coated, Welded and Seamless

.2 ASTM A325-10, Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength

.3 ASTM A653/A653M-11, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

.4 ASTM C939-10, Standard Test Method for Flow of Grout for Preplaced Aggregate Concrete (Flow Cone Method)

.5 ASTM A1011/A1011M-12b, Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with improved Formability, and Ultra-High Strength

.6 ASTM C1107/C1107M-11, Standard Specification for Packaged Dry, Hydraulic Cement Grout (Nonshrink)

.2 Canadian Standards Association (CSA):

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

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

.3 CSA-S16-09, Design of Steel Structures

.4 CSA-S136-07, North American Specification for the Design of Cold Formed Steel Structural Members

.5 CSA W47.1-09, Certification of Companies for Fusion Welding of Steel

.6 CSA W55.3-08, Certification of Companies for Resistance Welding of Steel and Aluminum

.7 CSA W59-03 (R2008), Welded Steel Construction (Metal Arc Welding)

.3 Canadian General Standards Board (CGSB):

.1 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating

.2 CAN/CGSB-51.32-M77, Sheathing, Membrane, Breather Type

.3 CGSB 31-GP-105Ma, Zinc Phosphate Conversion Coatings for Paint Base

.4 The Society for Protective Coatings (SSPC):

.1 SSPC1 Solvent Cleaning - 2004

.2 SSPC2 Hand Tool Cleaning - 2004

.3 SSPC-3 Power Tool Cleaning - 2004

.4 SSPC-6 Commercial Blast Cleaning - 2007

1.4 QUALITY ASSURANCE

.1 All Codes and Standards referred to in this Specification shall be current editions including all latest revisions and addenda.

.2 Conform to requirements of CSA-S16, Design of Steel Structures and CAN/CSA-S136, Cold Formed Steel Structural Members.

.3 Architectural metals work shall be of the highest architectural quality, free of scratches, pitting, roughness, marring, discolouration, staining and other imperfections.

.4 Work of this Section to be executed by firm thoroughly conversant with laws, by-laws and regulations which govern, and capable of workmanship of best grade of modern shop and field practice known to recognized manufacturer's specializing in this work.

.5 Work of this Section shall be executed by workers especially trained and experienced in this type of work. Have a full time, senior, qualified representative at the site to direct the work of this Section.

.6 Where required by authorities having jurisdiction, have work of this Section designed by a professional engineer licensed to design structures and registered in the Province of the Work.

1.5 SUBMITTALS

.1 Provide submittals in accordance with Division 01, bearing stamp or seal and signature of the Professional Engineer responsible for the design of the work of this Section.

.2 Shop Drawings:

.1 Make thorough examination of drawings and details, determine the intent, extent, and materials, and be fully cognizant of requirements when preparing shop drawings.

.2 Submit shop drawings showing and describing in detail all work of this Section including large scale detail of members and materials, of connection and interfacing with work of other Sections, jointing details, and of anchorage devices, dimension, gauges, thicknesses, description of materials, metal finishing, as well as other pertinent data and information.

.3 Digital files of design drawings shall not be used in the preparation of shop drawings.

1.6 STORAGE, DELIVERY, HANDLING AND PROTECTION

.1 Coordinate deliveries to comply with construction schedule and arrange ahead for strategic off the ground, under cover storage locations. Do not load any area beyond the design limits.

.2 Adequately protect and crate all components against damage, dirt, disfigurement and weather during delivery and storage. Damaged materials shall not be used and shall be replaced by approved material.

.3 Cover and protect the work of other Sections in the area of work from damage. Make good all damage to the satisfaction of the Consultant.

.4 Protect the installed work of this Section and on completion the work shall be examined and damage shall be remedied to the complete satisfaction of the Consultant.

2 Products

2.1 PERFORMANCE REQUIREMENTS

.1 Delegated Design: Engage a qualified professional engineer, to design railings, including attachment to building construction.

.2 Structural Performance: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

.1 Handrails and Top Rails of Guards:

.1 Uniform load of 50 lbf/ft. (0.73 kN/m) applied in any direction.

.2 Concentrated load of 200 lbf (0.89 kN) applied in any direction.

.3 Uniform and concentrated loads need not be assumed to act concurrently.

.2 Infill of Guards:

.1 Concentrated load of 50 lbf (0.22 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq. m).

.3 Infill load and other loads need not be assumed to act concurrently.

2.2 MATERIALS

.1 Structural Steel Sections and Steel Plate: New stock (not weathered or rusted); to conform to CAN/CSA-G40.21, Grade 300W (44W) and Grade 350W (50W) for wide flange shapes.

.2 Hollow Structural Sections (HSS): New stock; to conform to CAN/CSA-G40.21, Grade 350W (50W), Class C, stress relieved.

.3 Sheet Steel (Structural Quality): Conforms to ASTM A1011/A1011M.

.4 Sheet Steel (Commercial Quality): Conforms to ASTM A653/A653M, stretcher levelled or temper rolled.

.5 Tube: Conforms to ASTM A53.

.6 Galvanized Sheet Steel (Commercial Quality): Galvanized coating G90 (Z275) in accordance with ASTM A653/A653M, minimized spangle, stretch levelled or temper rolled. Specially treat by phosphate conversion process conforming to CGSB 31-GP-105Ma ready to receive prime paint finish.

.7 Steel Pipe: Hot-dip galvanized, zinc coated, welded and seamless type steel pipe conforming to ASTM A53/A53M.

.8 Aluminum Plate and Sheet: ASTM B209M, Alloy 6061-T6.

.9 Aluminum Extrusions: ASTM B221M, Alloy 6063-T6.

.10 Non-Shrink Grout: Premixed, high strength, maximum bearing, impact resistant, non-shrink non-metallic aggregate grout having minimum 76 Mpa 28 day compressive strength and conforms to ASTM C939 and ASTM C1107/C1107M, 'Embeco Premixed

Grout' by Master Builders Technologies Ltd., or 'Tartan Grout Iron' by Webster & Sons Ltd., or 'Sika Grout 212 HP' by Sika Canada Inc., or approved equivalent.

.11 Galvanizing: All uncoated steel specified to be galvanized shall be galvanized after fabrication by the hot dip process according to CAN/CSA-G164, with minimum coating of 2 oz./sq.ft. Galvanize after all welding is complete. Welding of galvanized material will not be permitted. Specially treat by phosphate conversion process conforming to CGSB 31-GP-105Ma ready to receive prime paint finish.

.12 Primer Paint: CISC/CPMA 2-75.

.13 Bolts, Nuts, Washers: Conforms to ASTM A325.

.14 Welding Materials: Conforms to CSA W59.

.15 Metal Filler: Polyester based type.

.16 Painting:

.1 Shop Applied Structural Steel Primer: Steel Spec Universal Primer (B50RV6227 Red), by Sherwin Williams Company of Canada Ltd., or approved equivalent. Apply a minimum of 2 mils dft./coat. Grey coloured primer is acceptable.

.2 Zinc Rich Paint For Touch-up of Galvanized Metals: Ready mixed, zinc-rich primer conforming to CAN/CGSB-1.181, Sealtight Galvafroid Zinc-Rich Coating by W.R. Meadows of Canada Limited or Zinc Clad No. 5 Organic Zinc Rich Primer by Sherwin Williams Company of Canada Ltd., or approved equivalent.

.3 Touch-up Primer (On Site): Procryl Universal Acrylic Primer by Sherwin Williams Company of Canada Ltd, or approved equivalent. Touch-up primer shall be no less than 3 mil dft.

.4 Refer to Section 09 90 00, and coordinate with the above.

.17 Isolation Coating: Acid and alkali resistant bituminous paint.

.18 Building Paper: Conforms to CAN/CGSB-51.32.

.19 Butyl Tape: Extruded, high grade, macro-polyisobutylene tape of size, width and shore hardness to suit conditions.

2.3 FABRICATION

.1 Fit and assemble work in shop where possible. Execute work according to details and reviewed shop drawings.

.2 Take measurements at the building for work which is to fit or be connected to steel or concrete before commencing fabrication.

.3 Where shop fabrication is not possible, make trial assembly in shop.

.4 Do all welding in accordance with requirements of CSA W59, CSA W55.3 and CSA W47.1 including all supplements. Weld stainless steel electric arc process. Grind welds smooth and flush with surface of parent metal, where exposed to view and where specifically indicated on drawings. Welds shall be continuous seam welds unless specified otherwise. Maintain sharp arises.

.5 Fit joints and intersecting members accurately in true planes, square, plumb, straight with tight joints and intersections.

.6 Provide adequate reinforcing, fastenings, anchors, accessories required for fabrication and erection of work of this Section. Such items occurring on or in an exterior wall or slab shall be hot-dip galvanized. Make thread dimensions such that nuts and bolts will fit without rethreading or chasing threads.

.7 Fabricate, drill and tap members to accommodate attachments, anchorage and work of other Sections where located and directed by them.

.8 Exposed steel surfaces shall be smooth and free from imperfections such as warping, buckling, weld marks, burrs, rust and scale.

.9 Gauges and sizes of metal shall be adequate for various conditions.

.10 Make exposed metal fastenings and accessories of same material, texture, colour and finish as base metal on which they occur unless otherwise shown or specified. Keep exposed fastenings to an absolute minimum evenly spaced and neatly laid out. Make fastenings of permanent type unless otherwise indicated.

2.4 SHOP PAINTING AND PROTECTION

.1 As per SSPC2 Hand Tool Clean and SSPC1 Solvent Clean, clean welds by wire brushing and wash down with clean water, to remove the chemical residues left by the electrodes, prior to painting.

.2 Prepare steel as per SSPC-3 Power Tool Cleaning for Interior or SSPC-6 Commercial Blast Cleaning for exterior members. Remove rust, mill scale, oil, dirt, and other foreign matter before commencing shop painting.

.3 Apply shop coat of primer to all surfaces except areas requiring field welding. Apply by brush, working paint well into surfaces, interstices and cavities.

.4 Primer is to be free of runs, sags, or other collections of primer due to dipping of members into primer.

.5 Steel work shall be painted under cover, and shall remain under cover, until the paint protection is dry.

.6 Prime field welded areas after erection and touch up shop coat where damaged and barred by erection and handling.

.7 Prime steel with two full coats of paint in strict accordance with paint manufacturer's directions.

.8 Give the parts which are inaccessible after assembly two coats of primer coat paint, of different colours, when members are noted to be painted.

2.5 HOT DIP GALVANIZING

.1 Hot dip galvanize, after fabrication, steel metal fabrication items. Straighten shapes and assemblies true to line and plane after galvanizing. Repair damaged galvanized surfaces with brush or spray-applied anti-corrosion coating containing 92-95% zinc, in accordance with manufacturer's printed directions.

.1 Members exposed to elements when in final location.

.2 Members embedded on exterior side of exterior walls.

.3 Members imbedded in concrete.

.4 Members specified in this Section or indicated on Drawings.

.2 Hot-dip galvanize members in accordance with CAN/CSA G164 and requirements of the following ASTM standards, with minimum coating weights or thicknesses as follows, unless otherwise indicated that high performance organic finish is required:

.1 Rolled, Pressed and Forged Steel Shapes, Plates, Bars and Strips: ASTM A123/A123M; average weight of zinc coating of actual surface

.1 4.8 mm (3/16”) and less member thickness: 600 g/sq.m.

.2 6 mm (1/4”) and heavier members: 640 g/sq.m.

.2 Iron and Steel Hardware: ASTM A153/A153M; minimum weight of zinc coating, in gram per square meter of surface, in accordance with Table 1 for the various classes of materials used in the Work.

3 Execution

3.1 GENERAL

.1 Verify at site that the Work to receive the work of this Section is free of irregularities detrimental to the installation and performance of the work and that it is located correctly and at proper levels before delivery and installation.

.2 Erection: To meet specified requirements of CAN/CSA-S16.

.3 Bearing Plates and Anchors: Standard.

.4 Anchors: Anchors to structural concrete shall be approved inserts set into concrete or approved self-drilling expansion insets drilled and placed afterwards.

3.2 INSTALLATION

.1 Assemble and erect work plumb, true, square, straight, level and accurate to sizes detailed, to reviewed shop drawings, free from distortion and defects detrimental to appearance and performance.

.2 Isolate metals where necessary to prevent corrosion due to contact between dissimilar metals and between metals and masonry, concrete or plaster. Use bituminous paint or butyl tape.

.3 Supply adequate instructions, templates, and if necessary, supervise installation of the fastenings or accessories requiring to be built-in by other Sections of the Work.

3.3 SCHEDULES

.1 Where items are required to be built into masonry, concrete or other work, supply such items to respective Sections with all anchors and accessories for building in.

.2 Itemized List: Supply and install metal work listed below unless specifically designated to be supplied only. Each item shall be as shown on drawings and as detailed on reviewed shop drawings.

.3 Miscellaneous Steel Framing, Channels, Angles, Plates and Brackets: As required and indicated on drawings.

.4 Metal grating: refer to structural drawings.

.5 Steel Pan Staircase:

.1 Cranked C-Channel stringer, treads, risers, platforms/landings as detailed on Drawings.

.2 Form risers, subtread pans from sheet steel of thickness needed to comply with performance requirements; directly weld metal pans to stringers.

.6 Guardrails and Handrails:

.1 Guardrail (GR-01) at Mezzanine (interior):

.1 Steel guardrail, complete with top rail, bottom toe board, intermediate stanchions and vertical pickets.

.2 Mounting: mechanically fastened to mezzanine structure

.3 Finish: paint finish per Spec 09 99 00

.2 Guardrail (GR-02) at Stairwell (interior):

.1 Galvanized steel guardrail, complete with top and bottom rail, continuously graspable handrail, intermediate stanchions and vertical pickets.

.2 Continuous bottom rail welded to stair stringer

.3 Finish: paint finish per Spec 09 99 00

.3 Guardrail (GR-03) at Terrace (exterior):

.1 Galvanized steel guardrail, complete with top and bottom rail, and intermediate stanchions and vertical pickets.

.2 Mounting: mechanically fastened to terrace structure.

.3 Finish: hot dip galvanized.

.4 Handrail (HR-01) at Stairs (interior):

.1 Tubular steel, 38mm (1-1/2”) dia. pipe rail with mounting flange as detailed on Drawings.

.2 Finish: paint finish per Spec 09 99 00

.7 Wall Protection Barriers:

.1 Wall Protection WP-01 at 2nd floor perimeter

.1 HSS vertical supports with base plate and continuous C-Channel horizontal members as detailed on Drawings. Ends of horizontal C-Channel member anchored to adjacent column/bracing for added stiffness.

.2 Finish: paint finish per Spec 09 99 00

.8 Heat Exchanger/Equipment Frame:

.1 Elevated Frame and Saddle Support Structure for Heat Exchanger:

.1 L-Angle legs complete with base plate and radiused saddle to support heat exchanger.

.2 Finish: paint finish per Spec 09 99 00

.9 Loose Lintels:

.1 Provide and install loose lintels if not by structural steel.

.2 Finish: Hot-dip galvanized after fabrication.

.10 Masonry Lateral Supports:

.1 Install deflection space and lateral support for non-load-bearing masonry walls and partitions in accordance with specified requirements of CAN/ULC-S304-M, where not provided on Structural Drawings.

.2 At walls with concealed tops:

.1 3" x 2" x 1/4" angles 8" long on both sides of walls. Anchor to structure above wall.

.3 At walls with tops exposed to view:

.1 3" x 2" x 1/4" angles, continuous on both sides of wall. Anchor to structure above wall.

.4 Finish: Prime paint.

.11 Access Ladders

.1 Aluminum pit ladder (at below slab Water Chamber and Elevator Pit)

.1 50mm x 10mm aluminum flat bar ladder stringer, c/w flat plate stand-off brackets to secure ladder to wall

.2 3mm x 38mm x 48mm bent aluminum checker plate ladder rung at max 300mm oc.

.2 Steel roof access ladder (at 2nd floor).

.1 50mm x 10mm steel flat bar ladder stringer, c/w flat plate stand-off brackets to secure ladder to wall

.2 20mm diameter steel ladder rungs at max 300mm oc.

.12 Corner Guards

.1 Stainless steel corner guards at exterior corners of GWB framed walls within manufacturing area.

.1 2” x 2” x 60” L, 16gauge

.13 Other Miscellaneous Metal Components:

.1 As required and indicated on drawings.

.2 Finish: Prime paint for interior components, ready for finishing by Section 09 90 00 and hot-dip galvanized after fabrication for exterior components.

END OF SECTION

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 REFERENCE STANDARDS

.1 American Society for Testing and Materials (ASTM):

.1 ASTM A307-04e1, Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength

.2 ASTM C954-00, Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness

.3 ASTM D6007-02 Standard Test Method for Determining Formaldehyde Concentration in Air from Wood Products Using a Small Scale Chamber

.4 ASTM D6330-98(2003) Standard Practice for Determination of Volatile Organic Compounds (Excluding Formaldehyde) Emissions from Wood-Based Panels Using Small Environmental Chambers Under Defined Test Conditions

.5 ASTM E1333-96(2002) Standard Test Method for Determining Formaldehyde Concentrations in Air and Emission Rates from Wood Products Using a Large Chamber

.2 Underwriters Laboratories of Canada (ULC):

.1 CAN/ULC S102-18, Standard Method of Test for Surface Burning Characteristics of building Materials and Assemblies

.3 American Wood Preservers Association (AWPA):

.1 AWPA Book of Standards, Latest edition

.4 Canadian General Standards Board (CGSB):

.1 CAN/CGSB 71.26-M88, Standard for Adhesives for Field-gluing Plywood to Lumber Framing for Floor Systems.

.5 Canadian Roofing Contractors Association (CRCA):

.1 Roofing Specifications

.6 Canadian Standards Association (CSA):

.1 CSA B111-1974 (R2003), Wire Nails, Spikes and Staples

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

.3 CSA O80 Series-97 (R2002), Wood Preservation

.4 CSA O86-01, Engineering Design in Wood

.5 CSA O112 Series-M1977(R2001), Adhesives for Wood

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

.7 CSA-O141-M91(R1999), Softwood Lumber.

.8 CSA O151-M1978(R2003), Canadian Softwood Plywood.

.9 CSA O325.0-92(R2003), Construction Sheathing

.10 CSA O437 Series 93 (R2003) OSB and Waferboard

.11 CSA O452 Series 94 (R2001), Design Rated OSB

.7 National Lumber Grading Association (NLGA):

.1 NLGA SPS2-2000 Special Products Standards on Machine Stress-Rated Lumber.

.2 NLGA Canadian Lumber Grading Rules

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.

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.

.2 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 19mm (3/4") thick and/or thickness as indicated on drawings, exterior grade at exterior locations; Douglas Fir plywood, veneer core.

.2 Select Sheathing; Tight Face, un-sanded, "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.

.2 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.

.3 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 PRESERVATIVE TREATED MATERIALS

.1 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 CSA O80 Series -08.

.1 Preservative Treatment: A waterborne, micronized copper azole (MCA) system developed to provide long-term protection for wood exposed in exterior applications from fungal decay and termite attack.

.1 For use on exterior lumber above ground, in ground contact and in freshwater contact.

.2 Basis of Design Materials: MicroPro Sienna® Treated Wood by Koppers Performance Chemicals Inc.

.2 Species: Pine or Spruce-Pine

.3 Grade: No.2 or better structural posts and lumber, pieces may be grade stamped or shipment certified by letter of compliance.

.4 Grading authority: NLGA, paragraph 131CC

.5 Material having twisted grain or structural defects affecting integrity of lumber will not be acceptable for this project.

.6 Use only material with radius edges, minimum 6 mm.

.7 Kiln dry lumber materials to 8% moisture content or less.

.2 Pressure Preservative Treated Plywood: Treated in accordance with CSA O80 Series -08 using micronized copper azole (MCA) preservative.

.1 Plywood or laminated materials shall be manufactured with exterior grade adhesives.

.2 After treatment, plywood shall be kiln dried to moisture content of 8% or less.

2.3 PRESSURE FIRE RETARDANT TREATED MATERIALS

.1 Treat by pressure impregnation with fire-retardant chemicals in accordance with CSA O80 Series -08 to provide classification for flame spread of not more than 25, smoke developed of not more than 75 in accordance with CAN/ULC S102.

.2 All fire retardant wood must comply with the requirements in AWPA Standard C20 for lumber and C27 for plywood.

.1 AWPA C20: Structural Lumber, Fire-Retardant Pressure Treatment, lumber materials shall only be of species listed. After treatment, lumber 50 mm or less in thickness shall be kiln dried to moisture content of 8% or less.

.2 AWPA C27: Plywood, Fire-Retardant Pressure Treatment, 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.

.3 All species to comply with CAN/ULC S102 for surface-burning characteristics and shall bear identification showing classification and type of fire retardant.

.3 Each piece or bundle of fire-retardant treated material or panel to bear ULC inspection label or stamp attesting to FRS rating indicating flame spread, smoke developed, and fuel contributed classification meeting AWPA standard C20 and C27 for Type A Use.

.4 Fire retardant chemicals used to treat lumber must comply with FR-1 of AWPA Standard P17 and shall be free of halogens, sulphates and ammonium phosphate.

.5 Acceptable materials: Plywood and lumber materials treated by licensed applicators with fire retardant materials from the following:

.1 Dricon FRTW by Hickson Corporation.

.2 Pyro-Guard by Hoover Treated Wood Products Inc.

.3 D-Blaze by Chemical Specialties Inc.

.4 Or approved equivalent.

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 others 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.

.4 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.

.5 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.

.6 Blocking shall be through-bolted to structure.

.7 Anchor rough bucks to concrete or masonry with pairs of 3/16” (4.75mm) diameter x 2 ¼” (57mm) long Hilti Kwik Con+ anchors (minimum 1”/25mm embedment), at max 350mm O.C. Refer also to details.

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.

.2 Block under cants same thickness as installed roof insulation.

.3 Check mechanical, electrical, architectural drawings and provide all blocking, cants, nailers etc. required.

.4 Leave work ready for roofing work and prefinished sheet metal flashing installation.

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 TREATED WOOD INSTALLATION

.1 Comply with AWPA 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 457mm (18”) 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.

3.5 PRESSURE FIRE RETARDANT TREATED WOOD INSTALLATION

.1 Field Cuts:

.1 Do not rip, mill or conduct extensive surfacing of fire retardant treated lumber, label will be voided. Only end cuts, drilling holes and joining cuts are permitted.

.2 All cuts on plywood will be considered end cuts.

.3 Fire-retardant lumber and plywood can be given a light sanding for cosmetic cleaning after treatment.

.4 Pre-cut to the greatest extent possible before treating.

.2 Fire retardant treated plywood used in structural applications shall be graded or span-rated material.

.3 Use only hot-dipped galvanized, corrosion resistant nail or screw fasteners. Staples are not acceptable for installation of fire-resistant treated materials.

.4 Where humidity conditions are such that moisture may condense between hardware and treated wood, hardware shall be back-primed with a corrosive-inhibitive paint.

.5 Back-prime at contact points and fasteners to prevent electrolysis when fire retardant framing members are used in metal buildings.

END OF SECTION

1 General

1.1 SUMMARY

.1 Supply all labour, materials, equipment, services and perform all operations required to complete all finish carpentry, millwork and fitment installation including but not limited to the following:

.1 Interior millwork

.2 High pressure decorative laminate

.3 Solid Surface countertops.

.4 Millwork finishing hardware and accessories.

1.2 REFERENCE STANDARDS

.1 American Society for Testing and Materials (ASTM):

.1 ASTM A307-04e1, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength

.2 ASTM D6007-02, Standard Test Method for Determining Formaldehyde Concentration in Air from Wood Products Using a Small Scale Chamber

.3 ASTM D6330-98(2003), Standard Practice for Determination of Volatile Organic Compounds (Excluding Formaldehyde) Emissions from Wood-Based Panels Using Small Environmental Chambers Under Defined Test Conditions

.4 ASTM E1333-96(2002), Standard Test Method for Determining Formaldehyde Concentrations in Air and Emission Rates from Wood Products Using a Large Chamber

.2 Underwriters Laboratories of Canada (ULC):

.1 CAN/ULC S102-18, Standard Method of Test for Surface Burning Characteristics of building Materials and Assemblies

.3 Canadian Standards Association (CSA):

.1 CSA B111-1974 (R2003), Wire Nails, Spikes and Staples

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

.3 CAN/CSA O80 Series-97 (R2002), Wood Preservation

.4 CSA O86-01, Engineering Design in Wood

.5 CSA O112 Series-M1977(R2001), Adhesives for Wood

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

.7 CAN/CSA-O141-M91(R1999), Softwood Lumber.

.8 CSA O151-M1978(R2003), Canadian Softwood Plywood.

.9 CSA O325.0-92(R2003), Construction Sheathing

.10 CSA O437 Series 93 (R2003) OSB and Waferboard

.11 CSA O452 Series 94 (R2001), Design Rated OSB

.4 National Lumber Grading Association (NLGA):

.1 NLGA Canadian Lumber Grading Rules

1.3 QUALITY ASSURANCE

.1 Contractor executing work of this section shall have a minimum of five (5) years continuous experience in successful manufacture/fabrication and installation of work of

type and quality shown and specified. Submit proof of experience upon Consultant'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.

.3 Unless otherwise indicated on drawings, all millwork shall be Custom Grade, in accordance with AWMAC standards.

.4 Supplements and modifications to the above standards as indicated on the drawings or as specified herein shall govern work of this section.

1.4 SUBMITTALS

.1 Provide submittals in accordance with Division 01.

.2 Samples for Verification: Submit two (2) samples prior to fabrication of millwork as follows; accepted samples will form the standard of acceptance for the remainder of the work:

.1 High pressure decorative laminate for finishing of millwork.

.2 Solid surface countertops.

.3 Wood trim with applied opaque Finish: 12” long lumber for each finish system and colour.

.4 Exposed Fasteners, Hardware and Accessories: One unit for each type and finish.

.3 Shop Drawings:

.1 Submit detailed shop drawings of all shop fabricated finish carpentry components.

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.

.2 Pre-Construction Conference: Arrange a site meeting, to coincide with regular bi-weekly site meetings, attended by the Contractor, the Subcontractor's representative and foreman for this project, the Consultant, materials supplier(s), and other relevant personal before commencement of work for this Section. Topics for discussion include but are not limited to the following:

.1 Installation requirements;

.2 Special surface effects and finishing;

.3 Coordination of work with adjacent finishes;

.4 Protection of finishes;

.5 Acceptability of substrates and quality of materials being used for the project.

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.

.2 Solid Surface Countertop Manufacturer Warranty: Provide manufacturer's standard 10 year warranty against defects in materials and workmanship; including material and labour to repair or replace defective materials.

.3 Agree to repair or replace faulty materials or work which appears during warranty period, without cost to the Owner.

.4 Defects shall include but not be limited to, opening of joints, cracking, shrinkage, warpage, delamination of plastic laminate.

2 Products

2.1 MATERIALS

.1 Framing Lumber:

.1 Lumber for structural components shall be of species and grade specified, well seasoned, and processed and stamped at same mill with appropriate grade markings. Conform to requirements of standard grading rule for Canadian lumber of Nation Lumber Grades Authority (NLGA) latest issue, approved by Canadian Lumber Standards Administrative Board, as follows:

.1 Rough Carpentry for built-in work: No. 2 select grade Ontario white pine.

.2 Blocking, Ground, Furring and Strapping, Bucks and Nailing Strips: C.L.A. No. 1 grade pine, kiln dried stock.

.3 Non-Exposed Softwood: Fabricator’s option, meeting requirements of CAN/CSA O141-05(R2009), kiln dried for interior use to a moisture content of 4% to 8%, and 7% to 10% for exterior use; Surface 4 sides (S4S).

.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.

.1 Basis of Design Materials: Premier Plus MR MDF by Flakeboard, or approved equivalent.

.4 Fire-Rated (FR) Medium density fibreboard (MDF): ANSI A208.2, meeting CAN/ULC S102, FSC certified; Modulus of Rupture (MOR): 4000 psi, with face screw hold of 250lbs.

.1 Basis of Design Materials: TRUPAN Fire-Rated (FR) MDF by Arauco, or approved equivalent.

.3 Glue: CSA 0112; Water-resistant urea-formaldehyde-free resin glue.

.4 Plastic Laminate Covered Components (PLAM-01):

.1 Plastic laminate face sheets: High pressure, paper based, melamine surfaced, laminated plastic sheets, conforming to CAN/CSA-A172, with thickness tolerances in accordance with Table 1 of CAN/CSA-A172 and plastic laminate grades as follows:

.1 General Purpose Grade (GP): Minimum 1.27mm (0.050") thick.

.2 Post-forming Grade (PF): Minimum 1.06mm (0.042") thick.

.2 Plastic laminate face sheet colour, gloss and texture (PLAM-01): Carry pricing for two colours, as selected by the Consultant, from the manufacturers standard product line.

.3 Plastic laminate backing and liner sheets: High pressure, paper based, melamine surfaced, laminated plastic backing sheets, conforming to CAN/CSA-A172, backing grade (BK), minimum 0.5mm (0.020") thick.

.4 Cores: Unless otherwise indicated, 19mm (3/4”) thick core.

.5 Laminating Adhesive: CSA-0112, water resistant type.

.6 Draw Bolt Fasteners: 'K&V 516' by Knape & Vogt Canada, or approved equivalent.

.7 Basis of Design: Wilsonart, Pionite, Nevamar or Formica.

.5 Solid Surface Countertop Material (QTZ-01): Cast, nonporous, filled polymer, with through body colour meeting requirements of NEMA LD 3, and having the following nominal properties:

.1 Thickness: 13 mm and as detailed.

.2 Surface Burning Characteristics: in accordance with CAN/ULC S102 and as follows:

.1 Flame Spread: Maximum 25

.2 Smoke Developed: Maximum 450

.3 Pattern and Colour: to be selected by Consultant from manufacturers standard colour line, allow for 2 colours.

.4 Basis-of-Design Material: Quartz by Ceasarstone, CambriaQuartz by Cambria, Quartz by Corian or approved equivalent.

.6 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.

.7 Millwork Finishing Hardware:

.1 As scheduled on drawings/details.

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 trim mouldings 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 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.

.17 Counters, Cabinets and Fitments:

.1 Provide and install counters, cabinets, and fitments as indicated on drawings.

.2 Shop fabricate and finish countertops and cabinet work in as large a size as practical. Verify field dimensions and conditions prior to fabrication.

.3 Make each unit rigid and self-supporting, suitable for individual removal. Assemble components with dovetail connections, mortise and tenon or blind dado joints, and adequately glued and secured with screws.

.4 Construct cabinets of solid lumber framing, with 19mm (3/4") MDF gables. Provide 19mm (3/4") MDF bottoms. Provide minimum 6mm (1/4") thick MDF full width backs having joints concealed behind framing. Backs which support shelves, equipment, or other loads, shall be 19mm (3/4") thick MDF. Route backs into end gables.

.5 Fabricate cabinet base in wood, separately in height indicated or, if not indicated, to match flooring base.

.6 Fabricate cabinet doors of flush panels from 19mm (3/4") thick MDF framed with hardwood edging.

.7 Make drawer fronts of 19mm (3/4") finished MDF, and wide enough to cover slide space. Provide 13mm (1/2") drawer backs, 16mm (5/8") sides, 6mm (1/4") dividers, and 6mm (1/4") bottoms, all of finished MDF. Fasten sides to fronts with dovetail joints, and grooved and glued joints for backs. Groove and glue bottoms into fronts and sides.

.8 Drawers shall be supported and guided with side extension drawer slides.

.9 Where a locking drawer is located below another drawer, provide 6mm (1/4") thick MDF diaphragm in framing immediately above locking drawer.

.10 Fabricate shelving of 19mm (3/4") finished MDF. Route cabinet gables to receive fixed shelving where indicated and to receive recessed metal shelf standards flush with adjacent surfaces for adjustable shelving.

.11 Fabricate countertops to details shown of 13mm solid surfacing mounted to 19mm exterior grade waterproof Douglas Fir plywood.

.1 Fit corners and edges of countertops with solid stock. Extend side and backsplashes to heights indicated. Provide side returns to match backsplashes at all abutting fixed vertical surfaces.

.2 Solid surfacing countertops: As indicated in Section 12 36 61.16

.3 Stainless steel countertops: As indicated in Section 05 50 00.

.18 Edging Treatment:

.1 Provide Self Edge Laminate: HPDL, colour matching cabinet work, as indicated on the Drawings.

.19 Plastic Laminate Covered Components:

.1 Meet requirements of CAN/CSA-A172, Appendix A.

.2 Bond plastic laminate to core with adhesive using pressure. Provide balanced construction with plastic laminate face sheet on exposed sides of core and backer/liner sheet. Finish drawers with liner sheet on both sides of core for balanced construction.

.3 Unless otherwise detailed, provide 19mm (3/4") thick core.

.4 Apply plastic laminate to core material in accordance with adhesive manufacturer's instructions. Provide same core and laminate profiles to provide continuous support and bond over entire surface.

.5 Use continuous lengths up to 2439mm (8'). Keep joints 610mm (2') from cutouts and in locations indicated on reviewed shop drawings.

.6 Locate joints, where required at 2439mm to 3048mm (8' to 10') O.C. At L-shaped corners mitre plastic laminate, to the outside corner. Accurately fit members together to provide tight and flush butt joints, in true planes. Provide 6mm (1/4") blind spline and approved type draw bolts; one draw bolt for widths up to 150mm (6") at maximum 457mm (18") centres for widths exceeding 150mm (6"). Colour-match adjoining units.

.7 Form shaped profiles and bends using postforming grade laminate to laminate manufacturer's instructions.

.8 Where curved or bent surfaces are required for counters, backsplashes and other areas, use postforming laminate.

.9 Self-edge straight-line-edging with general purpose laminate and radius corners with postforming laminate, of same colour and finish as facing sheet, to cover exposed edges of core material. Apply with same adhesive as facing sheet. Chamfer edges uniformly at approximately 20 deg using machine router. Do not mitre laminate edges.

.10 Fabricate horizontal wearing surfaces including counters, shelves, both sides of removable shelves, cabinet doors and drawer fronts, of general purpose laminate except where postforming is required.

.11 Use general purpose laminate for exposed vertical surfaces except where otherwise specified or indicated.

.12 Apply plastic laminate backing sheet to reverse side of core of plastic laminate finished work including under counter tops and concealed portions of plastic laminate faced work. Provide backing sheet of specified minimum thickness, increased as required to compensate stresses caused by facing sheet.

.13 Apply laminated plastic liner sheet to interior of cabinetry unless indicated otherwise.

.14 Assemble work, true and square. Arrange adjacent parts of continuous laminate work to match in colour and pattern.

2.3 MOISTURE CONTENT

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

2.4 FINISHES

.1 Finishes shall match approved finished samples of wood treatment submitted by this section for each species of wood required. Wood items provided under this section shall be finished as part of the work of this section.

.2 Apply stain to items where scheduled, indicated or as directed Consultant, providing uniform required stain colour(s).

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 Consultant 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 Consultant 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 Consultant, 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.

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 - FINISHING HARDWARE

.1 Take delivery of all finishing hardware and install. Check each item as received.

.2 Set, fit and adjust hardware according to manufacturer's directions at heights directed by Consultant. Hardware shall operate freely. Protect installed hardware from damage and paint spotting.

.3 Install all hardware for hollow metal doors including hinges.

.4 Pre-drill kickplates and doors before attachment of plates. Apply with water-resistant adhesive and countersunk stainless steel screws.

END OF SECTION

PART 1: GENERAL

1.1 Section Includes

.1 Materials and installation methods supplementing the primary damp proofing membrane.

1.2 Submittals

.1 Prior to commencing the Work submit copies of manufacturers current certification to ISO 9002. Membrane, primers, sealants, adhesives and associated auxiliary materials shall be included.

.2 Prior to commencing the Work submit references clearly indicating that the materials proposed have been installed for not less than five years on Projects of similar scope and nature. Submit references for a minimum of ten Projects.

1.3 Quality Assurance

.1 Damp proofing shall be carried out by applicators skilled in this Work in strict accordance with manufacturer's printed instruction. Submit proof of experience upon Consultant's request.

.2 Perform Work in accordance with the printed requirements of the membrane manufacturer and this specification.

.3 Maintain one copy of manufacturer instructions on site.

.4 At the beginning of the Work and at all times during the execution of the Work, allow access to Work site by the membrane manufacturers' representative.

.5 Components used in this section shall be sourced from one manufacturer, including sheet membrane, sealants, primers, mastics, and adhesives.

1.4 Delivery, Storage and Handling

.1 Deliver materials to the job site in undamaged and original packaging indicating the name of the manufacturer and Product.

.2 Store membrane at temperature of 5□C (40□F) and above to facilitate handling.

.3 Membrane contain petroleum solvents and are flammable. Do not use near open flame.

.4 Store role materials horizontally in original packaging.

.5 Store adhesives and primers at temperatures of 5°C and above to facilitate handling.

.6 Keep solvents away from open flame or excessive heat.

1.5 Site Conditions

.1 Environmental Requirements

.1 No installation Work shall be performed during rainy or inclement weather and on frost or wet covered surfaces.

.2 Protection

.1 Provide adequate protection of materials and Work of this section from damage by weather backfilling operations and other causes.

.2 Protect Work of other trades from damage resulting from Work of this section. Make good such damage at own expense to satisfaction of the Consultant.

PART 2: PRODUCTS

2.1 Below Grade Damproofing Materials (RWP-01)

.1 Dampproofing Coating for Temperatures Below 5°C (40°F)

.1 Primer: as recommended by manufacturer to CAN/CGSB 37.9.

.2 Foundation Coating: unfibered asphalt coating conforming to the requirements of CGSB 37-GP-6M. Acceptable product: Henry Bakor, Waterproofing Asphalt Emulsion 710-11 or equivalent.

.2 Dampproofing Coating for Temperatures Above 5°C (40°F):

.1 Primer: as recommended by manufacturer

.2 Foundation Coating: vacuum-reduced asphalt dispersed in a mineral colloid emulsifier. Acceptable Product: Henry Bakor Wateproofing Asphalt Emulsion 700-01,or equivalent.

PART 3: EXECUTION

3.1 Condition of Surface

.1 Before commencing Work ensure environmental and site conditions are suitable for installation of damp proofing.

3.2 Application of Dampproofing Coating for Temperatures Below 5°C (40°F)

.1 Apply a coat of Primer at rate of 0.5 to 2.0l/m^2 (100 to 400ft^2/gal) and allow to cure until touch dry.

.2 Apply damproofing at rate of 1.0 to 1.5 l/m^2 (2 to 3 gal/100ft^2) and allow to cure.

3.3 Application of Dampproofing Coating for Temperatures Above 5°C (40°F)

.1 Apply damproofing diluted 20% with clean water at the rate of 0.5l/m^2 (1 gal/100ft^2) as a primer and allow to dry.

.2 Apply a second coat of damproofing at rate of 1.0 to 1.5 l/m^2 (2 to 3 gal/100ft^2) and allow to dry.

3.4 Clean-Up

.1 Promptly as the Work proceeds and on completion clean up and remove from the premises all rubbish and surplus materials resulting from the foregoing Work.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

.1 Section Includes: Furnishing of all labour, material, equipment and services necessary to provide crystalline waterproofing additive to concrete structures to elevator pits, water chambers, tanks, sumps, area wells, cold-formed construction joints, and as indicated on the drawings and specified herein.

1.2 SYSTEM DESCRIPTION

.1 Crystalline Waterproofing Additive: The concrete waterproofing and protection system shall be of the crystalline type that chemically controls and permanently fixes a non-soluble crystalline structure within the pores and capillary tracts of the concrete. This crystalline system causes the concrete to become sealed against the penetration of liquids from any direction and protects the concrete from deterioration due to harsh environmental conditions. The system is used for above or below-grade walls and slabs, including liquid retaining structures and where enhanced chemical resistance is required. The crystalline waterproofing additive shall have a Visual Detection System (VDS) to enable confirmation of the presence of the additive in hardened concrete.

1.3 SYSTEM PERFORMANCE REQUIREMENTS

.1 Testing Requirements: The crystalline waterproofing system shall have been tested in accordance with the following standards and conditions, and the testing results shall meet or exceed the performance requirements as specified herein.

.2 Independent Laboratory: Testing shall have been performed by an accredited independent laboratory, meeting the requirements of ASTM E 329, CCRL, CCIL, ISO 17025 or other applicable international standard for certification of testing laboratories. The testing laboratory shall have obtained all control and treated concrete samples.

.3 Crystalline Formation: The crystallizing capability of the waterproofing system shall be evidenced by independent scanning electron microscope (SEM) photographs showing crystalline formations within the concrete matrix.

.4 Permeability: Independent testing shall be performed according to EN 12390-8. Treated samples shall be exposed to water with a pressure of 0.5 MPa for 72 hours. Treated samples must exhibit a reduction in permeability coefficient of at least 80% when compared to control concrete. Control samples must have a depth of penetration of at least 50 mm.

.5 Sulfate Resistance: Independent testing shall be performed to determine "Sulfate Resistance of Concrete Specimens" treated with integral crystalline admixture. Treated and untreated samples shall be immersed in a concentrated sulfate solution for at least 4 months. On final weighing, the percentage mass loss of the treated samples shall be significantly lower than the control samples.

.6 Compressive Strength: Concrete samples containing the crystalline waterproofing additive shall be tested against an untreated control sample of the same mix. At 28 days, the treated samples shall exhibit equal or increased compressive strength over the control sample.

1.4 SUBMITTALS

.1 Product data: Submit duplicate copies of manufacturer's product data in accordance with the Conditions of the contract indicating:

.1 Performance criteria, installation details, physical properties, detailed application and installation instructions, and limitations.

.2 product transportation, storage, and handling requirements.

.2 Shop drawings: Submit shop drawings in accordance with the Conditions of the contract indicating materials, details, dimensions, thickness, treatment of joints and cracks, protection, penetration details, and relationship to adjacent construction.

.3 Certificates:

.1 Submit certifications for items required at least 4 weeks prior to installation of work of this Section.

.2 Submit manufacturer's certification that waterproofing system materials and accessories supplied are compatible, meet specification requirements and that installer is approved by membrane manufacturer.

.3 Submit inspection reports, within 3 working days after each inspection, and certification by manufacturer confirming that installations are in accordance with manufacturer's requirements.

1.5 QUALITY ASSURANCE

.1 Manufacturer Qualifications: An ISO 9001 certified firm with not less than 25 years experience manufacturing crystalline waterproofing of the type specified, able to provide test reports showing compliance with specified performance characteristics, and able to provide on-site technical representation to advise on installation.

.2 Installer Qualifications: Experienced in work of the type specified in this section and approved in writing by waterproofing manufacturer.

.3 Preinstallation Meeting: Prior to starting work, conduct a meeting with the waterproofing installer, installers of adjacent work, and waterproofing manufacturer's representative to verify project requirements, substrate conditions, manufacturer's installation instructions, and manufacturer's warranty requirements; notify the Owner and Architect/Engineer at least one week in advance of meeting.

1.7 DELIVERY, STORAGE, AND HANDLING

.1 Store packaged materials in original undamaged containers with manufacturers labels and seals intact, in dry enclosed area, off the ground. Prevent damage of materials during handling and storage.

.2 Handle and store materials in accordance with manufacturers written instructions.

1.8 SITE CONDITIONS

.1 Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.9 WARRANTY

.1 Manufacturer's Warranty: Provide manufacturer's standard warranty document executed by authorized company official; warranty period: 5 years commencing on Date of Substantial Completion.

.2 Installer's Warranty: Provide warranty signed by installer as follows:

.1 Installer warrants that, upon completion of the work, surfaces treated with crystalline waterproofing will remain free of water leakage resulting from defective workmanship or materials for a period of 5 years from Date of Substantial Completion.

.2 In the event that water leakage occurs within the warranty period from such causes, the installer shall, at his own expense, repair, replace, or otherwise correct such defective workmanship and materials.

.3 Installer shall not be liable for consequential damages.

.4 Installer's liability shall be limited to repair, replacement, or correction of defective workmanship and materials.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

.1 (CRW-01) Basis of Design Manufacturer/Product: Xypex Admix C-500 as manufactured by Xypex, or equivalent by Kryton, WR Meadows or as per Specification 01 25 00.

2.2 DOSAGE

.1 General: Admix must be added to the concrete mix at time of batching.

.2 Dosage Rate: Under normal conditions, the crystalline waterproofing powder shall be added to the concrete mix at the following rates:

1. Xypex Admix C-500 2% – 3% by weight of cement content

PART 3 - EXECUTION

3.1 MANUFACTURER’S INSTRUCTIONS

.1 Comply with the manufacturer's product data regarding installation, including technical bulletins, product catalogue, installation instructions, and product packaging labels.

3.2 PROJECT CONDITIONS

.1 Crack Control: All reinforcement shall be in accordance with applicable standards. Concrete elements shall be designed and constructed to minimize and control cracking.

.2 Setting Time and Strength: Some delay of set may occur when using some Admix products. Factors affecting the time of set can include the concrete mix design, the particular Admix product used, dosage rate of the Admix, temperature of the concrete, and climatic conditions. Concrete containing a Xypex Admix product may develop higher ultimate strengths than plain concrete. Conduct trial mixes under project conditions to determine the setting time and strength of the concrete. Consult with manufacturer or manufacturer's representative regarding concrete mix design, project conditions, and the proper dosage rate.

.3 Weather Conditions: For mixing, transporting, and placing concrete under conditions of high temperature or low temperature, follow the concrete practices such as those referred to in ACI 305R (Hot Weather Concreting) and ACI 306R (Cold Weather Concreting) or other applicable standards.

3.3 APPLICATION

.1 General: Admix is added to the concrete at the time of batching. Admix shall be mixed into the concrete until homogeneous. Do not add dry Admix powder directly to wet mixed concrete as this could cause clumping and thorough dispersion may not occur.

.2 Concrete Batching & Mixing: Procedures for the addition of Admix will vary according to the type of batch plant operation and equipment. Consult with Crystalline Waterproofing manufacturer to establish when and how admixture will be incorporated into concrete mix.

.3 Construction and Cold Joints: In addition to specified waterstops apply one coat of Xypex concentrate slurry at a rate of 2 lb./sq. yd. (1 kg/m2) to joint surfaces between concrete pours. Moisten the surfaces prior to the slurry application. Apply the slurry and keep it moist for 12 hours then allow the slurry to set or dry. Where joint surfaces are not accessible prior to pouring new concrete, contact a Xypex Technical Services Representative for assistance.

.4 Xypex Sealing Strips: Where hydrostatic conditions exist, sealing strips shall also be applied at construction joints by filling grooves that are created along the joints. Dimensions of the grooves shall be 1 inch (25 mm) wide and 1.5 inches (37 mm) deep. If grooves have not been pre-formed then chip grooves to those dimensions. Fill the groves as follows:

.1 Apply a slurry coat of Xypex Concentrate to slot in accordance with the manufacturer's instructions or recommendations.

.2 While the slurry coat is still tacky, fill the slot with Xypex Concentrate Dry-Pac.

.3 Compact it tightly using a pneumatic packer or a hammer and block.

.4 Wet the Dry-Pac surface lightly with water, then apply a slurry coat of Xypex Concentrate at a coverage rate of 1.5 – 2 lb./sq. yd. (0.8 – 1 kg/m2) over sealing strip and extending to 6" (150 mm) on either side.

.5 Form Tie Holes: Form tie holes shall be waterproofed in accordance with the manufacturer's technical literature including relevant Method Statements and generally as follows:

.1 Prepare the tie hole to create a straight sided void with a profile of at least ICRI CSP-3. For through element ties holes, such as those created by taper ties, the prepared void is to be at least 5" (125 mm) deep. For cone ties, the void is to be to the bottom of the cone.

.2 Clean and profile the area to a 6-inch (150 mm) diameter around the tie hole to an ICRI CSP-3 profile.

.3 For through-element tie holes, create a solid plug of material at the bottom of the profiled hole using Xypex Patch'n Plug leaving at least 4" (100 mm) of empty tie hole from the top of the plug to the surface of the concrete element.

.4 Apply a coat of Xypex Concentrate slurry at a rate of 1.5 lb./sq. yd. (0.8 kg/m^2) to the inside of the tie hole and to a 12" (300 mm) diameter area around the hole.

.5 Fill and compact the tie hole with Xypex Concentrate Dry-Pac.

.5 Wet Dry-Pac surface lightly with water, then apply a slurry coat of Xypex Concentrate at a coverage rate of 1.5 - 2 lb. /sq. yd. (0.8 - 1 kg/m^2) over the repaired area to a 12" (300 mm) diameter area around the filled void.

.6 Repair of Defects: Concrete defects shall be repaired in accordance with the manufacturer's technical literature including relevant Method Statements and generally as follows:

.1 Cracks and Faulty Construction Joints:

.1 Chip out cracks, faulty construction joints, and other defects to a depth of 1.5 inches (37 mm) and a width of one inch (25 mm). A "V"-shaped slot is not acceptable. The slot may be saw cut instead of chipped but ensure that the slot is dovetailed or otherwise shaped such that there will be mechanical interlock of materials placed into the slot at a later stage.

.2 Clean the slot of debris and dust. Soak the area with water and remove any excess surface water. Apply a slurry coat of Xypex Concentrate at the rate of 1.5 lb./sq. yd. (0.8 kg/m^2) to the slot.

.3 While the slurry coat is still tacky, fill the cavity with Dry-Pac. Compress it tightly into the cavity using a pneumatic packer or a block and hammer.

.4 Wet Dry-Pac surface lightly with water, then apply a slurry coat of Xypex Concentrate at a coverage rate of 1.5 – 2 lb./sq. yd. (0.8 – 1 kg/m2) over the repaired area to 6" (150 mm) on either side of slot.

2. Rock Pockets, Honeycombing, or Other Defective Concrete: All areas of poor concrete consolidation (honeycomb or rock pockets) shall be repaired using Xypex Patch'n Plug or Megamix II.

3.4 PLACING

.1 Concrete Placement: Concrete placement shall be in accordance with ACI 309R: “Guide for Consolidation of Concrete” or other applicable standard. Special attention shall be given to consolidation at joints, penetrations and other potential leakage locations.

3.5 CURING

.1 General: Concrete containing Xypex Admix shall be moist cured in accordance with ACI 308, "Standard Practice for Curing Concrete" or other applicable standard.

.2 Curing Compounds: Curing compounds may be used in the event that project requirements or conditions prevent moist curing. Curing compounds shall comply with ASTM C-309 or other applicable standard.

3.6 PROTECTION

.1 Protection: Protect installed product and finished surfaces from damage during construction.

3.7 FIELD QUALITY CONTROL

.1 Verification of the Inclusion of Xypex: A concrete testing technician or other trained individuals shall examine the concrete surfaces on the construction site for VDS, typically within 28 days after placing or stripping. Alternately, perform a VDS evaluation on routine QC tests specimens (cubes or cylinders) cast on the construction site at the time they are stripped in the concrete laboratory.

.2 Examination for Defects: Do not conceal Xypex treated concrete before it has been observed by the Consultant, manufacturer's representative, and testing/inspection agency. The concrete shall be examined for structural defects such as honeycombing, rock pockets, tie holes, faulty construction joints, cold joints, and cracks larger than 0.02” (0.5 mm). Such defects shall be repaired in accordance with manufacturer's repair procedures, as noted above.

.3 Testing for Tanks and Foundation Works

1. Testing: Fill tanks or, for foundation works, shut off the dewatering system as soon as practical so that the structure shall be exposed to its normal service conditions. Examine for leaks. For structures that will be dry until a specific event (eg: interior located containment basin) the concrete elements should be fully saturated several times over a period of several weeks to encourage crystal development to occur.
2. Monitoring:
   - .1 Actively leaking cracks and joints shall be left to self-heal for as long as practical. Depending on job site and ambient conditions crack healing can be expected to take several days to weeks.
   - .2 Any crack or joints that do not heal in the allowable time frame shall be repaired.
   - .3 Moving cracks shall be repaired using polyurethane injection or other appropriate method.
3. Repair: Use Xypex repair procedures to seal any static crack or joint that does not self-heal. Contact a Technical Services Representative for appropriate repair procedures.

3.8 INTERACTION WITH OTHER MATERIALS

.1 Backfilling: Normal backfilling procedures may be used after concrete has been cured.

.2 Responsibility to Ensure Compatibility: Xypex Admix products are compatible with most admixtures used in the production of quality concrete. It shall be the responsibility of the Contractor to take whatever measures are necessary, including testing, to ensure compatibility of the Xypex Admix with other additives or admixtures being used in the concrete mix, and it shall be the responsibility of the installer of the surface-applied material that is to be applied over the Xypex treated concrete to take whatever measures are necessary, including testing, to ensure acceptance by or adhesion to the Xypex treated concrete.

3.9 SCHEDULE

.1 Provide crystalline waterproofing of concrete substrates, in the following locations:

.1 Water Chambers, area wells, sump pits, and below grade portion of elevator shaft.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

.1 This Section includes requirements for supply and installation of the following:

.1 Rigid Foundation and Underslab Insulation Board

.2 Concrete Faced Rigid Insulation Board

.3 Rigid Insulation Board at Roof Assemblies (see Roofing Specification 07 52 00)

.4 Mineral Wool Cavity Wall Insulation Board at Exterior Rainscreen assemblies

.5 Mineral Fibre Batt Acoustic Insulation (at interior framing cavity)

.6 Foamed-In-Place PU Insulation

1.2 REFERENCE STANDARDS

.1 Underwriters Laboratories of Canada (ULC):

.1 CAN/ULC S701-11, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering

.2 CAN/ULC S702-09-AM1, Standard for Thermal Insulation Mineral Fibre for Buildings

.3 CAN/ULC S114-05, Standard Method of Test for Determination of Non- Combustibility in Building Materials

.4 CAN/ULC S102-10, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies

.2 American Society for Testing and Materials (ASTM):

.1 ASTM D1621-10, Standard Test Method for Compressive Properties of Rigid Cellular Plastics

.2 ASTM D2842-06, Standard Test Method for Water Absorption of Rigid Cellular Plastics

.3 Canadian General Standards Board (CGSB):

.1 CGSB 71-GP-24M, Adhesive, Flexible for Bonding Cellular Polystyrene Insulation

.2 CAN/CGSB-37.5, Cutback Asphalt Plastic Cement

.3 CAN/CGSB-51.10-92, Mineral Fibre Board Thermal Insulation

.4 Canadian Standards Association (CSA):

.1 CSA A123.3-05 (R2010), Asphalt Saturated Organic Roofing Felt

1.3 SUBMITTALS

.1 Provide submittals in accordance with Division 01.

.2 Affidavits:

.1 In lieu of samples and inspection procedures when required by CGSB and CAN/ULC Standards, submit affidavits, if requested, that materials supplied under these requirements meet CGSB and CAN/ULC 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.

.4 Product Data Sheets.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Store insulation materials in dry areas, protected from wetting, sunlight and traffic. Store insulation board flat, on a flat surface, and to prevent edge damage and placing of materials on top of stored boards.

.2 Ensure that insulation board and adhesives are stored at a minimum temperature of 4 deg C for twelve (12) hours before installation, and that freezable adhesives are stored only at temperatures above 0 deg C at all times.

.3 Materials shall be delivered to the job in their original packages and containers bearing the manufacturer's labels intact and clearly visible.

.4 Store materials in dry, watertight areas and protect to prevent damage by other trades.

.5 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 BOARD INSULATION MATERIALS

.1 INS-01 Foundation and Underslab Insulation Board: Closed-cell, high compressive strength graphite expanded polystyrene (GPS) rigid board insulation.

.1 Meeting CAN/ULC S701 Type III.

.1 Basis of Design Materials: CHROME GPS 3000 Rigid Insulation by Beaver Plastics Ltd., or approved equivalent.

.2 Provide underslab insulation board with shiplapped edges.

.2 INS-02 Perimeter Insulation Board: Extruded polystyrene board to ASTM C578 (CAN/ULC-S701) Type IV, rigid, closed cell.

.1 Board Size: 610mm & 1220mm x 50mm (24” & 48” x 2” thick).

.2 Edges: Tongue and groove sides, square edge ends.

.3 Thermal Resistance (ASTM C 518): Long term aged R-value of 5/1” (0.03 sm K/W / 1mm).

.4 Compressive Strength: ASTM D1621, minimum: 25 psi (240 kPa).

.5 Water Absorption (ASTM D2842): <0.1 (0.7% by volume maximum).

.7 Water Vapor Permeance (ASTM E96): 1.5 perm max.

.8 Basis of Design Material: Groove ST-100 Insulation by Styrofoam/Dow or equivalent per Division 1.

.3 INS-03a Exterior Cavity Rigid XPS Insulation at Rainscreen Assemblies: Moisture-resistant, durable and lightweight extruded polystyrene foam board specifically designed for use in wet cavity wall environments in commercial applications. Product must be hydrochlorofluorocarbon (HCFC) free with zero ozone depletion potential with a thermal resistance not less than R5.0 per inch/25mm.

.1 Board Size: 1220mm x 2440mm (48” & 96” x thickness scheduled).

.2 Edges: shiplap.

.3 Thermal Resistance (ASTM C 518): Long term aged R-value of 5/1” (0.03 sm K/W / 1mm).

.4 Compressive Strength: ASTM D1621, minimum: 15 psi.

.5 Water Absorption (ASTM D2842): <0.3 (% by volume maximum).

.7 Water Vapor Permeance (ASTM E96): 1.5 perm max.

.8 Basis of Design Material: Cavitymate SC XPS Foam Insulation by Styrofoam or equivalent per Division 1.

.4 INS-03b Exterior Cavity Mineral Wool Wall Insulation at Rainscreen Assemblies: Fibrous mineral wool insulation, unfaced, in accordance with CAN/ULC S702, Type 1, thermal resistance not less than RSI 0.76/25 mm; rated non-combustible in accordance with CAN/ULC S114 and having a flame spread rating of 5 or less in accordance with CAN/ULC S102; density 72 kg/m3; square edges, board size 406 mm x 1220 mm x thickness indicated on the Drawings:

.1 Density: To ASTM C303:

.1 Outer layer: 100 kg/m3

.2 Inner layer: 60 kg/m3

.2 Water vapour permeance: 1555 ng/Pa.s.m2.

.3 Moisture sorption: 1 % maximum to ASTM C1104/C1104M.

.4 Fungi resistance: Zero mould growth to ASTM C1338.

.5 Basis of Design Material: CavityRock by ROCKWOOL Inc., or approved equivalent

2.2 BLANKET INSULATION MATERIALS

.1 INS-05 Mineral Fibre Batt Insulation:

.1 Unfaced, semi-rigid mineral slag batt insulation in accordance with CAN/ULC S702-09, Type 1; having a nominal RSI of 0.67/25 mm; rated non-combustible in accordance with CAN/ULC S114-05 and having a flame spread rating of 5 or less in accordance with CAN/ULC S102; density 32 kg/m3; square edges, thickness as required to meet design insulation values indicated on drawings or as required to fill insulated spaces where not indicated.

.2 Basis of Design Materials:

.1 ROCKWOOL Inc., COMFORTBATT

.2 Thermafiber, SAFB (2.5 pcf Density)

.3 Or approved equivalent.

.2 INS-06 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 equivalent.

2.3 INSULATION FASTENERS AND CLIPS

.1 Insulation Fasteners: Heat treated carbon steel pin with HPDE washer with 2-3/8” Holding Diameter

.1 Length of Fastener: shaft length to suit insulation thickness and substrate, as recommended by the Insultation Fastener Manufacturer.

.2 Basis of Design Material: Insulfast T4 I-F by Ramset, or approved equivalent.

.2 Concrete Faced Perimeter Insulation Fasteners: Manufacturer’s standard concealed fasteners with groove mounting plate and fastening spline.

.3 Thermally Broken Insulation Clips: Stainless steel, adjustable clips, complete with a thermal break pad at the back (insulation/moisture barrier interface). Clips include cut-outs that represent 15% to 20% of the clip volume, reducing quantity of conductive material, further reducing the effects of thermal bridging in wall systems.

.1 Adjustable clips are a two-piece design; Stainless steel pieces, “L” shaped. The inner piece of the clip fts inside the outer piece, allowing the exact depth of the clip to be adjusted on-site by the installers.

.2 Basis of Design Materials: ACS-A Thermal Clip by Soprema, or approved equivalent.

.3 Size: Required to suit depth of Insulation, allowing fastening to structural support.

2.4 ACCESSORIES

.1 Felt Slip Sheet: No. 15 asphalt saturated, organic, unperforated felt conforming to CSA A123.3-05 (R2010).

.2 Slip Sheet Mastic: Cut back asphalt plastic cement conforming to CAN/CGSB-37.5.

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 insulation installation in accordance with manufacturer's written recommendations.

.1 Visually inspect substrate in presence of Consultant.

.2 Ensure surfaces are free of snow, ice, frost, grease and other deleterious materials.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Consultant.

.2 Start of insulation installation indicates installer's acceptance of substrate installation conditions.

3.2 BLANKET INSULATION 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 75mm (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.

3.3 BOARD INSULATION INSTALLATION

.1 Install insulation and accessories in accordance with manufacturer's written instructions applicable to products and application indicated and as follows:

.1 Use insulation that is undamaged, dry, and unsoiled.

.2 Maintain continuous thermal insulation, vapour barrier and air tightness for building spaces and elements, and as follows:

.1 Saw cut and trim insulation neatly to fit spaces; fill voids with foamed-in-place insulation compatible with installed insulation.

.2 Butt edges and ends tight

.3 Fit insulation tight against mechanical, electrical and other items protruding through the plane of insulation

.4 Use insulation free of broken or chipped edges

.5 Apply single layer of insulation to produce thickness indicated, unless multiple layers are otherwise specifically shown or required to make up total thickness

.6 Fit insulation firmly against substrate using insulation fasteners spaced in accordance with manufacturers recommended spacing and pattern.

.7 Drill a drill hole through the insulation material and push/hammer the insulation fastener in drilled hole.

.8 Progressively screw in, preventing damage to the insulation and/or plug. Screw with double thread allows for quick installation.

.2 Leave insulation joints unbonded over line of expansion and control joints; bond a continuous 150mm (6”) wide strip of primary vapour membrane over expansion and control joints using compatible adhesive

.3 Protect insulation from damage until it is covered; replace any broken, sunburned, crushed or dented insulation immediately prior to covering; coordinate with back-filling operations

.4 Board Insulation: Install board insulation to vertical surfaces with adhesive applied in accordance with manufacturer's written instructions, and as follows:

.1 Exterior Application: Extend boards as indicated on Drawings to top of footing, installed on exterior face of perimeter foundation wall.

.2 Install insulation fasteners as indicated above.

.3 Protect below grade insulation on vertical surfaces from damage during backfilling by applying protection board; set in adhesive according to insulation manufacturer's written instructions.

.5 Foundation and Under Slab Insulation: Extend boards a minimum of 1220mm (4’) in from perimeter foundation wall, unless otherwise indicated on Drawings, and as follows:

.1 Lay boards on level compacted fill.

.2 Insulate structural slabs at entrances with insulation placed horizontally underneath the concrete, and insulate surrounding slabs on grade in the same way for a distance of 1220mm (4’) in every direction from the perimeter of the structural slab; omit perimeter insulation on adjacent foundations for the width of the structural slab.

.7 Cavity Wall Insulation: Fit courses of insulation between wall ties and other confining obstructions in cavity; butt edges tightly in vertical and horizontal directions and as follows:

.1 Install cavity insulation with a tight fit to substrate materials, provide adhesive and additional fasteners where uneven substrates cause air spaces behind insulation; apply adhesive to substrate in a continuous film not less than 3mm (1/8”) thick when wet and bed the insulation into adhesive before adhesive loses its tack or skins-over.

.2 Apply insulation fasteners following manufacturer’s written instructions.

.3 Install insulation clips to walls before sheet membrane air barriers are applied.

3.4 ADJUSTING & CLEANING

.1 At completion of installation remove off site all excess material and debris. Leave in clean, neat condition.

.2 Make good all defects to this installation or defects to other Work caused by this installation.

3.5 PROTECTION

.1 Protect installed board insulation from damage due to harmful weather exposures, physical abuse, and other causes.

.2 Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION

1 General

1.1 SUMMARY

.1 This Section includes requirements for supply and installation of weather barriers and accessories, installed behind rainscreen cladding assemblies.

1.2 REFERENCE STANDARDS

.1 American Society for Testing of Materials (ASTM):

.1 ASTM D882-2010, Standard Test Method for Tensile Properties of Thin Plastic Sheeting.

.2 ASTM E84-2010b, Standard Test Method for Surface Burning Characteristics of Building Materials.

.3 ASTM E96/96M-2010, Standard Test Methods for Water Vapor Transmission of Materials.

.4 ASTM E2178-2003, Standard Test Method for Air Permeance of Building Materials.

.2 Air Barrier Association of America (ABAA):

.1 ABAA 2011, Installer's Certification Program.

.2 ABAA 2012, Water-resistive Barrier Installation Guideline.

.3 American Association of Textile Chemists and Colorists (AATCC)

.1 AATCC 42 2007, Water Resistance: Impact Penetration Test.

1.3 ADMINISTRATIVE REQUIREMENTS

.1 Co-ordination: Co-ordinate work of this Section with work of other trades for proper time and sequence to avoid construction delays.

.2 Pre-Construction Conference: Arrange a site meeting, to coincide with regular bi-weekly site meetings.

.1 Notify attendees two (2) weeks prior to meeting and ensure meeting attendees include as minimum:

.1 Owner;

.2 Consultant;

.3 Water-resistive barrier installer;

.4 Manufacturer's Technical Representative.

.2 Ensure meeting agenda includes review of methods and procedures related to water-resistive barrier installation including co-ordination with related work.

.3 Record meeting proceedings including corrective measures and other actions required to ensure successful completion of work and distribute to each attendee within one (1) week of meeting.

1.4 SUBMITTALS

.1 Provide submittals in accordance with Division 01.

.2 Action Submittals:

.1 Product Data: Submit product data including manufacturer's literature for water-resistive barrier membrane and accessories, indicating compliance with specified requirements and material characteristics.

.1 Submit list on water-resistive barrier manufacturer's letterhead of materials, components and accessories to be incorporated into Work.

.2 MSDS report.

.3 Include product names, types and series numbers.

.4 Include contact information for manufacturer and their representative for this Project.

.2 Samples:

.1 Submit duplicate 305mm x 305mm (12" x 12") sample of membrane.

.2 Submit duplicate 305mm (12") long samples of seam tape and each type of flashing materials.

.3 Test Reports:

.1 Submit test reports showing compliance with specified performance characteristics and physical properties including air permeance, water vapour permeance and structural performance.

.2 Submit ICC-ESR documentation demonstrating compliance with ICC-AC 38 Acceptance Criteria for Water-Resistive Barriers.

.4 Field Reports: Submit manufacturer's field reports within three (3) days of each manufacturer representative's site visit and inspection.

.5 Installer Qualifications:

.1 Submit verification of manufacturer's approval of installer, or letter verifying installer's experience with work similar to work of this Section.

.3 Closeout Submittals

.1 Operation and Maintenance Data: Supply maintenance data for water-resistive barrier materials for incorporation into manual specified in Division 01.

.2 Record Documentation:

.1 List materials used in water-resistive barrier work.

.2 Warranty: Submit warranty documents specified.

1.5 QUALITY ASSURANCE

.1 Installer Quality Assurance: Manufacturer's approval of installer, or minimum two (2) years' experience with work similar to work of this Section.

.1 Ensure all accessories such as seam tape, flashing membranes, fasteners and sealants come from same source as water-resistive barrier membrane.

1.6 MOCK-UP

.1 Provide mock-ups in accordance with Division 01.

.2 Construct mock-ups for each form of construction and finish required to verify selections made under sample submittals and to demonstrate aesthetic effects and qualities of materials and execution before installing materials indicated in this Section.

.3 Build mock-ups using exposed and concealed materials indicated for the completed Work, and as follows:

.1 Locate mock-ups in the location and of the size indicated or, if not indicated, as directed by Consultant.

.2 Notify Consultant 7 days in advance of the dates and times when mock-ups will be constructed.

.3 Demonstrate the proposed range of aesthetic effects and workmanship.

.4 Include examples of window frame, door frame, interior corner, exterior corner and common protrusions or penetrations of membranes.

.5 Obtain Consultant's acceptance of mock-ups before proceeding with construction of work of this Section.

.6 Maintain mock-ups during construction in an undisturbed condition, as a standard for judging the completed Work.

.7 Accepted mock-ups may form a part of the completed Work.

1.7 ENVIRONMENTAL CONDITIONS

.1 Weather barrier shall 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.

1.8 DELIVERY, STORAGE, HANDLING AND PROTECTION

.1 Delivery and Acceptance Requirements:

.1 Deliver material in accordance with Division 01.

.2 Deliver materials and components in manufacture’s original packaging with identification labels intact and in sizes to suit project.

.2 Storage and Handling Requirements: Store materials off ground and protected from exposure to harmful weather conditions and at temperature conditions recommended by manufacturer.

.1 Ensure materials are protected from sunlight and UV radiation.

.3 Packaging Waste Management:

.1 Separate and recycle waste packaging materials.

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

.3 Collect and separate for disposal paper and plastic material in appropriate on-site storage containers for recycling in accordance with Waste Management Plan.

1.9 WARRANTY

.1 Manufacturer’s Warranty: Submit, for Owner’s acceptance, manufacturer’s standard warranty document executed by authorized company official. Manufacturer’s warranty is in addition to and not intended to limit other rights Owner may have under Contract Conditions.

.1 Ten (10) years limited material warranty.

.2 Installer’s Warranty: Submit installers warranty stating that weather barrier 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 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 Dörken Systems Inc.,

.2 Solitex.

.3 Vaproshield

2.2 MATERIALS

.1 Vapor permeable water-resistive barrier with highly tear-resistant thermo-bonded non-woven polyester substrate, and waterproof acrylic highly UV resistant coating.

.1 Include factory applied self-adhesive strip at longitudinal edges of barrier membrane.

.2 Design Criteria:

.1 Water Vapor Permeance: To ASTM E96 (Procedure A), 204 perms minimum.

.2 Water Impact Penetration Resistance: To AATCC 42, no water passing.

.3 Air Permeance: To ASTM E2178, 0.9 L/(s x m^2) @ 75 Pa.

.4 Tear Resistance: To ASTM D 1922, 1916 g minimum.

.5 Dry Tensile Strength: To ASTM D882, MD 47.4 lb/in^2, CD 28.7 lb/in^2 minimum.

.6 Elongation at Break: To ASTM D882, MD 40 %, CD 45 % minimum.

.7 Fire Rating Characteristics to ASTM E84:

.1 Rating: NFPA Class A, IBC Class A minimum.

.2 Flame Spread: 10 maximum.

.3 Smoke Developed: 145 maximum.

.3 WRB-01 Weather Resistant Barrier for Walls: Vapor permeable water-resistive barrier with tear-resistant thermo-bonded, non-woven polyester substrate and waterproof acrylic polymeric coating stabilized against oxidation and UV degradation and factory applied adhesive edge strips.

.1 Service Life Expectancy: Twenty-five (25) years.

.2 Weight: 5.5 lb/100 ft^2, 270 g/m^2, 44 lb/roll nominal.

.3 Colour: Black.

.4 Basis of Design Materials: Dörken Systems Inc., DELTA®-FASSADE S (or approved equivalent).

.4 Accessories:

.1 Seam tape: In accordance with water-resistive barrier manufacturer's written recommendations.

.1 Basis of Design Materials: Dörken Systems Inc., DELTA®-FASSADE TAPE (or approved equivalent).

.2 Flashings: Self-adhering, water-resistive flashing membrane in accordance with water-resistive barrier manufacturer's written recommendations.

.1 Basis of Design Materials: Dörken Systems Inc., DELTA®-FASSADE FLASHING (or approved equivalent).

.3 Fasteners: Water and vapour resistant fasteners in accordance with water-resistive barrier manufacturer's written recommendations.

.1 41mm (1-5/8”) corrosion-resistant screw with 50mm (2”) minimum diameter plastic caps, unless otherwise recommended by the manufacturer.

.4 Sealants and Adhesives: Elastomeric sealant and adhesive in accordance with water-resistive barrier manufacturer’s written recommendations, and Section 07 92 00.

.1 Ensure sealants are UV resistant and compatible with adjacent materials.

.2 Basis of Design Materials: Dörken Systems Inc., DELTA®-THAN (or approved equivalent).

.5 Primers: In accordance with flashing manufacturer’s written recommendations.

.6 Flexible Membrane Through-wall Flashing: Self-adhering, butyl-rubber based flashing membrane.

.1 Basis of Design Materials: Dörken Systems Inc., DELTA®-TW FLASHING (or approved equivalent).

3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: Verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for water-resistive barrier installation in accordance with manufacturer’s written recommendations.

.1 Visually inspect substrate in presence of Consultant.

.2 Inform Consultant 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 Consultant.

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 Ensure step flashings and kick-out flashings are installed before beginning installation of water-resistive barrier membrane.

.3 Ensure protrusions that may penetrate water-resistive barrier membrane are removed before beginning installation.

3.3 INSTALLATION

.1 Install water-resistive barrier before installation of windows and doors in accordance with manufacturer’s written recommendations.

.2 Do installation in accordance with ABAA written recommendations for installation of water-resistive barriers.

.3 Unroll water-resistive barrier with printed side out, wrapping entire building, including rough openings for windows, doors and other protrusions or penetrations.

.1 Install water-resistive barrier plumb and level to exterior face of sheathing, or directly to framing members in accordance with manufacturer written recommendations.

.2 Ensure water-resistive barrier is installed with textured side facing substrate.

.4 Start installation of water-resistive barrier at building corner, leaving 150mm to 305mm (6” to 12”) of membrane extended beyond corner.

.5 Install horizontally starting at bottom of wall.

.1 Overlap water-resistive barrier membrane as follows:

.1 Exterior Corners: 305mm (12”) minimum.

.2 Vertical and horizontal seems: 150mm (6”) minimum.

.3 Other seams, joints or at protrusions and penetrations: 150mm (6”) minimum.

.6 Attachment of Water-resistive Barrier Membrane to Substrate:

.1 Attach water-resistive barrier to steel studs through exterior sheathing with mechanical fasteners, and elastomeric adhesive in accordance with manufacturer’s written recommendations.

.1 Secure using fasteners and custom caps spaced 157mm (18”) maximum vertically on center along stud line and 610mm (24”) maximum on center, horizontally.

.2 Ensure fasteners penetrate securely through metal studs 19mm (¾”) minimum.

.3 Install fasteners 150mm (6”) from sill and frame of window and door openings.

.4 Ensure fasteners are installed 229mm (9”) minimum from window or door head.

3.4 SITE QUALITY CONTROL

.1 Field Inspection: Coordinate field inspection in accordance with Division 01.

.2 Manufacturer’s Services:

.1 Coordinate manufacturer’s services.

.1 Manufacturer review work involved in handling, installation, protection, and cleaning of water-resistive barrier and components, and submit written reports in acceptable format to verify compliance of Work with Contract conditions.

.2 Manufacturer’s Field Services: Provide manufacturer’s field services consisting of product use recommendations and periodic site visits for product installation review in accordance with manufacturer’s instructions.

.1 Report any inconsistencies from manufacturer’s recommendations immediately to Consultant.

.3 Schedule site visits to review work at stages listed:

.1 As required by consultant.

.2 Obtain reports within three (3) days of review and submit immediately to Consultant.

3.5 CLEANING AND PROTECTION

.1 Progress Cleaning: Perform cleanup as work progresses in accordance with Division 01.

.1 Leave work area clean end of each day.

.2 Final Cleaning: Upon completion, remove surplus materials, rubbish, tools, and equipment.

.3 Waste Management:

.1 Coordinate recycling of waste materials.

.2 Collect recyclable waste and dispose of or recycle field generated construction waste created during construction or final cleaning related to work of this Section.

.3 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

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

.5 Repair damage to adjacent materials caused by water-resistive barrier installation.

END OF SECTION

1 General

1.1 SUMMARY

.1 This section includes requirements for supply and installation of under-slab vapour retarder required for the following:

.1 Below-grade Areas.

1.2 SUBMITTALS

.1 Provide submittals in accordance with Division 01.

.2 Action Submittals:

.1 Samples: Submit samples of materials to Consultant for review and acceptance as follows:

.1 305 mm x 305 mm (12” x 12”) sample for review and acceptance.

.2 Data Sheets: Manufacturer's descriptive literature and recommended method of installation.

.3 Certificates: Manufacturer's certificates attesting that products meet specification requirements.

.3 Informational Submittals:

.1 Product Data: Submit manufacturer’s product literature for each product listed including manufacturer’s recommended installation procedures and any modifications required to suit installation conditions.

1.3 QUALITY ASSURANCE

.1 Contractor executing work of this Section shall employ installers having a minimum of five (5) years continuous experience in successful installation of work of type and quality shown and specified. Submit proof of experience upon Consultant's request.

.2 The below-grade vapour retarder shall be inspected by the Consultant prior to concrete work.

1.4 STORAGE, DELIVERY, HANDLING AND PROTECTION

.1 Deliver materials on manufacturer's original skids, or in original unopened protective packing.

.2 Protect materials during transportation, storage and installation to avoid physical damage.

2 Products

2.1 MATERIALS

.1 Plastic Sheet Vapour Retarder (VB-01): Polyethylene sheet in accordance with ASTM E1745-11, including manufacturer’s recommended seam tape, pipe boots and vapour proofing mastic forming a complete system, and as follows:

.1 Vapour Permeance: 0.3 Perm maximum

.2 Water Vapour Transmission Rate: 17 ng/(s·m2·Pa) maximum

.3 Tensile Strength: Class A

.4 Thickness: Not less than 15 mil in accordance with ACI 302R recommendations.

.5 Acceptable Materials:

.1 Perminator 15 mil by W.R. Meadows, Perminator 15 mil.

.2 Stego Wrap Vapour Barrier by Stego Industries.

3 Execution

3.1 INSPECTION

.1 Check graded subgrade for conformity with elevations and cross-sections before placing material.

.2 Check for unstable areas and areas requiring additional compaction.

.3 Notify Consultant of unsatisfactory surfaces and conditions.

.4 Do not begin installation of material until deficiencies have been corrected.

3.2 INSTALLATION

.1 Coordinate placement with other drainage materials and install in accordance with manufacturer's written instructions.

.2 Before placing concrete for slabs on grade, water compacted base; do not use polyethylene. Place interior slabs on premoulded vapour retarder membrane, installed in accordance with manufacturer's written instructions.

.3 Overlap sheet membrane seams 150mm (6") and tape using manufacturer's recommended 100mm (4") seam tape. Tape membrane edge to foundation wall to prevent membrane from moving and ensuring a continuous below-grade vapour retarder.

3.3 PROTECTION

.1 Take extreme care during trenching operations, installation of materials and backfilling not to damage or displace materials or other utilities.

END OF SECTION

1 General

1.1 SUMMARY

.1 Supply labour, materials, plant, tools and equipment to complete the Work as shown on the Drawings and as specified herein, including, but not limited to the following:

.1 Compatible fluid applied/sheet applied vapour permeable air barrier (AB) membranes, complete with all associated primers and accessories necessary for complete system installation.

.2 Materials and installation methods to bridge and seal the following air leakage pathways and gaps:

.1 Connections of the walls to the roof air barrier.

.2 Connections of the walls to the foundations, seismic and expansion points, openings and penetrations of window frames, store front, and other envelope systems, door frames, piping, conduit, duct and similar penetrations, masonry ties, screws, bolts and similar penetrations.

.3 All other leakage pathways in the building envelope.

1.2 PERFORMANCE REQUIREMENTS

.1 Provide a vapour permeable air barrier constructed to perform as a continuous air and vapour barrier, and as liquid water drainage plane flashed to discharge any incidental condensation or water penetration.

.2 The air barrier shall be joined in an airtight and flexible manner to the air barrier material of adjacent systems, allowing for the relative movement of systems due to thermal and moisture variations and creep. Connection shall be made between:

.1 Foundations and walls.

.2 Walls and windows or doors.

.3 Different wall systems.

.4 Wall and roof.

.5 Wall and roof over unconditioned space.

.6 Walls, floor and roof across construction, control and expansion joints.

.7 Walls, floors and roof to utility, pipe and duct penetrations.

.8 All penetrations of the air barrier and paths of air infiltration/exfiltration shall be made airtight.

1.3 QUALITY ASSURANCE

.1 Work in this Section is to be carried out by a skilled applicator approved by manufacturer and in strict accordance with manufacturer's printed instructions. Upon request, provide written confirmation or certification from the vapour permeable air barrier manufacturer that the installer has been trained and is recognized by the manufacturer as suitable for the execution of the work.

.2 Perform Work in accordance with the manufacturer's written instructions of the air barrier membrane and this specification.

.3 Maintain one (1) copy of the manufacturer's written instructions on site.

.4 Compounds used in this section shall be sourced from one (1) manufacturer, including sheet membrane, air barrier sealants, primers, mastics and adhesives.

.5 Pre-Installation Conference:

.1 Convene a pre-installation conference two (2) weeks prior to commencing work of this section. Require attendance of parties directly affecting work of this section, including, but not limited to, the Owner's representative, Consultant, General Contractor, vapour permeable air barrier membrane contractor, vapour permeable air barrier membrane manufacturer's representative and substrate installer.

.2 Pre-Installation conference to be scheduled to coincide with regularly scheduled, on-site project progress meeting.

.3 Review preparation and installation procedures and co-ordinating and scheduling required with related work.

.4 Record discussions of conference and decisions and agreements (or disagreements) reached, and furnish copy of record to each party attending. Review foreseeable methods and procedures related to the vapour permeable air barrier membrane, including the following:

.1 Tour, inspect and discuss condition of substrate, penetrations and preparatory work performed by other trades.

.2 Review surface preparation, minimum curing period and installation procedures.

.3 Review special details and flashings.

.4 Review required submittals, both completed and yet to be completed.

.5 Review and finalize construction schedule related to work and verify availability of materials, installer's personnel, equipment and facilities needed to make progress and avoid delays.

.6 Review required inspections, testing, protection and repair procedures.

.7 Review weather and forecasted weather conditions, and procedures for coping with unfavourable conditions.

.6 Arrange for a Manufacturer's Representative to:

.1 Visit the site and discuss any special requirements, procedures and unique conditions, prior to commencement of work.

.2 Inspect substrate surfaces and recommend solutions to accommodate requirements for surface preparation of the existing coating and any adverse conditions.

.3 Periodically visit and inspect the installation and report unsatisfactory conditions to the Contractor.

.4 Attend final inspection and to submit written certification that the products, systems and assemblies have been installed in accordance with the manufacturer's requirements.

.7 Inspection and Testing:

.1 Cooperate and coordinate with the Owner's inspection and testing agency. Do not cover any installed vapour permeable air barrier membrane until any required inspections, testing approvals have been completed.

.2 Contractor and membrane manufacturer's representative shall conduct at least three ASTM D4541 Adhesion test at random mock-up locations, demonstrating membrane achieves minimum pull strength of 16 PSI.

1.4 SUBMITTALS

.1 Provide submittals in accordance with Division 01.

.2 Documentation:

.1 Prior to commencing the Work, submit documentation from an approved independent testing laboratory certifying that the air leakage and vapour permeance rates of the air barrier membranes, including primary membrane and transition sheets, exceed the requirements of the NBC.

.2 Prior to commencing the Work submit copies of manufacturer's current ISO certification. Membrane, primers, sealants, adhesives and associated auxiliary materials shall be included.

.3 Prior to commencing the Work submit references clearly indicating that the membrane manufacturer/installer has successfully completed projects on an annual basis of similar scope and nature for a minimum of fifteen (15) years. Submit references for a minimum of ten (10) projects.

.4 Prior to commencing the Work submit manufacturer's complete set of standard details for the air barrier membrane system showing a continuous plane of air tightness throughout the building envelope.

.5 Prior to commencing work provide a material checklist, complete with application rates and minimum thickness of primary membranes.

.3 Shop Drawings:

.1 Show the locations and extent of the vapour permeable air barrier system including details of typical conditions, intersections with other envelope systems and materials, membrane counter-flashings and details showing how gaps in construction will be bridged and how miscellaneous penetrations such as conduits, pipes, etc. are sealed.

.4 Samples:

.1 Submit to Consultant for approval, samples of materials and components to be used in vapour permeable air barrier system, prior to fabrication of work together with name of manufacturer and technical literature. Submit 305mm x 305mm (12" x 12") samples of vapour permeable air barrier membrane.

.5 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 ENVIRONMENTAL CONDITIONS

.1 Vapour permeable air barrier membrane is not to be applied to surfaces that are either wet, oily, frosted, dirty or contaminated in any way.

.2 Maintain surface of substrates and ambient temperatures constantly between 38 deg C and 5 deg C during application and curing of primers and adhesives for flexible vapour permeable air barrier membrane flashings, except as permitted otherwise by Consultant in writing.

1.6 DELIVERY, STORAGE, HANDLING AND PROTECTION

.1 Coordinate deliveries with construction schedule and arrange for proper storage areas.

.2 Deliver materials to the job site in undamaged and original packaging indicating the name of the manufacturer and product.

.3 Store materials in a clean, dry and protected area, off the floor or ground, in their original containers, sealed and undamaged. Manufacturer's labels are to be easily visible and undamaged. Store rolled materials on end.

.4 Store liquid membrane materials, adhesives and primers at minimum 5 degree C, and store away from open flames, sparks and excessive heat as liquid membrane materials and primers are flammable because of solvent content.

.5 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.

.6 In addition to the above, store modified bituminous sheet type flexible vapour permeable air barrier membrane flashings as follows;

.1 Store rolls of membrane tape in accordance with manufacturers written instructions.

.2 Store materials away from direct heat or open flame.

.3 Store rolls away from direct sunlight until ready for use.

.4 For installation in cold weather, store rolls of membrane in heated storage trailer for minimum of 24-hours with the temperature kept at 21 degree C and remove for application with as little exposure as possible to low ambient temperatures.

.7 The vapour permeable air barrier membrane is not designed for permanent exposure, but can be left exposed for up to a maximum of thirty (30) days. As soon as possible after the membrane has cured, protect vapour permeable air barrier membrane from damage by work of other Sections.

1.7 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 two (2) years and agree to repair and replace faulty materials or work which becomes evident during the warranty period, without cost to the Owner. Provide the Owner with a written warranty to this effect.

2 Products

2.1 MATERIALS

.1 Fluid-applied, Vapour Permeable Air Barrier (AB-01): One-component, rubberized, elastomeric membrane containing less than 100 g/l VOC.

.1 Basis of Design Product: AirBloc 17MR by Henry Company, or approved equivalent.

.2 Sheet-applied, Vapour Permeable Air Barrier (AB-01): Self-adhering vapour permeable membrane bonded with permeable adhesive layer and split-back poly-release film.

.1 Basis of Design Product: Blueskin VP160 by Henry Company, or approved equivalent.

.3 Sheet-applied Air Barrier Membrane Flashing Primer:

.1 Water based, polymer emulsion type.

.1 Basis of Design Product: Blueskin Aquaprime by Henry Company, or approved equivalent.

.4 Flexible Air Barrier Membrane Flashings (Transition Flashings):

.1 40 mils (1mm) thick x width to suit, strips of self-adhering, SBS rubberized asphalt laminated to a cross-laminated, high density polyethylene film with a silconized release liner.

.1 Basis of Design Product: Blueskin TWF by Henry Company, or approved equivalent.

.5 Reinforcing Fabric (Joint Treatment Mesh):

.1 150mm (6") wide, open weave 20/10 mesh, glass fibre yarn saturated with synthetic resins, reinforcing fabric fabric weighing minimum of 2.5 oz/sq.yd., and conforming to CGSB 37-GP-63M

.1 Basis of Design Product: Yellow Jacket 990-06 by Henry Company, or approved equivalent.

.6 Air Barrier Sealant:

.1 High solids, high flexibility, polymer modified, rubberized asphalt type sealant, compatible to vapour permeable air barrier membrane and conforming to CAN/CGSB-37.29-M.

.1 Basis of Design Product: Polybitume Sealing Compound by Henry Company, or approved equivalent.

.7 Substrate Cleaners:

.1 Petroleum spirits thinner or low flash petroleum spirits (mineral spirits) conforming to CAN/CGSB-1.4-2000, or xylene thinner (xylol) conforming to CAN/CGSB-1.49-M.

.8 Packing Insulation:

.1 Loose, glass fibre or mineral fibre insulation, 1.0 lbs./cu.ft. density, and conforming to CAN/CGSB-51.11.

3 Execution

3.1 EXAMINATION

.1 The installer shall examine conditions of substrates, areas and other conditions under which the vapour permeable air barrier system will be applied for compliance with requirements.

.2 Verify that surfaces and conditions are ready to accept the Work of this section. Surfaces shall be sound, dry, even and free of oil, grease, dirt, excess mortar or other contaminants. Concrete surfaces shall be cured and dry, smooth without large voids, spalled areas or sharp protrusions. Masonry joints shall be flush and completely filled with mortar, and all excess mortar sitting on masonry ties shall have been removed. Verify substrate is visibly dry and free of moisture.

.3 Notify the Consultant in writing of any discrepancies. Commencement of work or any parts thereof shall mean acceptance of the prepared substrate.

.4 Do not proceed with application of vapour permeable air barrier membrane when rain is expected within 16-hours.

3.2 GENERAL

.1 Ensure continuity of the air seal throughout the scope of this section.

.2 Components and membrane materials must be obtained as a single-source from the membrane manufacturer to ensure total system compatibility and integrity.

.3 Install all materials in accordance with the manufacturer's written directions, unless otherwise specified herein.

3.3 SURFACE PREPARATION

.1 Clean, prepare and treat substrates according to manufacturer's written instructions. Surfaces to be coated must be smooth, clean, dry, firm to the touch and free from oil, grease, dirt, excess mortar and other contaminants.

.1 Brushing and/or scraping of substrates may be required to adequately prepare surface.

.2 Remove all poorly bonded, existing surface coating prior to installing work of this Section.

.3 Thoroughly wash metal surfaces with mineral spirits or xylol and wipe dry with clean rags.

.2 Vapour permeable air barrier membrane 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 (2) weeks prior to application of vapour permeable air barrier membrane.

.3 Concrete surfaces shall be free of large voids and spalled areas. Fill all spalled concrete areas, form-tie holes/voids and open mortar joints in concrete block with mortar to produce a smooth, even surface. Allow to cure properly before proceeding.

3.4 JOINT AND PROTRUSION TREATMENTS

.1 Prepare only enough vapour permeable air barrier membrane compound as required for joint and protrusion treatments and can be used within compound's usable pot life. Mix vapour permeable air barrier membrane with a double blade agitator attached to a 13mm (1/2") drill in strict accordance with the manufacturer's written instructions.

.2 Exterior sheathing board inside/outside corners: Embed minimum 305mm (12") wide, continuous strip of reinforcing fabric in vapour permeable air barrier membrane, centred over corner.

.3 Fill joints up to 6mm (1/4") wide in exterior grade sheathing board and joints in between panels of exterior grade plywood with trowel application of vapour permeable membrane or mastic as recommended by manufacturer ensuring that joints are completely filled.

.4 Where joints in exterior grade sheathing board are over 6mm (1/4") wide, ensure joints are completely filled with a vapour permeable membrane or mastic and apply continuous flexible air barrier membrane flashing or mesh as specified herein, lapped a minimum of 75mm (3") and fully adhered to both sides of substrate.

.5 Where joints/cracks up to 6mm (1/4") wide occur in concrete or masonry, fill joints/cracks with a thick trowel application of vapour permeable air barrier membrane or mastic, ensuring that joints are completely filled.

.6 Where joints/cracks in concrete or masonry are over 6mm (1/4") wide, apply a vapour permeable membrane or mastic as recommended by manufacturer ensuring that joints are completely filled.

.7 Ensure continuity of air barrier membrane by working air barrier membrane over all exterior sheathing board fasteners and around all masonry ties and anchors and other items.

3.5 APPLICATION - AIR BARRIER MEMBRANE FLASHINGS

.1 Apply primer to all substrate areas where flexible air barrier membrane flashings are to be applied. Apply primer using lambs wool roller at rate 100 sq.ft. to 300 sq.ft./gallon (2.044 to 6.131 sq.m./gallon) depending on porosity of substrates. Allow primer to "tack up" for approximately 30-minutes prior to application of flexible air barrier membrane flashings.

.2 Do not use solvent-based primer where it may be in contact with polystyrene insulation.

.3 Install flexible air barrier membrane flashings in strict accordance with the manufacturer's written instructions unless otherwise specified herein.

.4 Ensure a uniform, continuous air barrier effect. Where air barrier membranes are to be provided under other Sections, co-ordinate the work such that air barrier membrane continuity is achieved.

.5 Provide air tight seals at penetrations in flexible air barrier membrane flashings.

.6 Apply flexible air barrier membrane flashings to extend air barrier membrane at peripheries of the installation as required to facilitate joining and sealing of the air barrier provided in adjacent construction, lapping joints minimum of 75mm (3"), extending membrane onto adjacent concrete/metal substrates not less than 150mm (6"), centred over joints.

.7 Apply continuous flexible air barrier membrane flashings at expansion and deflection joints within framing members, lapping joints minimum of 75mm (3"), extending membrane onto adjacent concrete/metal substrates which have no applied air barrier not less than 150mm (6"), centred over joints.

.8 Flexible Weather Barriers:

.1 Provide continuous 457mm (18") side flexible weather barrier membrane in exterior masonry cavity walls at expansion joints.

.2 Install flexible weather barrier membrane to substrate with adhesive, in strict accordance with manufacturer's instructions.

.3 Loop down flexible weather barrier into expansion/control joints approximately two (2) times the width. Lap joints minimum 150mm (6") and seal. Ensure that flexible weather barrier lap joints which are looped into expansion /control joints are sealed with adhesive. Seal tops and bottoms of membrane barrier at change in construction to present continuous, uninterrupted flexible weather barrier.

.4 Pack joint with loose batt insulation with face of insulation down two (2) times the width of expansion from face interior wythe.

3.6 APPLICATION - VAPOUR PERMEABLE AIR BARRIER MEMBRANE - LIQUID APPLIED

.1 Areas to receive vapour permeable air barrier membrane are as follows:

.1 On all new / existing substrates, behind all rainscreen cladding.

.2 Prepare only enough vapour permeable air barrier membrane compound as can be used within compound's usable pot life. Mix vapour permeable air barrier membrane with a double blade agitator attached to a 13mm (1/2") drill in strict accordance with the manufacturer's written instructions.

.3 Apply vapour permeable air barrier membrane to substrates in a continuous coating at a rate of 27 - 45 litres/9.29 sq.m. (6 to 10 gal./100 sq.ft.) by roller, spray or trowel methods, producing a minimum wet film thickness of 70 wet mils (1.5mm).

.4 Ensure that application of vapour permeable air barrier membrane overlaps all flexible air barrier membrane flashings, dampproof course/thru-wall flashings a minimum of 75mm (3").

.5 Where masonry anchors pass through the air barrier membrane, ensure continuity of air barrier by applying vapour permeable air barrier membrane all around/over masonry anchors.

3.7 APPLICATION - VAPOUR PERMEABLE AIR BARRIER MEMBRANE - SHEET APPLIED

.1 Apply self-adhering water resistive air barrier membrane complete and continuous to substrate in an overlapping shingle fashion and in accordance with manufacturer's recommendations and written instructions. Stagger all vertical joints.

.1 Align and position self-adhering membrane to substrate, remove top panel of protective release film and press firmly into place.

.2 Ensure alignment, hold membrane in place to avoid wrinkles and sequentially remove remaining panels of protective film and press firmly into place.

.3 Ensure minimum 75mm (3") overlap at all end and 50mm (2") side laps of subsequent membrane applications.

.4 Apply pressure to all membrane surfaces, laps and flashings using an appropriate roller to provide best possible surface adhesion.

.5 Seal all laps and flashings with termination sealant, as recommended by the membrane manufacturer.

3.8 PROTECTION AND CLEAN-UP

.1 Protect membrane to avoid damage from other trades, and construction materials during subsequent operations.

.2 If the vapour permeable air barrier cannot be covered within thirty (30) days after installation, apply temporary UV protection such as dark plastic sheet or tarpaulins. Contact material manufacturer for further recommendations.

.3 Clean spillage and soiling on adjacent construction that will be exposed in the finished work using cleaning agents and procedures recommended by the manufacturer of the affected construction.

.4 Remove any masking materials after installation.

.5 Applicator is responsible for the removal of surplus and waste material incurred during application.

.6 Equipment and tools can be cleaned using mineral spirits or xylol.

END OF SECTION

1 GENERAL

1.1 SECTION INCLUDES

.1 Steel faced, polyisocyanurate core metal wall panels MTL-01.

.2 Accessories including fasteners and perimeter trim.

1.2 REFERENCES

.1 American Architectural Manufacturers Association (AAMA)

.1 AAMA 501.1: Standard Test Method for Metal Curtain Walls for water penetration using Dynamic Pressure.

.2 AAMA 501.2: Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls and Sloped Glazing Systems.

.2 American Society of Civil Engineers (ASCE)

.1 ASCE 7: Minimum Design Loads for Buildings and Other Structures.

.3 ASTM International

.1 ASTM A480: Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet and Strip.

.2 ASTM A653: Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

.3 ASTM A755: Standard Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products

.4 ASTM A792: Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot–Dip Process

.5 ASTM A924: Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process

.6 ASTM B117: Standard Practice for Operating Salt Spray (Fog) Apparatus

.7 ASTM B209: Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate

.8 ASTM C209: Standard Test Methods for Cellulosic Fiber Insulating Board

.9 ASTM C273: Standard Test Method for Shear Properties of Sandwich Core Materials.

.10 ASTM C518: Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus

.11 ASTM C920: Standard Specification for Elastomeric Joint Sealants

.12 ASTM D224; Standard Specification for Smooth-Surfaced Asphalt Roll

.13 ASTM D522: Standard Test Methods for Mandrel Bend Test of Attached Organic Coatings

.14 ASTM D523: Standard Test Method for Specular Gloss

.15 ASTM D714: Standard Test Method for Evaluating Degree of Blistering of Paints

.16 ASTM D968: Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive

.17 ASTM D1308: Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes

.18 ASTM D1621: Standard Test Method for Compressive Properties of Rigid Cellular Plastics

.19 ASTM D1622: Standard Test Method for Apparent Density of Rigid Cellular Plastics

.20 ASTM D1623: Standard Test Method for Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics

.21 ASTM D1654: Standard Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments.

.22 ASTM D1929: Standard Test Method for Determining Ignition Temperature of Plastics

.23 ASTM D2126: Standard Test Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging.

.24 ASTM D2244: Standard practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates

.25 ASTM D2247: Standard Practice for Testing Water Resistance of Coatings in 100 percent Relative Humidity

.26 ASTM D2794: Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)

.27 ASTM D3273: Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.

.28 ASTM D3359: Standard Test Methods for Measuring Adhesion by Tape Test

.29 ASTM D3363: Standard Test Method for Film Hardness by Pencil Test

.30 ASTM D4145: Standard Test Method for Coating Flexibility of Prepainted Sheet

.31 ASTM D4214: Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films

.32 ASTM D5894: Standard Practice for Cyclic Salt Fog/UV Exposure of Painted Metal, (Alternating Exposures in a Fog/Dry Cabinet and a UV Condensation Cabinet)

.33 ASTM D6226: Standard Test Method for Open Cell Content of Rigid Cellular Plastics.

.34 ASTM E72: Standard Test Methods of Conducting Strength Tests of Panels for Building Construction

.35 ASTM E84: Standard Test Method for Surface Burning Characteristics of Building Materials

.36 ASTM E90: Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements

.37 ASTM E283: Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen

.38 ASTM E330: Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference

.39 ASTM E331: Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference

.40 ASTM G153: Standard Practice for Operating Enclosed Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials

.41 ASTM G154: Standard Practice for Operating Fluorescent Light Apparatus for UV Exposure of Nonmetallic Materials

.4 National Fire Protection Agency (NFPA)

.1 NFPA 259: Standard Test Method for Potential Heat of Building Materials.

.2 NFPA 268: Standard Test Method for Determining Ignitibility of Exterior Wall Assemblies Using a Radiant Heat Energy Source.

.3 NFPA 285: Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components.

.5 UL Canada (ULC)Approvals:

.1 CAN/ULC-S101: Standard Methods of Fire Endurance Tests of Building Construction and Materials

.2 CAN/ULC-S102: Standard Method of Test for Surface Building Characteristics of Building Materials and Assemblies

.3 CAN/ULC-S134: Fire Test of Exterior Wall Assemblies

.4 CAN/ULC-S138: Standard Method of Test for Fire Growth of Insulated Building Panels in a Full-Scale Room Configuration

1.3 PRE-INSTALLATION CONFERENCE

.1 Arrange a site meeting, to coincide with regular bi-weekly site meetings, attended by the Contractor, the Subcontractor's representative and foreman for this project, the Consultant, materials supplier(s), and other relevant personal before commencement of work for this Section; agenda for meeting will include; but not be limited to, the following:

.1 To discuss expectations for fit and finish of cladding system, structural support requirements, quality of workmanship for installation of air/vapour retarders and insulation and relationship of the cladding system to adjacent components and other requirements specific to the project.

.2 Manufacturer’s representative shall also provide frequent inspection visits during the course of work of this Section to assure quality and competence of membrane installation and panel alignment.

1.4 SUBMITTALS

.1 Refer to Section 01 33 00 Submittal Procedures.

.2 Product Data: Submit manufacturer current technical literature for each type of product.

.3 Shop Drawings: Submit detailed drawings and panel analysis showing:

.1 Profile

.2 Gauge of both exterior and interior sheet

.3 Location, layout and dimensions of panels

.4 Location and type of fasteners

.5 Shape and method of attachment of all trim

.6 Locations and type of sealants

.7 Installation sequence

.8 Coordination Drawings: Provide elevation drawings and building sections which show panels in relationship to required locations for structural support. Include panel details and details showing attachment to structural support.

.9 Other details as may be required for a weathertight installation

.4 Shop drawings shall bear the seal of an engineer registered to practice in the place of Work, employed by the Insulated Metal Cladding Panel supplier, and shall include complete design calculations for the system and documentation in regard to the reactions of the cladding panels due to thermal expansion and contraction, positive and negative wind pressure and assurance that the thermal movement and wind forces have sufficient attachments, supports, bracing and anchorage.

.5 Panel Analysis: Provide panel calculations to verify panels will withstand the design wind loads indicated without detrimental effects or deflection exceeding L/180. Include effects of thermal differential between the exterior and interior panel facings and resistance to fastener pullout. Calculations to be signed and sealed by and engineer registered to practice in the place of work.

.6 Samples: Provide nominal 3 x 5 inch of each color indicated.

.7 Quality Assurance Submittals

.1 Design Data, Test Reports: Provide manufacturer test reports indicating product compliance with requirements.

.2 Manufacturer Erection Instructions: Provide manufacturer's written installation instructions including proper material storage, material handling, installation sequence, panel location(s), and attachment methods, details and required trim and accessories.

1.5 MOCKUP

.1 Construct mock-ups for each form of construction and finish required to verify selections made under sample submittals and to demonstrate aesthetic effects and qualities of materials and execution before installing materials indicated in this Section.

.2 Build mock-ups using exposed and concealed materials indicated for the completed Work, and as follows:

.1 Locate mock-ups in the location and of the size indicated or, if not indicated, as directed by Consultant. Mockup shall consist of a minimum of 3 cladding panels widths x full height of assembly, including soffit.

.2 Notify Consultant 7 days in advance of the dates and times when mock-ups will be constructed.

.3 Demonstrate the proposed range of aesthetic effects and workmanship.

.4 Obtain Consultant's acceptance of mock-ups before proceeding with construction of work of this Section.

.5 Mockup must meet field testing requirements before proceeding with construction of the work of this Section.

.6 Maintain mock-ups during construction in an undisturbed condition, as a standard for judging the completed Work.

.7 Accepted mock-ups may form a part of the completed Work.

.3 Field Water Test: After completing mockup of wall panel assembly including accessories and trim, test for water penetration in accordance with AAMA 501.2. Cost of test shall be paid for from project Cash Allowance

1.6 QUALITY ASSURANCE

.1 Manufacturer Qualifications:

.1 Manufacturer shall have a minimum of five (5) years experience in the production of insulated wall panels. Manufacturer shall demonstrate past experience with examples of projects of similar type and exposure.

.2 Manufacturer to be registered with a Program Operator with a Certified, Environmental Product Declaration, in conformance with ISO 14025, for Insulated Metal Panels.

.2 Installer Qualifications: Authorized by the manufacturer and the work shall be supervised by a person having a minimum of five (5) years experience installing insulated wall panels on similar type and size projects.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Deliver panel materials and components in manufacturer's original, unopened, undamaged packaging with identification labels intact.

.2 Store wall panel materials on dry, level, firm, and clean surface. Stack no more than two bundles high. Elevate one end of bundle to allow moisture run-off, cover and ventilate to allow air to circulate and moisture to escape.

1.8 WARRANTY

.1 Limited Warranty: Standard form in which manufacturer agrees to repair or replace items that fail in materials or workmanship within specified warranty period. The items covered by the warranty include structural performance including bond integrity, deflection and buckling.

.1 Warranty Period: Two (2) years from date of Substantial Completion.

.2 Finish Warranty: Submit Manufacturer's limited warranty on the exterior paint
finish for adhesion to the metal substrate and limited warranty on the exterior paint finish for chalk and fade.

.3 Thermal Warranty: Standard form in which manufacturer agrees to repair or replace panels that exhibit greater than 10% reduction from published material R-value at time of manufacture as measured in accordance with ASTM C518 within specified warranty period.

.1 Warranty Period: Thirty (30) years from date of Substantial Completion.

2 PRODUCTS

2.1 MANUFACTURER

.1 **Basis of Design: Kingspan KS Quadcore Cladding Pane**l as manufactured by Kingspan Insulated Panels Ltd. 12557 Coleraine Drive, Caledon, ON L7E 3B5 (866-442-3594); 5202-272nd Street, Langley, B.C. V4W 1S3 (866-442-3594) (www.kingspanpanels.ca); and

.2 Equivalent products in accordance with Specification 01 25 00.

2.2 INSULATED METAL CLADDING PANELS MTL-01

.1 Performance Criteria:

.1 Structural Test: Structural performance shall be verifiable by witnessed structural testing for simulated wind loads in accordance with ASTM E72 and E330. Deflection criteria shall be L/180.

.2 Freeze / Heat Cycling Test: Panels shall exhibit no delamination, surface blisters, permanent bowing or deformation when subjected to cyclic temperature extremes of minus 36 deg. F to plus 180 deg. F temperatures for twenty one, eight-hour cycles.

.3 Water Penetration: There shall be no uncontrolled water penetration through the panel joints at a pressure differential of 20 psf, when tested in accordance with ASTM E331.

.4 Dynamic Water Penetration: There shall be no uncontrolled water penetration through the panel assembly at a pressure difference of 15 psf, when tested in accordance with AAMA 501.1.

.5 Air Infiltration: Air infiltration through the panel shall not exceed 0.01 cfm/sf at 6.24 psf air pressure differential when tested in accordance with ASTM E283.

.6 Humidity Test: Panels shall exhibit no delamination or metal interface corrosion when subjected to plus 140 deg. F temperature and 100 percent relative humidity for a total of 1500 hours (62 days).

.7 Autoclave Test: Panels shall exhibit no delamination or shrinkage/melting of the foam core from the metal skins after being subjected in an autoclave to a pressure of 2psig (13.8kPa) at a temperature of plus 218 deg. F (plus 103 deg. C) for a period of 2 1/2 hours.

.8 Seismic Performance: Comply with ASCE 7, Section 13, “Seismic Design Requirements for Non-Structural Components”. Panels shall be hard-fastened to structure along one edge only such that lateral slippage between panels can occur in the event of seismic activity.

.9 Fire Test Response Characteristics: Steel-faced panels with polyisocyanurate (ISO) core shall fully comply with Chapter 26 of International Building Code regarding the use of Foam Plastic.

.2 Flame Spread and Smoke Developed Tests on exposed Insulating Core:

.1 ASTM E84 Flame spread and smoke developed indices:

.1 Flame Spread: 25 or less.

.2 Smoke Developed: 90 or less.

.2 CAN/ULC S102 Flame spread and smoke developed indices:

.1 Flame Spread: 30 or less.

.2 Smoke Developed: 45 or less.

.3 Insulating Core: Polyisocyanurate (POLYISO) core, ASTM C591 Type IV, CFC and HCFC free, compliant with Montreal Protocol and Clean Air Act, with the following minimum physical properties:

.1 Core is 95 percent closed cell when tested in accordance with ASTM D6226

.2 Panel shall provide a nominal R-values of 8.0 [hr·ft2·°F/Btu] per inch thickness when tested in accordance with ASTM C 518 at 75°F mean temperature and 9.0 [hr·ft2·°F/Btu] per inch thickness when tested in accordance with ASTM C 518 at 35°F mean temperature.

.3 Foam has a density of 2.2 to 2.8 pounds per cubic foot when tested in accordance with ASTM D1622

.4 Compressive Stress: Panels shall have a compressive stress of 24 psi. when tested according to ASTM D1621

.5 Shear Stress: 22 psi when tested in accordance with ASTM C273

.6 Tensile Stress: 24 psi when tested in accordance with ASTM D1623

.7 Oven Aging at 212 degrees F:

.1 14 days: minus 0.6 percent volume change

.2 Tested according to ASTM D2126

.8 Low Temperature Aging at minus 40 degrees F:

.1 14 days: minus 0.2 percent volume change

.2 Tested according to ASTM D2126

.4 Paint Finish Characteristics:

.1 Gloss: 15 ± 5 measured at 60 degree angle tested in accordance with ASTM D523.

.2 Pencil Hardness: HB-H minimum tested in accordance with ASTM D3363.

.3 Flexibility, T-Bend: 1-2T bend with no adhesion loss when tested in accordance with ASTM D4145.

.4 Flexibility, Mandrel: No cracking when bent 180° around a 1/8 mandrel as tested in accordance with ASTM D522.

.5 Adhesion: No adhesion loss tested in accordance with ASTM D3359.

.6 Reverse Impact: No cracking or adhesion loss when impacted 3000 by inches of metal thickness (lb-in), tested in accordance with ASTM D2794.

.7 Abrasion Resistance: Nominal 65 liters of falling sand to expose 5/32 inch diameter of metal substrate when tested in accordance with ASTM D968.

.8 Graffiti Resistance: Minimal effect.

.9 Acid Pollutant Resistance: No effect when subjected to 30 percent sulfuric acid for 18 hours, or 10 percent muriatic acid for 15 minutes when tested in accordance with ASTM D1308.

.10 Salt Fog Resistance: Passes 1000 hours, when tested in accordance with ASTM B117 (5 percent salt fog at 95 deg. F).

.11 Cyclic Salt Fog and UV Exposure: Passes 2016 hours when tested in accordance with ASTM D5894.

.12 Humidity Resistance: Passes 1500 hours at 100 percent relative humidity and 95 deg. F, with a test rating of 10 when tested in accordance with ASTM D2247, and D714.

.13 Color Retention: Passes 5000 hours when tested in accordance with ASTM G153 and G154.

.14 Chalk Resistance: Maximum chalk is a rating of 8 when tested in accordance with ASTM D4214, Method A.

.15 Color Tolerances: Maximum of 5ΔE Hunter units on panels when tested in accordance with ASTM D2244.

.5 Panel Assembly:

.1 Panel thickness: 6 inches thick or as scheduled/detailed.

.2 Panel width: 36 inches and/or as indicated on drawings.

.3 Panel Lengths: As indicated on Drawings.

.4 Panel Attachment: Shall consist of fasteners and stainless steel attachment clip completely concealed within the panel side joint.

.5 Horizontal Panel Joint Reveals: 3/8 inch (9.5mm).

.6 Vertical Panel Joint Reveals: 3/8 inch (9.5mm).

.7 Exterior Face of Panel:

.1 Material: Steel coil material shall be in accordance with ASTM A755: AZ50 Galvalume®/ Zincalume® (55 percent aluminum, 45 percent zinc) in accordance with ASTM A792.

.2 Gauge: 22 gauge.

.3 Profile: Micro Rib

.4 Texture: Smooth

.5 Exterior Paint Finish Color:

.1 To be selected by Consultant from manufacturers current stock colour chart; allow for 2 colours.

.2 Finish System:

.1 1.0 mil. Fluropolymer (PVDF) Two Coat system: 0.2 mil primer with 0.8 mil Kynar 500 (70 percent) SOLID color coat.

.8 Interior Face of Panel:

.1 Material: Steel coil material shall be in accordance with ASTM A755: AZ50 Galvalume®/ Zincalume® (55 percent aluminum, 45 percent zinc) in accordance with ASTM A792.

.2 Profile: Shadowline.

.1 Shadowline Profile description: Linear striations nominal 0.0625 inch deep by 3/4 inches wide at 3 inches on center.

.3 Texture: Non-directional stucco embossed.

.4 Gauge: 22 gauge.

.5 Interior Finish: modified polyester, dry film thickness of 1.0 mil including primer.

.1 Colour: To be selected by Consultant from manufacturers current stock colour chart; allow for 1 colour.

2.3 ACCESSORIES

.1 Fasteners:

.1 Self drilling fasteners shall be corrosion resistant plated steel with neoprene washer, as recommended by manufacturer.

.2 Material: Hex-head type with steel and neoprene washer and 12 gauge stainless steel clip supplied by the manufacturer.

.3 Size: As recommended by manufacturer.

.2 Perimeter Trim:

.1 Fabricated perimeter trim and metal flashing: Shall be same gauge, material and coating color as exterior face of insulated metal wall panel.

.2 Extruded perimeter trim: Shall be extruded aluminum 6063-T5 alloy with spray applied PVF coating in same color as exterior face of insulated metal wall panel.

.1 Sealants: Butyl, non-skinning/curing type as recommended by manufacturer.

.2 Butyl Tape: As recommended by manufacturer.

3 EXECUTION

3.1 EXAMINATION

.1 Contractor and cladding installer to coordinate field measurements as required to achieve proper fit of the preformed wall panel envelope.

.2 Contractor and cladding installer shall review requirements for cold formed metal cladding support system, and coordinate installation as required to meet required dimensional tolerances of Insulated Metal Cladding Panel system, including:

.1 Plus or minus 1/8 inch in 5 feet in any direction along plane of framing.

.2 Plus or minus 1/4 inch cumulative in 20 feet in any direction along plane of framing.

.3 Plus or minus 1/2 inch from framing plane on any elevation.

.4 Plumb or level within 1/8 inch at all changes of transverse for pre-formed corner panel applications.

.5 Verify that bearing support has been provided behind vertical joints of horizontal panel systems and horizontal joints of vertical panel systems. Width of support shall be as recommended by manufacturer.

.3 Examine individual panels upon removing from the bundle; notify manufacturer of panel defects. Do not install defective panels.

3.2 PANEL INSTALLATION

.1 Installation shall be in accordance with manufacturer's installation guidelines and recommendations.

.2 Install panels plumb, level, and true-to-line to dimensions and layout indicated on approved shop drawings.

.3 Cut panels prior to installing, where indicated on shop drawings, using a power circular saw with fine tooth carbide tip blade per manufacturer's instructions. Personnel should wear respiratory and eye protection devices.

.4 Butyl Weather Barrier Sealant:

.1 Apply non-skinning butyl sealant as shown on shop drawings and manufacturer's installation instructions as necessary to establish the vapor barrier for the panels.

.2 Use non-skinning butyl tube sealant only for tight metal-to-metal contact.

.3 Do not use non-skinning butyl tube sealant to bridge gaps.

.5 Place panel fasteners through pre-punched holes in attachment clips, concealed within the joint of the panel. Secure units to the structural supports. Space clips as recommended by manufacturer or otherwise indicated on the approved shop drawings.

.6 Trim Installation

.1 Place trim and trim fasteners only as indicated per details on the approved shop drawings.

.2 Field drill weep holes where appropriate in horizontal trim; minimum 1/4 inch diameter at 24 inches on center.

.3 Place a continuous strip of butyl tube sealant between the inside back face of closure trims and interior panel faces for proper vapor seal.

.7 Sealant Installation for Exposed Joints

.1 Clean and prime surfaces to receive exterior exposed sealants in accordance with sealant manufacturer's recommendations.

.2 Follow sealant manufacturer's recommendations for joint width-to-depth ratio, application temperature range, size and type of backer rod, and compatibility of materials for adhesion.

.3 Direct contact between butyl and silicone sealants shall not be permitted.

.8 Field Quality Control

.1 Testing Agency: General Contractor shall engage an independent testing and inspection agency acceptable to the Consultant to perform field tests and inspections and to prepare reports of findings. Cost for field tests shall be paid for from project Cash Allowance.

3.3 CLEANING AND PROTECTION

.1 Remove protective film immediately after installation.

.2 Touch-up, repair or replace metal panels and trim that have been damaged.

.3 After metal wall panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.

END OF SECTION

1 General

1.1 SUMMARY

.1 This Section includes requirements for prefinished metal siding, complete with a system of girts, flashings and trims, using sheet metals and exposed fasteners, on the following installation applications:

.1 Corrugated Exterior Wall Cladding MTL-02

.2 Provide specified system with labour, materials, and equipment required to fabricate and erect siding including cutting and penetrations, accessories, flashings, trims and closures necessary for a complete installation.

1.2 REFERENCE STANDARDS

.1 American Architectural Manufacturers Association (AAMA):

.1 AAMA 605.2, Voluntary Specification for High Performance Coatings on Architectural Panels and Extrusions.

.2 American Society for Testing and Materials (ASTM):

.1 ASTM A653/A653M-11, Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process, Physical (Structural) Quality.

.2 ASTM A755/A755M-11, Standard Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products.

.3 Canadian Sheet Steel Building Institute (CSSBI):

.1 CSSBI 20M-08, Standard for Sheet Steel Cladding for Architectural, Industrial and Commercial Building Applications.

.2 CSSBI S8-08, Quality and Performance Specification for Prefinished Sheet Steel Used for Building Products.

.4 Canadian Standards Association (CSA):

.1 CSA CAN/CSA S16-09, Design of Steel Structures

.2 CSA S136-07, North American Specification for the Design of Cold Formed Steel Structural Members

.5 Canadian General Standards Board (CGSB):

.1 CGSB 1.108-M89, Bituminous Solvent Type Paint

.6 The Society for Protective Coatings (SSPC)

.1 SSPC Guide 14, Guide for the Repair of Imperfections in Galvanized, Organic, or Inorganic Zinc-Coated Steel Using Organic Zinc-Rich Coatings

1.3 SUBMITTALS

.1 Submit manufacturer's product specifications, standard details, certified product test results, and general recommendations, as applicable to materials and finishes for each component and for total panel assemblies.

.2 Shop Drawings:

.1 Submit fully dimensioned shop drawings to Consultant showing construction, assembly, elevations, sections and interfacing with work of other Sections.

.2 No work of this Section shall be fabricated until shop drawings and all other related submittals, documentation, certifications and samples as required by this Section, have been reviewed by the Consultant.

.3 Details shall indicate metal thicknesses, areas to be sealed and sealant materials, gaskets, type of joints, flashings, trim, finishes, fasteners and welds, all anchorage assemblies and components and erection details.

.4 Shop drawings shall bear the seal of an engineer registered to practice in the place of Work, employed by the preformed metal siding manufacturer, and shall include complete design calculations for the system and documentation in regard to the reactions of the metal siding due to thermal expansion and contraction, positive and negative wind pressure and assurance that the thermal movement and wind forces have sufficient attachments, supports, bracing and anchorage.

.1 Contractor is to perform field testing of the proposed anchors for the new cladding system. Testing shall be in conformance with ASTM E488/E488M and tested to a maximum pull out strength determined by the shop drawings engineer but with a minimum safety factor of 3. Conduct a minimum of 6 tests to include at least 3 different floors and 4 different elevations.

.3 Samples:

.1 Submit to the Consultant for approval, samples of materials and components to be used in the system, prior to fabrication of work together with name of manufacturer and technical literature.

.2 Submit 305mm x 305mm (12" x 12") samples of metal siding, and full size samples of thermal clips.

.4 Verification Samples:

.1 Submit two (2) full size panels of metal siding.

.5 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.

1.4 QUALITY ASSURANCE

.1 Qualifications:

.1 Manufacturer and tradesmen executing the work of this Section shall have had a minimum five (5) years continuous experience in successful manufacture and installation of work of type and quality shown and specified. Submit proof of experience upon Consultant's request.

.2 Erection of preformed metal siding systems shall be by workers especially trained and experienced in this type of work. Have a qualified representative at the job site to direct the work of this Section at all times.

.3 Retain a professional engineer, registered in the province of the Work, to design fabrication and erection of the Work of this Section in accordance with applicable Building Code and Contract Document requirements including, but not limited to, the following:

.1 Seal and signature to shop drawings and design submittals requiring structural engineering.

.2 Field review of installed components.

.4 Conform to the requirements of the local Building Code, local by-laws and Authorities having jurisdiction.

1.5 PRE-INSTALLATION CONFERENCE

.1 Arrange a site meeting, to coincide with regular bi-weekly site meetings, attended by the Contractor, the Subcontractor's representative and foreman for this project, the

Consultant, materials supplier(s), and other relevant personal before commencement of work for this Section; agenda for meeting will include; but not be limited to, the following:

.1 To discuss expectations for fit and finish of wall system, quality of workmanship for installation of air/vapour retarders and insulation and relationship of wall system to adjacent components.

.2 Manufacturer's representative shall also provide frequent inspection visits during the course of work of this Section to assure quality and competence of membrane installation and panel alignment

1.6 DESIGN REQUIREMENTS

.1 Maximum deflection not to exceed L/180 under system's own weight plus wind load (positive and negative) loads acting normal to the plane in accordance with the Building Code Climatic Data, wind load 1:50 years.

.2 Design sheet cladding to span continuously over at least four structural supports (three spans) and design fastening to structural supports to sustain factored loads in accordance with CAN/CSA S136-07.

.3 Calculate live load deflections in accordance with CSSBI 20M-08, as modified by the requirements of this Section.

.4 Provide for movement of components without causing buckling, failure of joint seals, undue stress on fasteners when subject to seasonal temperature range from -40 deg C to +50 deg C, and wind loads noted above.

.5 Final review and acceptance of work completed by this Section shall be carried out by the manufacturer's representative, the Consultant, Contractor and the Subcontractor.

1.7 BUILDING ENVELOPE PERFORMANCE CRITERIA

.1 Design systems identified in this Section to allow for the following:

.1 Air Infiltration: Design system for maximum air leakage of 0.03 L/m^2 of fixed wall area when tested in accordance with ASTM E283 at a minimum static air pressure differential of 300 Pa.

.2 Water Penetration Under Static Pressure: Design system for zero water penetration when tested in accordance with ASTM E331 at a minimum differential static pressure of 20% of positive design wind load, but not less than 475 Pa.

.3 Dynamic Water Penetration: No uncontrolled water penetration when tested in accordance with AAMA 501 at dynamic pressure differential of not less than 300 Pa (6.24 psf) for a 15 minute duration, with water application rate of 5 gal/ft2/hr.

1.8 MOCK-UP

.1 Provide mock-ups in accordance with Division 01.

.2 Construct mock-ups for each form of construction and finish required to verify selections made under sample submittals and to demonstrate aesthetic effects and qualities of materials and execution before installing materials indicated in this Section.

.3 Build mock-ups using exposed and concealed materials indicated for the completed Work, and as follows:

.1 Locate mock-ups in the location and of the size indicated or, if not indicated, as directed by Consultant.

.2 Notify Consultant 7 days in advance of the dates and times when mock-ups will be constructed.

.3 Demonstrate the proposed range of aesthetic effects and workmanship.

.4 Include examples of window frame, door frame, interior corner, exterior corner and common protrusions or penetrations of membranes.

.5 Obtain Consultant's acceptance of mock-ups before proceeding with construction of work of this Section.

.6 Maintain mock-ups during construction in an undisturbed condition, as a standard for judging the completed Work.

.7 Accepted mock-ups may form a part of the completed Work.

1.9 STORAGE, DELIVERY, HANDLING AND PROTECTION

.1 Co-ordinate deliveries to comply with construction schedule and arrange ahead for off-the-ground, under cover storage locations. Do not load any area beyond the design limits.

.2 Adequately protect and crate all components against damage, dirt, disfigurement and weather.

.3 Assembled units and/or their component parts shall be transported, handled and stored in a manner to preclude damage. Accessory materials required for erection at the Site shall be delivered to the Site in manufacturer's labelled containers. Remove all units or components which are cracked, bent, chipped, scratched or otherwise unsuitable for installation and replace with new.

.4 Provide safe and adequate equipment on the Site to execute the work of this Section, hoisting, scaffolding, staging, safety protection equipment, tools, plant and other equipment required for the completion of the work of this Section.

.5 Delivered damaged materials or materials which do not comply with this Section shall be rejected by Consultant, removed from the Site and replaced with acceptable materials at Contractor's expense.

.6 Adequately protect the structure and work of all other trades during delivery, storage, handling and erection of the work of this Section.

.7 Preformed metal siding components being hoisted to the working level shall be adequately banded and carefully slung employing steel wire rope.

.8 Bundles shall be tag lined during the ascent of the hoisting operation. Precaution shall be taken to avoid damage to metal siding components and to prevent marring of exposed surfaces.

.9 Preformed metal siding components, after being positioned, shall be adequately secured in place as quickly as possible and prior to leaving the job site at the end of the working day.

.10 Loose bundles of preformed metal siding components shall be adequately secured at the completion of each working day.

.11 Scaffolds, platforms, ladders, and the like, required by the erector for installation of metal siding components shall be properly secured to prevent accidental movement or collapse.

1.10 PROJECT CONDITIONS

.1 Make thorough examination of drawings and details. Determine the intent, extent, materials, and conditions of interfacing with work of other Sections and be fully cognizant of requirements.

.2 Inspect substrate surfaces on which the work of this Section is erected for any irregularities detrimental to the application and performance of the work of this Section. Confirm conditions satisfactory before proceeding.

.3 Co-ordinate and verify, by measurement at the job site, all dimensions affecting work of this Section. Notify Consultant, in writing, of all dimensions and/or conditions at variance with those on the reviewed shop drawings, Contract Documents and/or detrimental to the proper and timely installation of materials. Direction regarding correction measures shall be obtained from Consultant prior to fabrication of the item affected. Insure the compatibility of adjacent items in relationship to the work of this Section.

.4 Do not perform work of this Section during period of rain, fog, sleet or snow, or upon surfaces covered with dust, water, dew, ice, frost or snow.

.5 Report to Consultant in writing, defects of work prepared by other trades and unsatisfactory Site conditions. Commencement of application implies acceptance of surfaces and conditions.

1.11 COORDINATION

.1 Coordinate work of this section with the requirements of Section 07 62 00, for specific requirements for supply of prefinished sheet metal flashing materials to other sections of the work as follows:

.1 Supply prefinished sheet metal flashings required for the project, regardless of sheet metal thickness and colour.

.2 Provide prefinished sheet metal flashings to installing trades, tension levelled and guillotine sheared to length ready for brake forming, fabrication and installation by installing trades.

.3 Coordinate with installing trades during bid period and provide unit prices for materials based on specified thickness and colour of flashing materials required under their respective scopes of work; installing trades will be responsible for carrying cost for flashing materials in their scope of work in their Bid Price.

.4 Requirements of this portion of the scope of work do not apply to extruded aluminum or other pre-manufactured flashing materials normally supplied by installing trades (i.e.: extruded aluminum curtain wall flashing and sills, preformed roof penetrations, non-prefinished sheet metal products).

.5 Subcontractor responsible for supply of metal wall and soffit cladding will only be responsible for fabrication and installation of flashings relating to their scope of work.

1.12 WARRANTY

.1 Warrant the work of this Section against defects in materials and workmanship in accordance with General Conditions, but for a period of five (5) years. Agree to promptly make good defects which become evident during warranty period without cost to the Owner.

.2 Without restricting the generality of the Warranty, defects shall include deformation, buckling, leakage, weather tightness, failure of anchors and fastenings, failure of paint coating and sealants.

.3 Promptly make good defects and/or failures in the Work upon written notification by the Owner. Remedy shall include labour, materials, equipment and services required to make good defective work, and to replace components and finishes and the Owner's property damaged or disturbed in the course of remedying defects.

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.

.2 Acceptable Preformed Metal Siding Profile: Subject to compliance with requirements specified in this Section, profiles that may be incorporated into the Work include; but are not limited to, the following:

.1 Ribbed Exterior Wall Siding (MTL-02):

.1 34-1/2” wide wall sheet, complete with equally spaced 7/8” deep corrugations.

.1 Basis of Design Profile: 7/8” Corrugated by Vic West, (or approved alternate).

.2 Orientation: Vertical profile.

.3 Colour: To be selected by Consultant from manufacturer’s full colour range.

2.2 MATERIALS

.1 Steel:

.1 Sheet steel conforming to ASTM A653/A653M-11, structural quality, Grade 'A' with a minimized spangle zinc coating of Z275 conforming to ASTM A653/A653M-11 shall be used for girts, sub-grits, Z-bars, brackets, battens, retention clips, cleats, fascias, preformed metal siding panels, closures and flashings.

.2 Girts, sub-girts, Z bars, clips brackets shall be of the required base steel nominal thickness to meet design requirements. Thermal clips shall be slotted to minimize thru-metal conductivity.

.3 Thermally Broken Clip System: One piece stainless steel clip shaped similar to a z-girt, with a minimum 15% web cutout to reduce extent of thermally conductive material and with an aerogel thermal break pad between clip and backup wall. System to provide compliance to ASHRAE 90.1 and thermally broken façade requirements of the building code

.1 Clip Depth: Based on depth of the cavity insulation and air space, as indicated on the Drawings.

.2 Vertical Clip Spacing: As recommended by clip manufacturer, and indicated on stamped Shop Drawings.

.3 Basis of Design Product: ACS-A CLIPS, by Soprema, or approved equivalent.

.4 Fasteners:

.1 Colour matched stainless steel rivets, as per clip manufacturer recommendations. No dissimilar materials allowed, in selection of fasteners.

.4 Weather Resistant Barrier: As indicated in Section 07 25 00.

.5 Vapour Permeable Air Barrier: As indicated in Section 07 27 39.

.6 Metal siding shall be of required base steel nominal thickness to meet design requirements. Metal flashings, fascias, copings, cap flashings, closures and the like shall be base steel nominal thickness of 24 gauge and thicker to suit application to prevent oil-canning.

.2 Finish:

.1 Preformed metal siding and related metal flashings shall be prefinished coil coated material in accordance with Technical Bulletin No. 7 "Prefinished and Post Painted Galvanized Sheet Steel for Exterior Building Products" of the Canadian Sheet Steel Building Institute (CSSBI), prefinished to CSSBI 10,000 Series or WeatherX finish requirements, (or approved alternate). Colours shall be as indicated on drawings and where not indicated, as selected later by Consultant from manufacturer's full available colours range, including manufacturer's extended colours range. Allow for two (2) different colours to be selected.

.2 Flatstock Material: Minimum 0.024" (24 gauge) thick or thicker to suit design requirements, coil coated sheet steel, prefinished to CSSBI 10,000 Series or WeatherX finish requirements, (or approved alternate). Colours shall be as indicated on drawings, and where not indicted, as selected later by Consultant from manufacturer's full available colours range, including manufacturer's extended colours range. Allow for two (2) different colours to be selected.

.3 Sealing Tape: Macro-polyisobutylene preformed sealant tape designed for use in metal cladding assemblies.

.4 Sealants and Gaskets:

.1 Sealants and gaskets shall be of types to allow for maximum movements anticipated, maintaining life cycle expectancy, adhesion and flexibility under temperature ranges of -25 degree C up to +80 degree C, without undue softening or deleterious effects.

.2 At sidelaps and end laps of panels, as required, factory applied butyl tape, or polyvinyl chloride "wedge fit" type extrusions.

.3 Perimeter Sealant: Multi-component, chemical curing epoxidized polyurethane type sealant conforming to ASTM C920-11, 'DYMERIC 240' by Tremco (Canada) Ltd., or 'Sonolastic NP2' by BASF Construction Chemicals, (or approved alternate). Colour as selected later by Consultant. Provide primers, bond breakers and cleaning agents as recommended by the sealant manufacturer.

.5 Screws, Bolts, Nuts, Washers, Rivets and Other Fastening Devices:

.1 Exposed fasteners used on exterior facing panels, flashing and all trim members shall be Series 400 stainless steel and nylon coloured coated head to match substrate colour, Atlas "Colormate", (or approved alternate).

.2 Mechanical fasteners used on underlayment; self tapping metal screws, type and length to suit application and securement plates to the approval of the Consultant.

.3 Concealed fasteners located within wall: No.12 teks, self-drilling, self-tapping galvanized screws.

.6 Bituminous Paint:

.1 Conforming to CAN/CGSB-1.108-M, Type 2.

.7 Field Touch-Up Paint:

.1 Zinc rich anti-corrosion primer, conforming to SSPC Guide 14, and approved by the coil coating manufacturer. Top coating of type and colour to match finish sheet and to comply with VOC regulations identified in South Coast Air Quality Management District (SCAQMD).

2.3 FABRICATION

.1 Co-ordinate and verify, by measurement at the job site, all dimensions affecting the Work. Submit written notifications documenting any and all field dimensions and/or conditions which are at variance with those on the reviewed shop drawings. The Contract documents and/or detrimental to the proper and timely installation of job site materials. The decision regarding corrective measures shall be obtained from the Consultant prior to the fabrication of the item affected. Ensure the suitability of adjacent items in relationship to the work of this Section.

.2 Report to Consultant in writing, defects in Work prepared by other trades and unsatisfactory Site conditions. Commencement of work shall imply acceptance of conditions.

.3 Workmanship shall be best trade shop and field practice known to recognized manufacturers specializing in work of this Section. Joints and intersecting members shall be accurately fitted to true planes, adequately and securely fastened and made completely weathertight. Component fastenings shall be concealed of adequate strength.

.4 Fabricate units to profile and sizes indicated complete with rabbets, interlocks, flashings, trim and filler sections, as required to interface with work of other trades.

.5 Fabricate all devices required for erection and adequate anchorage and attachment required to be built into or attached to the steel structural or steel deck and main building structure for the support of the Work.

.6 Anchorage brackets and devices shall be designed and fabricated to compensate for unevenness and dimensional difference in the structure and permit unrestricted expansion and contraction of framing members.

.7 Steel Welding: Conform with CSA W59-03 (R2008) and executed in accordance with CSA W47.1-09 or CSA W55.3-08.

.8 Fabricate preformed metal siding systems where indicated. The systems shall be formed to meet design requirements, and of prefinished steel sheet. The system shall be accurately cut and fitted, all fastenings shall be concealed. Method of attachment shall be to the Consultant's approval and clearly detailed on shop drawings. Panel faces shall be flat and true without waves, buckles or oil canning.

.9 Supply sufficient prefinished metal of same thickness and colours as the preformed metal siding to Section 07 62 00 for his use in installing roof flashings.

.10 Form starter strips of same material as flashings 1-1/2" wide and continuous.

.11 Exposed steel surfaces shall be smooth and free from imperfections such as warping, buckling, scratches, dents and abrasion.

.12 Thickness of metal shall be adequate for various conditions.

.13 Isolate where necessary to prevent electrolysis due to dissimilar metal to metal contact or metal to masonry or concrete. Use bituminous paint or other approved divorcing membrane.

3 Execution

3.1 INSTALLATION

.1 Erect preformed metal siding and accessories in strict accordance with reviewed shop and erection drawings and manufacturer's instructions to give a complete and weatherproof system.

.2 Install Vapour Permeable Air Barrier (AB-01) membrane on substrate under preformed metal siding assembly and elsewhere as required in strict accordance with manufacturer's written instructions forming a complete waterproof barrier, free of leaks.

.3 Install girts, 'Z' girts, thermally broken clips, sub-girts, cleats and retention clips and other attachment members necessary to complete the work of this Section.

.1 Co-operate with other trades to ensure proper installation and anchorage of work of this Section. Install steel bracing and framing and continuous clip angles and secure plumb and in line.

.2 Damaged, bent or dished sheets will be rejected.

.4 Install exterior rainscreen insulation snugly between cladding clips, temporarily hold in place with adhesive as necessary.

.5 Install continuous Weather Resistant Barrier (WRB) to hold insulation permanently in place, prior to installation of secondary sub girt framing.

.6 Place preformed metal siding against supporting substrate and adjust to final position before permanently securing. Bring each unit to bear evenly on framing.

.7 Align units to provide accurate fit with corresponding sections parallel and straight. Ensure complete nesting of interlocking and sealed side lap joint and fasten sheets to structural supports.

.8 Fasten exterior sheets of panels to horizontal sub-girts, using colour matching fasteners, where indicated.

.9 Install necessary closure and trim or neoprene closures at openings and penetrations, fastening at 12" O.C. Make cut-outs neatly by saw cutting.

.10 Where welding has been performed on work of this Section, or field cutting or scratches have been made, field coat such areas with touch-up paint after thoroughly cleaning affected surfaces.

.11 Seals:

.1 Fit flexible seals, tapes, formed gaskets and the like at locations required to provide air/vapour barriers and weathertight junctions. Ensure that end joints, between lengths of material have been properly sealed.

.2 Caulk junctions of preformed metal siding system components to themselves and work of other Sections with sealant in accordance with the requirements of Section 07 92 00, to maintain continuity of air/vapour and weather barriers.

.12 Rigidly connect all prefinished flashing pieces with specified colour matching fasteners at 12" O.C. along length. Use preformed corner pieces and erect with ample allowance for thermal movement.

.13 Furnish adequate quantity of prefinished flat stock flashing sheet to Section 07 62 00 for forming and installation. Trim members in this category are cap flashing, base flashing and those specifically shown on drawings as being prefinished and in close proximity to roofing. Flashing pieces entirely remote from roofing flashing and the like are furnished in place under work of this Section.

.14 Install work of this Section only during period of no rain, fog, sleet or snow, or upon surfaces covered with dust, water, dew, ice, frost or snow.

3.2 CLEANING

.1 Remove debris and surplus materials from the Site upon completion of work of this Section.

.2 Clean dirt, soil and misplaced sealants from preformed metal siding systems with recommended cleaners and solvents.

END OF SECTION

1 General

1.1 SUMMARY

.1 This Section includes requirements for the supply and installation of both mechanically fastened (R-1) and cold applied (R-2) SBS modified bituminous membrane roofing system.

.2 Section includes:

.1 Preparation of Metal Deck Surface

.2 Vapour Retarder

.3 Roof Insulation & Insulation Overlay Board

.4 Base Sheet Membrane

.5 Base Sheet Flashing

.6 Cap Sheet Membrane

.7 Cap Sheet Flashing

.8 Accessories

1.2 REFERENCE STANDARDS

.1 Canadian Roofing Contractors Association (CRCA):

.1 Roofing Specification Manual

.2 American Society for Testing and Materials (ASTM):

.1 ASTM C1002-04, Steel Drill Screws for the Application of Gypsum Board

.2 ASTM C1396/C1396M-06a, Standard Specification for Gypsum Board

.3 Canadian General Standards Board (CGSB):

.1 CGSB 37-GP-56M, Membrane, Modified, Bituminous, Prefabricated and Reinforced for Roofing

.2 CGSB 37-GP-64M, Mat Reinforcing, Fibrous Glass, for Membrane Waterproofing Systems and Built-up Roofing

.3 CAN/CGSB-37.5-M89, Cutback Asphalt Plastic Cement

.4 CAN/CGSB-37.28-M89, Reinforced, Mineral Colloid Type, Emulsified Asphalt for Roof Coatings and Waterproofing

.5 CGSB 37-GP-9Ma, Primer, Asphalt, Unfilled, for Asphalt Roofing, Dampproofing or Waterproofing

.4 Canadian Standards Association (CSA):

.1 CSA A123.4-04, Bitumen for Use in Construction of Built-up Roof Coverings and Dampproofing and Waterproofing Systems

.2 CSA B111-1974 (R2003), Wires, Nails, Spikes and Staples

.3 CSA O151-M1978 (R2003), Canadian Softwood Plywood

.5 Underwriters Laboratories Canada (ULC):

.1 CAN/ULC S107-03, Standard Methods of Fire Tests of Roof Coverings

.2 CAN/ULC S701-05, Thermal Insulation, Polystyrene, Boards and Pipe Covering

.3 CAN/ULC S702-97, Thermal Insulation, Mineral Fibre, Boards for Buildings and ULC S702.2-03, Mineral Fibre Thermal Installation for Buildings, Part 2: Application Guidelines

.4 CAN/ULC S704-03, Standard for Thermal Insulation, Polyurethane and Polyisocyanurate, Boards, Faced

.5 CAN/ULC S770-2000, Determination of Long-Term Thermal Resistance of Closed-Cell Thermal Insulating Foams

1.3 SUBMITTALS

.1 Provide required information in accordance with Division 01.

.2 Action Submittals: Provide the following submittals before starting any work of this Section:

.1 Product Data: Submit copies of membrane manufacturers current technical data sheets describing the physical properties and recommended installation procedures.

.2 Shop Drawings:

.1 Submit sloped insulation manufacturer’s proposed roofing diagrams and layouts for review by the Consultant.

.2 Submit membrane manufacturer’s standard details that will be used for this project, indicate changes that must be made to make the details project specific for review by the Consultant.

.3 Informational Submittals:

.1 Certificates: Provide roofing system materials that are compatible with building vapour retarders specified in Division 07; submit a written declaration to the Consultant that roofing materials and components are compatible with wall air and vapour retarder membranes when requested by Consultant.

1.4 QUALITY ASSURANCE

.1 Obtain roofing membrane materials through one source from a single manufacturer and install using workers who are trained and approved by the roofing membrane manufacturer; maintain a full time experienced journeyman roofer, and at least one apprentice per crew on the Work at all times.

.2 Roofing and sheet metal work will be performed in conformance with the roofing manufacturer's written recommendations using materials that meet the requirements of CAN/ULC S107 to obtain a Class A fire resistance rating; submit proof that roofing materials meet required performance when requested by the Consultant.

.3 Conform to Roofing Specifications as published by Canadian Roofing Contractors Association (CRCA) as a reference.

.4 Execute work of this section using an applicator approved by the membrane manufacturer, and capable of issuing a 10 year Performance Warranty.

.5 Pre-installation Conference:

.1 Convene a pre-installation conference at the site, one week prior to commencing work of this Section to review preparation and installation procedures and coordinating and scheduling required with related work.

.2 Require attendance of parties directly affecting work of this Section, including, but not limited to, the Owner's representative, Consultant, Contractor, Roofing Applicator and job foreman and Roofing Manufacturer's Representative.

.3 Contact Consultant two weeks prior to pre-installation conference to confirm schedule.

.4 Record discussions of conference and decisions and agreements (or disagreements) reached, and furnish copy of record to each party attending. Review foreseeable methods and procedures related to roofing work, including the following:

.1 Tour, inspect and discuss condition of substrate, roof drains, roof drain final locations, curbs, penetrations and other preparatory work performed by other trades.

.2 Review structural loading limitations of deck and inspect deck for loss of flatness and for required mechanical fastening.

.3 Review roofing system requirements (drawings, specifications and other contract documents).

.4 Review required submittals, both completed and yet to be completed.

.5 Review and finalize construction schedule related to roofing work and verify availability of materials, installer's personnel, equipment and facilities needed to make progress and avoid delays.

.6 Review required inspections, testing, certifying and material usage accounting procedures.

.7 Review weather and forecasted weather conditions, and procedures for coping with unfavourable conditions, including possibility of temporary roofing (if not a mandatory requirement).

1.5 DELIVERY, STORAGE AND HANDLING

.1 All materials will be delivered and stored in conformance with manufacturers written requirements; they must remain in their original packaging, displaying the manufacturer's name, product name, weight, and reference standards, as well as all other indications or references considered standard.

.2 Store materials in a dry and properly ventilated area, away from any welding flame or spark and sheltered from the elements or any harmful substance. Only materials destined for same-day use can be removed from this storage area. In cold weather, store materials in a heated area at a minimum temperature of +10 degree C and removed prior to application. If rolls cannot be stored in a heated environment, they may be pre-conditioned before installation, refer to manufacturers written recommendations on membrane application procedures.

.3 Store adhesives and emulsion-based waterproofing mastics at a minimum +5 degree C. Store adhesives and solvent-based mastics at sufficiently high temperatures to ensure ease of application.

.4 Materials delivered in rolls will be carefully stored upright; flashing will be stored to avoid creasing, buckling, scratches or any other possible damage.

.5 Avoid material overloads which may affect the structural integrity of specific roof areas.

.6 Place plywood runways over the Work to enable the movement of materials and other traffic during construction of roofing.

.7 Protect surrounding surfaces against damage from roofing work. Where hoisting is necessary, hang tarpaulins to protect walls during delivery of materials from ground to roof.

.8 Materials will be rejected and be replaced at no extra cost to the Owner where materials are damaged by the elements, improper handling or other causes; remove rejected materials promptly from the site.

.9 Protect exposed surfaces of finished walls with tarp to prevent damage during roofing work, repair any damage caused to adjacent materials and finishes caused by roofing installation.

1.6 SITE CONDITIONS

.1 Maintain roofing equipment in good working order.

.2 Apply roofing within the range of ambient and substrate temperatures recommended by roofing system manufacturer:

.1 Do not apply roofing to a damp or wet substrate.

.2 Do not apply roofing in snow, rain, fog, or mist.

1.7 WARRANTY

.1 Roofing Membrane Manufacturer: Provide manufacturer's warranty stating that they will repair or replace defective roofing (including labor) and base flashing materials that do not remain watertight, that splits, tears, or separates at the seams or from the substrate within the specified warranty period and as follows:

.1 Warranty Period: Ten (10) years Standard Warranty, starting from Substantial Performance for the Project.

2 Products

2.1 MANUFACTURERS

.1 Basis-of-Design products are named in this Section; additional manufacturers offering similar setting systems may be incorporated into the work provided they meet the performance requirements established by the named products.

.2 Additional manufacturers offering similar Products may be incorporated into the work provided they meet the performance requirements established by the named products and provided they submit requests for substitution a minimum of ten (10) days in advance of Bid Closing.

.3 Subject to compliance with requirements, manufacturers offering membrane products that may be incorporated into the Work include, but are not limited to, the following:

.1 Soprema Inc.

.2 Henry Company

.3 IKO

.4 Or approved equivalent.

2.2 PERFORMANCE REQUIREMENTS

.1 Design and construct roof so that completed installation will not leak.

.2 Structural Design Performance:

.1 Design Roof System to Resist:

.1 Maximum deflection not to exceed l/180 under system's own weight plus wind load (positive and negative) loads acting normal to the plane in accordance with the Building Code Climatic Data, wind load 1:50 years.

.1 Design roofing membrane to resist the following site specific dynamic wind uplift:

.1 Corner: -2.6kPa;

.2 Edge: -1.3kPa;

.3 Field: -1.0kPa.

.2 Design the systems so that there is no air or water infiltration under the positive and negative forces imposed by wind and gravity loads.

.2 Thermal movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, overstressing of components, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime sky heat loss.

.1 Temperature change (range): 20 deg C; Ambient: 40 deg C, material surfaces.

2.3 MATERIALS

.1 Adhesives: Manufacturers recommended adhesives specifically formulated for installation of materials outlined below, meeting the wind resistance rating indicated in this Section.

.2 Vapour Barrier:

.1 Self-adhesive membrane composed of SBS modified bitumen, with a surface screen made of high-density polyethylene laminated between two layers of polyethylene films.

.2 Resistance to water vapour transmission: 0.92 ng/Pa.s.m^2 (0.016 Perm).

.3 Basis of Design Product: SOPRAVAP'R by Soprema Inc. (or approved equivalent).

.3 Carpentry: Wood roof materials shall be as specified in Section 06 10 00. Do not use pressure treated materials where SBS membrane materials are to be adhered to wood fabrications.

.4 Insulation INS-04b – Flat and Tapered Mineral wool (Upper Layer):

.1 Dual-density mineral wool insulation board with a rigid upper layer, impregnated with bitumen layer, compatible with mechanical fastening and adhesive applied membranes.

.2 Mineral wool boards made from balsat rock and steel slag, resulting in a non-combustible insulation.

.3 Thermal Resistance per 25mm (1"): R-3.8

.4 Compressive Strength – Top Layer at 25%: 37psi.

.5 Density – Top Layer: 220 kg/m3

.6 Density – Bottom Layer: 160 kg/m3

.7 Basis of Design Product: SOPRAROCK DD PLUS by Soprema Inc. (or approved equivalent).

.5 Insulation INS-04a – Flat (Lower Layer):

.1 Closed cell polyisocyanurate foam core between organic facers reinforced with glass fibres, suitable for mechanical installation and use with adhesives.

.2 Thermal Resistance per 25mm (1"): R-5.7

.3 Compressive Strength – 138 kPa (20 psi).

.4 Linear Stability: < 5%

.5 Density: 32 kg/m3 (2.0 lb/ft3)

.6 Basis of Design Product: SOPRA-ISO by Soprema Inc. (or approved equivalent).

.6 Base Sheet Membrane (Mechanically Fastened):

.1 A high-performance base sheet membrane composed of SBS modified bitumen and a composite reinforcement. The surface is covered with a thermofusible plastic film and the underface is sanded.

.2 Basis of Design Product: SOPRAFIX BASE 630 by Soprema Inc. (or approved equivalent).

.3 Mechanical Fasteners: As recommended by membrane manufacturer.

.7 Base Sheet Membrane (Adhered):

.1 A high performance base sheet membrane composed of SBS modified bitumen and a composite reinforcement. Both sides are sanded

.2 Basis of Design Product: COLDPLY BASE 410 by Soprema Inc. (or approved equivalent).

.3 Adhesive: As recommended by membrane manufacturer.

.8 Base Sheet Membrane Flashing:

.1 Membrane composed of SBS modified bitumen and non-woven polyester mat reinforcement.

.2 Surface: Fine mineral aggregate for cold adhesive applications; Underside: High tack, self-adhesive layer, protected by polyefin release film.

.3 Basis of Design Product: SOPRALENE STICK by Soprema Inc. (or approved equivalent).

.9 Cap Sheet Field Membrane and Cap Flashing (at mechanically fastened assembly):

.1 A high performance cap sheet membrane composed of SBS modified bitumen and a composite reinforcement. The surface is protected by coloured granules and the underface is covered with a thermofusible plastic film.

.2 Thickness: 4.0mm

.3 Basis of Design Product: SOPRAPLY TRAFFIC CAP by Soprema Inc. (or approved equivalent).

.10 Cap Sheet Field Membrane and Cap Flashing (at adhered assembly):

.1 Membrane composed of SBS modified bitumen and composite reinforcement.

.2 Thickness: 3.5mm

.3 Surface: Covered and protected by coloured granules; Underside: Fine mineral aggregate for cold adhesive applications.

.1 Colour of Granules: As selected by the Consultant from the manufacturer's standard product line.

.4 Basis of Design Product: COLPLY TRAFFIC CAP 460 by Soprema Inc. (or approved equivalent).

.11 Jointing Mastic / Caulking: SOPRAMASTIC by Soprema Inc. (or approved equivalent).

.12 Metal Flashings: As indicated in Section 07 62 00.

3 Execution

3.1 EXAMINATION

.1 Inspect completed roof deck and ensure that any defect of level or construction is corrected before proceeding with the work of this Section.

.2 Do not apply any roofing to surfaces which are dusty, rusty or covered in loose material, snow, water, ice or any other substance which might impair the bond of roofing materials.

.3 Verify that roof drains have been properly set and installed by the mechanical trade. Report any discrepancies to the Consultant so that they may be corrected.

.4 Ensure items projecting through roof are solidly set and reglets and nailing strips are in place.

.5 Inspect wood blockings, curbs and cants. Do not install roofing over such items if method of attachment is inadequate to withstand stresses imposed by thermal movement of roofing components.

.6 Start of roofing work will be interpreted as meaning roofing conditions are in accordance with manufacturer's requirements.

3.2 PREPARATION

.1 Protect finished work to avoid damage during roof installation and material transportation.

.2 Install protective boardwalks to enable passage of personnel and materials without causing damage to installed roofing materials.

.3 Mount mechanical application devices on pneumatic tired wheels; use devices designed and maintained to operate without damaging insulation, roofing membrane or structural components.

.4 Flame heated equipment is prohibited.

.5 Thoroughly clean all surfaces which are to receive the roofing and flashings by whatever means necessary to remove laitance, frost, snow, ice, water, debris, extraneous matter and other substances which could affect the proper performance of the work of this Section.

.6 Prime vertical surfaces with asphalt primer commencing at the top of the cant strip to the reglet or highest point as detailed. Allow sufficient time for the asphalt primer to cure and ensure that primer does not run into the building or stain wall faces.

3.3 INSTALLATION

.1 Prepare surfaces and complete roofing work specified in this Section in accordance with manufacturer's written instructions and guidelines.

.2 Install roofing elements on clean and dry surfaces; in a continuous operation when substrates are ready and as weather conditions permit.

.3 Seal seams in base sheets that are not covered by a cap sheet membrane in the same day; do not install cap sheet if any moisture is present at or within base sheet seams.

.4 Protect work of other sections during installation of work of this Section; repair or compensate other sections for damage caused by this Section.

.5 Vapour Retarder:

.1 Install self-adhering vapour barrier membrane by unrolling vapour barrier membrane onto deck sheathing board substrate, starting at bottom of slope without removing silicone release sheet, and as follows:

.1 Align roll parallel to sheathing board supporting membrane.

.2 Peel back one end of silicone release sheet and adhere membrane to substrate; peel remaining release sheet at a 45 deg angle to avoid wrinkles in membrane.

.3 Cut roll and start again where membrane is not properly aligned to deck sheathing board; re-align membrane and overlap end of misaligned piece by 150mm (6").

.4 Overlap adjacent membranes by 75mm (3"); overlap end laps by 150mm (6"); stagger end laps by 305mm (12"); place thin sheet of metal under end lap of membrane to provide structural support to lapped membranes.

.2 Overlap roof vapour barrier to wall air/vapour barrier using compatible continuity strip to provide continuity of building envelope.

.3 Install vapour barrier at insulation perimeters and around each element piercing insulation to provide sealed connections with base sheet at up-stands.

.6 Insulation:

.1 Adhere insulation to vapour barrier using manufacturer’s recommended adhesive applied at rate recommended by manufacturer; adhere insulation at locations where roof deck will be visible in final installation.

.2 Mechanically attach insulation fastening into top flutes of steel deck in accordance with manufacturer's written recommendations; do not mechanically attach insulation where roof deck will be visible in final installation.

.3 Install secondary insulation layer onto vapour barrier as the first layer, followed by installation of manufacturer’s required primary flat insulation ready for installation of cold adhesive applied membrane roofing.

.4 Stagger vertical joints between primary insulation boards and secondary insulation modules and between two rows of insulation board.

.5 Install only as much insulation as can be covered by roof membranes in the same day.

.7 Cold Adhesive Applied Field Base Sheet Installation:

.1 Install membrane base sheet in full bed of adhesive applied at rate recommended by roofing membrane manufacturer using a notched 5mm (3/16") neoprene squeegee starting at drain and perpendicular to slope.

.2 Apply base sheet in parallel strips, butting board joints up and covering the joints with self-adhesive strip attached to adjacent board.

.3 Roll surface installed membrane using a 30 kg steel roller to smooth membrane and to provide continuous and uniform adhesion to insulation.

.4 Seal lap joints of base sheet at end each workday; perform work without interruption to avoid tears and formation of fish mouths, air pockets or wrinkles.

.5 Cut off corners at end laps being covered by next roll.

.6 Terminate base sheet at top of cant or at perimeter.

.8 Mechanically Fastened Base Sheet Installation:

.1 Dry unroll the flame-stop membrane onto the insulation, being careful to overlap adjacent selvedges to ensure that the flame will not penetrate the insulation.

.2 Dry unroll the base sheet membrane on the substrate, taking care to align the edge of the first selvedge with the centre of the drain parallel to the edge of the roof.

.3 Mechanically fasten membranes with screws and plates for membranes. Mechanical fasteners must be installed in at a rate required to satisfy wind uplift design requirements.

.4 Each selvedge should overlap the previous one along the lines provided for this purpose.

.5 Adhere the first part of the self-adhesive side laps using a roller, then heat-weld the last part (combined self-adhesive and heat-welded side laps).

.6 Seal end laps by welding a 240-mm (9.45-in) wide protection strip centered on the joint.

.7 Avoid the formation of wrinkles, swellings or fishmouths.

.9 Self-Adhere Base Sheet Flashing:

.1 Apply base sheet flashing when primer coat is dry and in accordance with manufacturer's written instructions.

.2 Position pre-cut membrane pieces; peel back 100mm to 150mm (4" to 6") of silicone release paper to hold the membrane in place at the top of the parapet, then gradually peel back remaining silicone release paper, pressing down on the membrane with aluminum applicator to provide good adhesion and to provide smooth transition between up-stand and field surface; smooth entire membrane surface with a roller for full adhesion.

.3 Cut off corners at end laps being covered by next roll.

.4 Seal overlaps at the end of each workday.

.10 Installation of Cap Sheet (Field):

.1 Starting at drain, unroll membrane on base sheet, taking care to align the edge of the first selvedge with the edge of the roof.

.2 Cut off corners at end laps at areas to be covered by the next roll.

.3 Each selvedge will overlap the previous one along lines provided for this purpose, and will overlap by 150mm (6") at ends. Space end laps a minimum of 305mm (12").

.4 Apply adhesive to base sheet membrane for first 125mm (5") of end laps using steel trowel with 5mm (3/16") notches.

.5 Use electric hot-air torch on all side laps and last 25mm (1") of end laps, rolling with membrane roller to adhere cap sheet membrane to base sheet, as recommended by the membrane manufacturer.

.6 During installation, be careful not to overheat the membrane or its reinforcements.

.7 Avoid the formation of wrinkles, swellings or fishmouths.

.8 Avoid walking over finished surfaces until adhesive has cured; use rigid protective walkways as needed.

.11 Cold Applied Cap Sheet Flashings:

.1 Install cap sheet flashings in 1000mm (3.25') wide strips.

.2 Each selvedge will overlap the previous one laterally along lines provided for this purpose, and will overlap by 150mm (6") the field surface.

.3 Space flashing membranes a minimum 100mm (4") with respect to the cap sheet membranes on the field surface, to avoid areas of excessive membrane thickness.

.4 Cut off corners at end laps on areas to be covered by the next roll.

.5 Use a chalk line to draw a straight line on the field surface, 150mm (6") from flashings and parapets.

.6 Starting from the chalk line on the field surface to the bottom edge of the flashing or parapet, as well as on the granulated vertical surfaces to be overlapped, apply adhesive for first 125mm (5") of end laps using steel trowel with 5mm (3/16") notches.

.7 Use electric hot-air torch on all side laps and last 25mm (1") of end laps, rolling with membrane roller to apply pressure and complete the installation.

.8 Avoid the formation of wrinkles, swellings or fishmouths.

.9 During installation, be careful not to overheat the membrane and its reinforcements.

3.4 FIELD QUALITY CONTROL

.1 An independent inspection and testing company appointed and paid for by the Owner may carry out inspection and testing.

.2 Arrange site meeting with roofing inspector three weeks prior to commencement of work on site to review work and procedures specified in this Section.

.3 Cooperate with the inspector and afford all facilities necessary to permit full inspection of the work and testing of materials prior to their use.

END OF SECTION

1 General

1.1 SUMMARY

.1 Furnish labour, materials and other services to complete the fabrication and installation of the following:

.1 Cap and base flashing; curb flashings,

.2 Roof edge flashing,

.3 Flashing at intersection of roof with vertical surfaces,

.4 Break metal flashings where shown,

.5 Prefinished flashings where indicated,

.6 Any other flashing as indicated on the drawings or as required, including 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.

1.2 REFERENCE STANDARDS

.1 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 Canadian General Standards Board (CGSB):

.1 CAN/CGSB-1.108-M89, Bituminous Solvent Type Paint

.2 CAN/CGSB-1.181-99, Ready Organic Zinc-Rich Coating

.3 CAN/CGSB-19.24-M90, Multicomponent, Chemical-Curing Sealing Compound

.3 Canadian Roofing Contractors Association

.1 CRCA Specifications Manual

1.3 SUBMITTALS

.1 Provide submittals specified and as required to assess conformance with the Contract Documents, in accordance with Division 01.

.2 Submit shop drawings indicating material, thickness and finish.

.3 Submit duplicate 4 sq.in. samples of each type of sheet metal material, colour and finish for review by Consultant prior to fabrication.

1.4 QUALITY ASSURANCE

.1 Fabricator and tradesmen executing the work of this Section shall have had a minimum five (5) years continuous experience in successful manufacture and installation of Work of type and quality shown and specified. Submit proof of experience upon Consultant's request.

.2 Erection of metal flashing systems shall be by workmen especially trained and experienced in this type of work. Have a senior, qualified representative at the job site to direct the work of this Section at all times.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Store materials flat at site under protection to prevent staining from the work of other trades or from collection of water on material and secured against wind damage.

.2 Carefully store preformed sheet metal work in such a manner as to prevent twisting, bending and rubbing.

.3 Protect sheet metal work from corrosive materials and dissimilar metals.

1.6 WARRANTY

.1 Warrant the work of this Section against defects in materials and workmanship in accordance with General Conditions, but for a period of two (2) years. Agree to promptly make good defects which become evident during warranty period without cost to the Owner.

.2 Without restricting the generality of the Warranty, defects shall include deformation, buckling, leakage, weather tightness, failure of anchors and fastenings, failure of paint coating and sealants.

.3 Promptly make good defects and/or failures in the work of this Section upon written notification by the Owner that such exist. Remedy shall include labour, materials, equipment and services required to make good defective work, and to replace components and finishes and Owner's property damaged or disturbed in the course of remedying defects.

2 Products

2.1 MATERIALS

.1 Sheet Metal Materials (MF-01): Prefinished galvanized sheet steel to ASTM A653/A653M-11 Grade A with G90 designation zinc coating to ASTM A653/A653M-11, factory precoated with Series 8000 paint finish, minimum 26 gauge.

.2 Hold-down, fastener clips - 20 ga. galv. steel sheet as above, unpainted.

.3 Nails, bolts screws and rivets: Material - galvanized steel, stainless steel or same metal as material to be fastened. Type - to approved samples.

.4 Bituminous Paint: Conforming to CAN/CGSB-1.108-M, Type 2.

.5 Field Touch-Up Paint: Zinc rich anti-corrosion primer, conforming to CAN/CGSB-1.181-92, 'Galvafroid, Grade SB' by W.R. Meadows of Canada Limited and top coating of type and colour to match finish sheet.

.6 Underlay for metal flashing: Asphalt laminated 3.6 to 4.5 kg kraft paper.

.7 Sealant: Multi-component, chemical curing epoxidized polyurethane type sealant conforming to CAN/CGSB-19.24-M90, 'DYmeric 240' by Tremco (Canada) Ltd., or approved equal. Colour as selected later by Consultant. Provide primers, bond breakers and cleaning agents as recommended by the sealant manufacturer.

.8 All other materials not specifically described but required for a complete and proper installation of the work of this Section shall be new first quality of their respective kinds and subject to the approval of the Consultant.

2.2 FABRICATION

.1 Fabricate metal flashings and other sheet metal work to applicable CRCA 'FL' series specifications and as detailed.

.2 Form flashings, counter flashings, scuppers and copings as required to suit each condition. Use prefinished sheet steel in all locations. Form pieces in 8'-0" maximum lengths. Make allowance for expansion at joints.

.3 Fabricate sheet metal components with lines, arrises and angles sharp and true and plane surfaces free from objectionable wave, warp or buckle.

.4 Mitre and seal corners with sealant. Form drip edging at 45 deg angle, secure with a continuous 20 ga. hold-down clip.

.5 Exposed edges of sheet metal shall be folded back to form a 1/2" wide hem on the side concealed from view. Prefabricate corner pieces for flashings and copings. The workmanship and methods employed for forming, anchoring, cleating and the provision for expansion and contraction of sheet metal work shall be to the approval of the Consultant.

.6 Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.

.7 Fabricate scuppers and overflow scuppers to applicable CRCA 'FL' Series details and as detailed.

.8 Apply two coats of bituminous paint to metal surfaces to be in contact with masonry, concrete, mortar or dissimilar metals.

2.3 FINISHING

.1 Provide 8000 series finished sheet for all work.

.2 Colour: As selected by the Consultant from the Manufacturers full colour range. Allow for three (3) colours in Base Bid.

3 Execution

3.1 EXAMINATION

.1 Inspect substrate surfaces on which the work of this Section is erected for any irregularities detrimental to the application and performance of the Work. Confirm conditions satisfactory before proceeding. Report to Consultant in writing, defects of work prepared by other trades and unsatisfactory site conditions. Commencement of work implies acceptance of surfaces and conditions.

3.2 INSTALLATION

.1 Metal flashing shall be in compliance with best sheet metal trade practice and shall in no way be contrary to sheet metal practice that will qualify for the Guarantee Certificate specified. Install with "S" lock expansion joints or standing seams incorporated on end of flashing length and all joints sealed with mastic.

.2 Provide continuous starter strips to present true, non-waving leading edge. Provide clips and anchor to backup in an approved manner to provide rigid, secure installation. Conceal fastenings in completed flashing. Lap, lock and seal all seams.

.3 Provide underlay under sheet metal. Secure in place and lap joints 100mm (4").

.4 Install sheet metal flashings, cap flashings and copings as indicated on drawings using flat lock seams. Make joints to permit thermal movement. Make surfaces free from buckling, warp, wave, dents, oil canning or other defects. Make corners square and surfaces straight and in true planes. Equally space joints in cap flashings to suit wall panel module. Space seams not farther apart than 2439mm (8').

.5 All sheet and strip flashing to be held in place by 14 gauge galvanized iron clips of a size and type to be determined by the construction requirements, except where specifically detailed on the drawings.

.6 Caulk flashing at cap flashing with sealant.

.7 Lock end joints and caulk with sealant.

.8 Use rubber-asphalt sealing compound for joints between sheet metal and bitumen.

.9 Supply rigid flashing, copings and sheet metal back-up to other trades where required to be built into other work at doors, windows, block openings, curbs and where shown on drawings.

.10 Take careful note of fans, vents, etc., on mechanical drawings to determine whether flashing and counter flashing is required or whether units are self-counter flashing.

.11 Caulking shall be installed as per written manufacturer's recommendations.

.12 Exposed fastenings will be permitted where indicated or where concealed fastening is not possible. Obtain Consultant's approval of exposed fastenings and methods of making same.

.13 If exposed screws or bolts are used, use cupped neoprene washers.

.14 Install scupper drains and overflow scupper drains as indicated on drawings, in strict accordance with CRCA manual.

3.3 CLEANING

.1 Remove, as the work progresses, all excess or foreign material which would set up or become difficult to remove from finished surfaces.

.2 Do all final cleaning upon completion of the Work of this Section. Leave building and Work in condition to meet the approval of the Consultant.

.3 Remove excess sealant by the moderate use of mineral spirits or other solvent acceptable by the sealant manufacturer.

END OF SECTION

1 General

1.1 SUMMARY

.1 Metal roof hatches with integral curbs.

1.2 SYSTEM DESCRIPTION

.1 The roof hatches shall have a clear opening as shown on the drawings, and shall consist of an insulated cover and frame. Material shall be G-90 galvanized steel and have a factory applied coat of primer. Corners shall be fully welded and ground smooth. A gasket between cover and frame shall create a weather tight seal.

1.3 SUBMITTALS

.1 Provide submittals in accordance with Division 01.

.2 Shop Drawings:

.1 Indicate type of curb, frame and door construction and core

.2 Indicate material thickness, mortises, reinforcements, anchorages, locations of exposed fasteners, openings and arrangement of standard hardware.

.3 Contractor responsible for coordination and installation of products provided under this Section shall;

.1 Verify and provide to the contractor responsible for the supply of metal roof hatch products, actual opening sizes and field conditions by field measurement before fabrication. Submittal drawings shall reflect measurements and conditions provided, and product manufactured accordingly. Coordinate field measurements with fabrication and construction schedules to avoid delays.

.2 Verify that substrate conditions, whether existing or installed under other Sections, are as detailed in the Architect's drawings, and are acceptable for product installation in accordance with the manufacturer's instructions.

.3 Manufacturer shall not proceed with fabrication without receipt of approved submittal drawings and approved hardware schedule.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Examine units upon arrival at jobsite. Notify the carrier and manufacturer of any damage immediately.

.2 Store units under roof, if possible until installation; or, if stored outside, store under a tarp or suitable cover.

1.5 WARRANTY

.1 Provide warranty of 5 years against defective material and workmanship, covering parts only, no labor or freight. Defective parts, shall be replaced at no charge.

2 Products

2.1 MANUFACTURER

.1 Acceptable Manufacturer: Precision Ladders, Bilco or equivalent per Specification 01 25 00.

2.2 MATERIALS

.1 PERFORMANCE CHARACTERISTICS

.1 Cover shall be reinforced to support a minimum live load of 40 psf (195kg/m²) with a maximum deflection of .67% of the span and a 20 psf (97 kg/m²) wind uplift for roof hatches.

.2 Operation of the cover shall be smooth and easy with controlled operation throughout the entire arc of opening and closing.

.3 Operation of the cover shall not be affected by temperature.

.4 Entire hatch shall be weather tight with fully welded corner joints on cover and curb.

.2 CURB

.1 Formed from 14 gauge galvanized steel of lock forming quality per ASTM A-525 with G90 coating.

.2 Sheathed with 1" of rigid fiber board insulation.

.3 Height of minimum 12" or as indicated otherwise on drawings.

.4 4" integral flange for securing to roof.

.5 Hinges connecting curb to door shall be 1/8", 2 piece formed steel with 3/8" pivot pin.

.6 Extruded rubber gasket within a 20 gauge extruded aluminum track shall be securely attached to the frame to make the unit weathertight.

.3 COVER

.1 Formed from 14 gauge galvanized steel of lockforming quality per ASTM A-525 with G90 coating.

.2 Liner shall be 22 gauge galvanized steel with G90 coating.

.3 Insulation between cover and liner to be 1" thick U.L. plain fiberglass 0.75# density.

.4 Lid shall be reinforced as required with 11 ga. steel channel.

.5 A one point cab lock is to be provided with a built-in inside handle on units with a length of 4' 6" or less. On units of greater length, a 2 point slam lock will be used.

.6 Exterior of cover shall be devoid of hardware with the exception of the outside handle.

.7 Outside handle shall be vinyl coated, steel T-handle.

.8 Automatic hold-open device shall be formed from 3/16" steel flat bar and 1/2" diameter steel round stock with a vinyl grip.

.9 Padlock provisions provided on both interior and exterior of unit.

.10 Extruded rubber gasket shall be securely attached to the liner, thus providing a weather-tight seal.

.4 PRESSURE CONTROL

.1 Opening/closing assistance/resistance shall be provided with spring-loaded pressure intensifiers consisting of a telescoping tube; the top(outer) tube shall be 1 5/16",bottom (inner) tube shall be 1 1/2". Tubes shall be cadmium plated and chromate-sealed.

.5 HARDWARE

.1 Corrosion resistant hardware and fasteners to be provided as standard.

.6 MANUFACTURED UNITS

.1 Dimensions as detailed/scheduled.

.7 FABRICATION

.1 The hatch shall be completely fabricated ready for installation before shipment to the site.

.8 FINISH

.1 Red oxide primer, ready for field painting.

.9 SOURCE QUALITY CONTROL

.1 All products tested in factory for proper operation before shipment.

3 Execution

3.1 EXAMINATION

.1 Examine rough opening in roof for opening size and squareness.

3.2 INSTALLATION

.1 Install per the manufacturer's installation instructions.

END OF SECTION

1 General

1.1 SUMMARY

.1 This Section includes requirements of design, supply and installation of thin film intumescent fire resistant protective coating systems consisting of surface preparation, basecoat and protective decorative finish coat, having a fire resistance rating as indicated on the Drawings for both interior and exterior environments.

1.2 REFERENCE STANDARDS

.1 Underwriters Laboratories of Canada (ULC)

.1 CAN/ULC S101-07, Fire Endurance Tests of Building Construction and Materials

.2 CAN/ULC S102-10, Surface burning characteristics of building materials and assemblies

.3 ULC List of Equipment and Materials, latest edition

.2 National Fire Protection Association (NFPA):

.1 NFPA 251-06, Standard Methods of Fire Tests of Building Construction and Materials

.3 Society for Protective Coatings (SSPC)/National Association of Corrosion Engineers (NACE International):

.1 Coating Materials Guidelines

.2 Surface Preparation Guidelines

.3 SSPC-PA2, Paint Application Specification No.2 - Measurement of Dry Paint Thickness with Magnetic Gages

.4 American Society for Testing of Materials (ASTM):

.1 ASTM E119-12, Standard Method of Fire Tests of Building Construction and Materials

.2 ASTM E605-93 (2011), Tests for Thickness and Density of Sprayed Fire-Resistive Material Applied to Structural Members

.3 ASTM E736-00 (2011), Standard Test Method for Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members

.4 ASTM E759-92 (2011), Standard Test Method for Effect of Deflection on Sprayed Fire-Resistive Material Applied to Structural Members

.5 ASTM E761-92 (2011), Standard Test Method for Compressive Strength of Sprayed Fire-Resistive Material Applied to Structural Members

.6 ASTM E859-93 (2011), Standard Test Method for Air Erosion of Sprayed Fire-Resistive Materials (SFRMs) Applied to Structural Members

1.3 SUBMITTALS

.1 Provide required information in accordance with Division 01.

.2 Action Submittals: Provide the following submittals before starting any work of this Section:

.1 Product Data: Submit product data including certified copies of test reports verifying fire resistant material applied to substrate as constructed on project will meet or exceed requirements of specification.

.2 Installation Schedule: Submit schedule listing surfaces to which fire resistant material is to be applied indicating minimum thickness required a minimum of one month prior to scheduled application of cementitious fireproofing material.

.3 Manufacturer's Data: Submit manufacturer's specifications and installation instructions.

.4 Samples: Submit 12” x 12” samples of intumescent fireproofing system including final finish, for each colour indicated on the Drawings. Indicate location where material/system shall be utilized.

.5 Submit manufacturer's list of approved primers tested for adhesion and compatibility with intumescent fireproofing.

.3 Informational Submittals: Provide the following submittals when requested by the Consultant:

.1 Certificates: Submit test results in accordance with CAN/ULC S101 for fire endurance and CAN/ULC S102 for surface burning characteristics.

.4 Delegated Design Submittals: Provide engineered judgements and certification for work performed by this Section in accordance with requirements of Authority Having Jurisdiction.

1.4 QUALITY ASSURANCE

.1 Regulatory Requirements: Use materials and methods required to achieve fire resistance ratings required for the Project to the satisfaction of the Authority Having Jurisdiction, latest edition of the Ontario Building Code (OBC) and in accordance with referenced standards.

.2 Qualifications: Provide proof of qualifications when requested by Consultant:

.1 Applicator: Use applicators that are licensed or approved by manufacturer of fire resistant material.

.2 Materials: Use materials produced under label service of an agency that has tested material, or assemblies containing material, in accordance with specified test standards.

.3 Air Quality: Provide ventilation in areas receiving fire resistant material during and 24 hours after application to dry material; maintain non-toxic, unpolluted working area; provide temporary enclosure to prevent spray from contaminating air.

.3 Certifications: Provide the following during the course of the Work:

.1 Compliance Certification: Provide certificates from manufacturer indicating tested performance requirements required by Authorities Having Jurisdiction.

.4 Field Inspection: An independent testing agency, retained through the project Cash Allowance, to test random samples, as applied, to verify thickness of intumescent fireproofing.

.1 Inspection shall be carried out prior to application of the protective top coat.

1.5 SITE CONDITIONS

.1 Ambient Conditions: Apply fireproofing materials when temperature of substrate and surrounding air is above manufacturer’s minimum temperature, provide sufficient ventilation to aid curing of materials and to maintain air quality requirements.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Delivery and Acceptance Requirements: Deliver in original undamaged sealed containers with manufacturer's labels, application instructions, and labelling agencies labels intact.

.2 Storage and Handling Requirements: Store materials in dry protected area, raised off ground and away from damp surfaces and conditions that have deleterious effect on materials; keep materials dry until ready for use; discard material that has been exposed to water before actual use; use stock before its expiration date.

1.7 SEQUENCING AND SCHEDULING

.1 Sequence work in conjunction with structural steel.

.2 Steel surfaces with less than 3' clear working access may necessitate applying material to inaccessible surfaces prior to erection of the finished steel members, either at the point of fabrication or on-site.

2 Products

2.1 MANUFACTURERS

.1 Additional Manufacturers: Subject to compliance with requirements specified in this Section and as established by the Basis-of-Design Materials, manufacturers offering products that may be incorporated into the Work include; but are not limited to, the following:

.1 HILTI FIRE FINISH 120+ by Hilti

.2 A/D FIREFILM III by A/D Fire Protection Systems Ltd.

.3 CAFCO SprayFilm WB 4 (exterior) and 5 (interior) by Cafco/Isolatek International Inc.

.4 Or approved equivalent.

2.2 MATERIALS

.1 Intumescent Fireproofing: Decorative, thin-film intumescent fire-resistive coating system for structural steel at interior locations, with the following product characteristics:

.1 Volatile Organic Compounds (VOC): 0 g/l.

.2 Hardness: Durometer D67 minimum (ASTM D2240)

.3 Surface Burning Characteristics (ASTM E84-12):

.1 Flame Spread: 0.

.2 Smoke Developed: 0.

.4 Off Gassing (ASTM E595-07): No off gassing.

.5 Approvals: ULC-S101/ULC-S102.

.2 Topcoating: Provide compatible topcoat materials for color-coding, aesthetics and additional surface protection, and approved by the thin-film fire resistive material manufacturer, for both interior and exterior locations.

.1 Protective Exterior Decorative Finish: acrylic, UL exterior approved topcoat, compatible with thin-coat intumescent coating system.

.2 Protective Interior Decorative Finish: acrylic, UL interior approved topcoat, compatible with thin-coat intumescent coating system.

.3 Colour: As selected by the Consultant from the Manufacturers full colour range. Allow for two (2) colours in Base Bid.

2.3 ACCESSORIES

.1 Primers: As required by intumescent fireproofing manufacturer and compatible with selected system and contiguous materials to comply with ULC listing.

3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: Verify that materials having a high moisture load that could cause excessive humidity and affect application and drying of intumescent coatings are installed and cured before applying materials of this Section.

.2 Pre-Installation Testing: Test surfaces to receive work of this Section and report any defects that may affect the Work of this Section and to confirm compatibility of surfaces to receive fire resistant materials.

.3 Beginning of installation means acceptance of existing surfaces.

3.2 INSTALLATION

.1 Surfaces to receive fireproofing shall be free of dirt, dust, grease, oil, rust, loose materials, form release agents, frost, moisture or any other matter which would impair the bond of fireproofing material to the substrate. Commercial Blast Cleaning (SSPC-SP6/NACE No. 3) is the recommended minimum requirement for steel surface.

.2 Prime substrates in accordance with manufacturer's written instructions or recommendations. Confine primers to areas of bond; do not allow spillage or migration onto exposed surfaces.

.3 Apply intumescent fire resistant in accordance with manufacturer's instructions in sufficient thickness to achieve fire rating indicated; beginning of application means acceptance of substrate.

.4 Apply intumescent fire resistant and decorative finish using airless spray equipment, brush or roller to achieve smooth, high gloss finish. Orange peel texture and other surface runs or marks arising from painting operations will require remedial action or replacement.

.5 Apply decorative finish and protective seal coat in accordance with manufacturer's recommendations for finish matching approved samples.

.6 Mask where necessary to prevent fireproofing material from contracting adjoining surfaces that will remain exposed upon completion of Work. Remove tape as soon as it is possible to do so, without disturbing the fireproofing material located at the joint between the fireproofing and adjacent substrates.

3.3 FIELD QUALITY CONTROL

.1 Notify Consultant when completed applications are ready for inspection.

.2 Arrange for inspections by the Owner's independent inspection and testing company, appointed by Owner. Co-ordinate with requirements of Division 01.

.3 Following field inspection, provide all repairs as required to ensure compliance with the Contract Documents.

3.4 CLEANING AND PROTECTION

.1 Upon completion of this work, remove all materials, equipment and debris from the site.

.2 Leave work area and adjacent surfaces in a condition acceptable to the Consultant.

.3 Leave installed work with sufficient protection to enable it to remain untouched until project turnover.

.4 Remove excess material, overspray, droppings and debris.

3.5 PATCHING

.1 Patch and repair any fire resistant material that has been damaged by this or any other section; coordinate cost of repairs with Contractor; costs for repairs will be assessed to Sections of work responsible for damage.

END OF SECTION

1 General

1.1 SUMMARY

.1 Provide all labour, materials, equipment and services necessary for the complete and proper installation of all sprayed fire protection and related work as shown on the drawings or where specified herein, and in accordance with all applicable requirements of the Contract Documents, and having a fire resistance rating of the following:

.1 45-min assemblies, and/or as indicated on the Drawings.

.2 Work of this Section includes, but is not limited to the following:

.1 Preparation of substrates as necessary for application of applied fireproofing;

.2 Application of applied fireproofing to prepared acceptable substrate, complete with approved fireproofing sealer, and;

.3 Work required to patch, repair and make good after installation of adjacent materials that may cause damage to completed work of this Section.

.3 The material and installation shall conform to the applicable building code requirements of all authorities having jurisdiction.

.4 Structural steel elements that are protected by masonry, concrete, or a rated gypsum board assemblies do not require protection using materials specified in this Section provided that the applied fireproofing system meets required fire resistance ratings for the application, as determined from the latest edition of the local Building Code.

1.2 COORDINATION OF WORK EXECUTED UNDER OTHER SECTIONS

.1 Clean and prepare surfaces to receive sprayed fire protection; prime/seal as necessary. Obtain manufacturers written approval confirming adequate adhesion with all new/existing proposed substrates.

.2 Coordinate installation of the following materials and/or systems prior to the application of spray-applied fire resistive materials identified in this Section:

.1 Existing and/or installation of new clips, hangers, supports, sleeves and other attachments to the substrate;

.2 Installation of concrete work onto steel floor decks scheduled to receive spray-applied fire resistive materials on the underside of the deck;

.3 Installation of roofing materials is complete, all penthouse construction has concluded, and mechanical units have been installed.

.1 Prohibit roof traffic in areas above application of spray-applied fire resistive materials.

.4 Ensure coverage over existing services scheduled to remain conforms with ULC listing as required.

.3 Coordinate installation of the following materials and/or systems after the application of spray-applied fire resistive materials identified in this Section:

.1 Installation of ducts, piping, conduit or other suspended equipment in the area where spray-applied fire resistive materials is scheduled to be installed.

1.3 REFERENCE STANDARDS

.1 American Society for Testing of Materials (ASTM):

.1 ASTM E84, Surface Burning Characteristics of Building Materials.

.2 ASTM E119, Fire Tests of Building Construction and Materials.

.3 ASTM E136, (Noncombustibility) Behavior of Materials in a Vertical Tube Furnace at 750ºC.

.4 ASTM E605, Thickness and Density of Sprayed Fire-Resistive Materials Applied to Structural Members.

.5 ASTM E736, Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members.

.6 ASTM E759, Effect of Defection of Sprayed Fire-Resistive Materials Applied to Structural Members.

.7 ASTM E760, Effect of Impact on Bonding of Sprayed Fire-Resistive Materials Applied to Structural Members.

.8 ASTM E761, Compressive Strength of Sprayed Fire-Resistive Materials Applied to Structural Members.

.9 ASTM E859, Air Erosion of Sprayed Fire-Resistive Materials Applied to Structural Members.

.10 ASTM E937, Corrosion of Steel by Sprayed Fire-Resistive Materials Applied to Structural Members.

.2 Underwriters Laboratories of Canada (ULC):

.1 CAN/ULC-S101, Standard Methods of Fire Endurance Tests of Build Construction and Materials

.2 CAN/ULC S102 Surface Burning Characteristics of Building Materials and Assemblies

.3 CAN/ULC S114, Standard Test Method for Determination of Non-combustibility in Building Materials.

.4 ULC List of Equipment and Materials

.3 National Fire Protection Association (NFPA):

.1 NFPA 251, Standard Methods of Fire Tests of Building Construction and Materials

1.4 ADMINISTRATIVE REQUIREMENTS

.1 Coordinate installation of the following, prior to installation of applied fireproofing identified in this Section:

.1 Hangers, inserts, clips and similar items to surfaces needing protection;

.2 Removal/reinstatement of existing ducts, pipes, conduits and similar items that could obstruct spraying operations, and new installation of same.

.2 Coordinate patching of fireproofing after installation of materials installed subsequent to installation of fireproofing.

.3 Delegated Design:

.1 When required to identify design intent, provide engineered judgements and certification for work performed by this Section in accordance with requirements of Authority Having Jurisdiction.

1.5 SUBMITTALS

.1 Provide required information in accordance with Division 01.

.2 Action Submittals: Provide the following submittals before starting any work of this Section:

.1 Product Data: Submit product data including certified copies of test reports verifying fire resistant material applied to substrate as constructed on project will meet or exceed requirements of specification.

.2 Installation Schedule: Submit schedule listing surfaces to which fire resistant material is to be applied indicating minimum thickness required a minimum of two (2) weeks prior to scheduled application of applied fireproofing material. Include information on surface preparation, confirmation of adhesion to all substrates and treatment of fireproofing after application.

.3 Informational Submittals: Provide the following submittals when requested by the Consultant:

.1 Certificates: Submit test results in accordance with CAN/ULC S101 for fire endurance and CAN/ULC S102 for surface burning characteristics.

1.6 QUALITY ASSURANCE

.1 Regulatory Requirements: Use materials and methods required to achieve fire resistance ratings required for the Project to the satisfaction of the Authority Having Jurisdiction, latest edition of the local Building Code and in accordance with referenced standards.

.2 Qualifications: Provide proof of qualifications when requested by Consultant:

.1 Applicator: Use applicators that are licensed or approved by manufacturer of fire resistant material.

.2 Materials: Use materials produced under label service of an agency that has tested material, or assemblies containing material, in accordance with specified test standards.

.3 Air Quality: Provide ventilation in areas receiving fire resistant material during and twenty-four (24) hours after application to dry material; maintain non-toxic, unpolluted working area; provide temporary enclosure to prevent spray from contaminating air.

.3 Certifications: Provide the following during the course of the Work:

.1 Provide compliance certification from manufacturer indicating tested performance requirements required by Authorities Having Jurisdiction.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Delivery and Acceptance Requirements:

.1 Deliver in original undamaged sealed containers with manufacturer's labels, application instructions, and labelling agency's labels intact.

.2 Storage and Handling Requirements:

.1 Store materials in dry protected area, raised off ground and away from damp surfaces and conditions that have deleterious effect on materials.

.2 Keep materials dry until ready for use.

.3 Discard material that has been exposed to water before actual use, and use stock before its expiration date.

1.8 SITE CONDITIONS

.1 When the prevailing outdoor temperature at the building is less than 4°C (40°F), a minimum substrate and ambient temperature of 4°C (40°F) shall be maintained prior to, during, and a minimum of twenty-four (24) hours after application of spray-applied fire resistive material. If necessary for job progress, provide enclosures and heat to maintain proper temperatures and humidity levels.

.2 Provide ventilation to allow proper drying of the sprayed fire protection during and subsequent to its application.

.1 Ventilation must not be less than four (4) complete air exchanges per hour until the material is dry. When spraying in enclosed areas such as basements, stairwells, shafts, and small rooms, additional air exchanges may be necessary.

1.9 SEQUENCING AND SCHEDULING

.1 Complete all fire protection work on a single floor prior to proceeding to the next floor.

.2 Cooperate in the coordination and scheduling of fire protection work to avoid delays in job progress.

2 Products

2.1 MANUFACTURERS

.1 Basis-of-Design products are named in this Section; additional manufacturers offering similar spray-applied fire resistive materials (SFRM) may be incorporated into the work provided they meet the performance requirements established by the named products.

.2 Acceptable Materials Manufacturers: Subject to compliance with requirements specified in this Section and as established by the Basis-of-Design Materials, manufacturers offering products that may be incorporated into the Work include; but are not limited to, the following:

.1 Isolatek International Inc., Cafco Industries Limited

.2 Carboline Company, A/D Fire Protection Systems Inc.

.3 Grace Construction Products

.4 Or approved equivalent.

2.2 DESIGN CHARACTERISTICS

.1 Adhesion: Provide materials that meet or exceed adhesion requirements in accordance with ASTM E736.

.2 Thickness and Weight: Determine application thickness and weight of fireproofing based on tests of assemblies in accordance with CAN/ULC S101, ASTM E119 or NFPA 251; apply same thickness of fireproofing material to all structural components forming a part of the assembly including; but not limited to, cross bracing, support angles and hangers.

.3 Spray-applied fire resistive materials shall contain no detectable asbestos. Material manufacturer shall provide certification of such upon request.

.4 Defection: When tested in accordance with ASTM E759, the material shall not crack or delaminate when the non-concrete topped galvanized deck to which it is applied is subjected to a one time vertical centerload resulting in a downward defection of 1/120th of the span.

.5 Bond Impact: When tested in accordance with ASTM E760, the material shall not crack or delaminate from the concrete topped galvanized deck to which it is applied.

.6 Density: When tested in accordance with ASTM E605, the material shall meet the minimum individual and average density values as listed in the appropriate UL / ULC design or as required by the authority having jurisdiction.

.7 Air Erosion: When tested in accordance with ASTM E859, the material shall not be subject to losses from the finished application greater than 0.025 grams per sq. ft. (0.27 grams per square meter).

.8 Corrosion Resistance: When tested in accordance with ASTM E937, the material shall not promote corrosion of steel.

.9 Non-combustibility: When tested in accordance with ASTM E136 or CAN/ULC-S114, the material shall be non-combustible.

.10 Surface Burning Characteristics: When tested in accordance with ASTM E84 or CAN/ULC-S102, the material shall exhibit the following surface burning characteristics:

.1 Flame Spread: 0

.2 Smoke Developed: 0

.11 Engineered Judgements: When required, provide engineered judgment acceptable to Authority Having Jurisdiction where assembly being protected differs from the tested assembly used to determine thickness.

.1 Engineered Judgements are not required when a tested assembly, published by ULC or cUL, is identified for the application in question.

2.3 APPLIED FIREPROOFING (SAF-01)

.1 Portland Cement Based, Medium Density Spray-Applied Fire Resistive Material (SFRM):

.1 Wet mix, medium density Spray-Applied Fire Resistive Material (SFRM) complying with indicated fire-resistance design to provide fire protection for structural steel.

.2 Material Characteristics:

.1 Dry Density: The in place density shall be measured in accordance with ASTM E605. Average and individual density shall be 15/14 pcf respectively.

.2 Bond Strength: When tested in accordance with ASTM E736 over steel, fireproofing shall have a minimum bond strength of 150 psf according to IBC code.

.3 Compressive Strength: Fireproofing shall achieve an average value of 3700 psf when tested in accordance with ASTM E761.

.4 Deflection Resistance: Material shall not crack or delaminate from the surface when tested by ASTM E759.

.5 Corrosion: Material shall show 0.00 gm/mm^2 of corrosion when tested by ASTM E937.

.6 Impact Resistance: Material shall not crack or delaminate from the surface when tested by ASTM E760.

.7 Surface Burning Characteristics: Maximum flame spread and smoke development shall be 0 and 0 when tested under ASTM E-84.

.3 Fireproofing shall have been tested by Underwriters Laboratories, Inc. in accordance with the procedures of UL 263 / ASTM E119.

.4 Fireproofing shall be free of asbestos, mineral fibers, polystyrene, or other known materials which may be considered hazardous either during mixing, application curing, or chemical release in a fire.

.5 Basis of Design Material: Southwest GP5 spray-applied fire resistive material by AD Fire Protection Systems/Carboline.

2.4 APPLIED FIREPROOFING ACCESSORIES

.1 Water: Clean, fresh, suitable for domestic consumption, and free from such amounts of mineral or organic substance as would affect set of fire resistant material.

.2 Provide accessories to comply with manufacturer's recommendations and to meet fire resistance design and code requirements. Such accessories include, but are not limited to, any required or optional items such as bonding agents, mechanical attachments; and application aids such as metal lath.

.3 Primer/Adhesive and Applied Fireproofing Sealer:

.1 Water based sealer, as recommended by applied fireproofing manufacturer, allowing installation of approved coloured surface coatings or spray foam insulation to applied fireproofing.

3 Execution

3.1 EXAMINATION

.1 Verification of Conditions:

.1 Verify that environmental conditions and surfaces receiving fireproofing meet manufacturer's requirements before beginning installation products specified in this Section.

.2 Verify that objects which will penetrate fireproofing such as clips, hangers, support sleeves, etc. are securely attached to the substrate.

.3 Verify that substrates are not obstructed by ducts, piping, equipment, or other construction which might interfere with fireproofing application. If obstruction(s) are evident, General Contractor to have responsible trade remove obstruction until fireproofing is completed in the area.

.4 Primed steel must follow the current Underwriters Laboratories, Inc. application requirements for bond and/or mechanical attachment.

.5 All unsuitable substrates must be identified by the installer and made known to the General Contractor and corrected prior to application of the spray-applied fire resistive material.

.6 Installation of products will denote acceptance of site conditions.

3.2 PREPARATION

.1 Surface Preparation:

.1 All surfaces to receive spray-applied fire resistive material shall be free of oil, grease, loose mill scale, dirt, paints/primers or other foreign materials which would impair satisfactory bonding to the surface.

.2 Where required, install metal lath and/or reinforcing mesh per the Underwriters Laboratories, Inc. and Manufacturer design and application requirements.

.3 Prime surfaces as required by manufacturer to achieve bond of fireproofing materials to substrates.

.2 Protection of Existing Conditions:

.1 Provide and maintain temporary enclosures to prevent spray from marring adjacent construction, close off and seal installed duct work to prevent contamination of air supply system.

.2 Provide and maintain masking, drop cloths and polyethylene coverings to protect surfaces exposed in final construction from over spray.

.3

3.3 APPLICATION

.1 Application of spray-applied fire resistive material shall not commence until certification has been received by the General Contractor that surfaces to receive sprayed fire protection have been inspected by the applicator and are acceptable to receive spray-applied fire resistive material.

.2 Provide masking, drop cloths or other suitable coverings to prevent overspray from coming in contact with surfaces not intended to be sprayed.

.3 Apply fireproofing in accordance with manufacturers written installation requirements and as required to obtain fire resistance ratings indicated for the Project.

.4 Apply fireproofing in coats not exceeding recommended by manufacturer for fire resistance ratings indicated for the Project.

.5 Mix each batch of material separately in accordance with manufacturer's instructions to achieve required density and thickness; do not re-temper material or use frozen, caked, or lumpy material.

.6 Apply fireproofing sealer as per the appropriate UL/ULC fire resistance design and manufacturer’s written recommendations.

3.4 SITE QUALITY CONTROL

.1 Site Testing and Inspections: Site testing and inspections will be performed in accordance with requirements specified in Division 01, and as follows:

.1 Appoint third party inspection and testing agency to confirm that installation of fireproofing materials meets requirements of ASTM E605 and ASTM E736. Cost for inspection and testing shall be paid for from project cash allowance.

.2 One series of tests will be performed using both laboratory and site testing for each 1000 m^2 of floor area sprayed; patch and repair inspection locations after completion of cut tests.

.3 Testing Agency shall distribute test results to Consultant, Contractor and Subcontractor at completion of each floor.

.2 Non-Conforming Work:

.1 Repair deficiencies identified in test results; patch damage to fireproofing caused by other work of the Project before fireproofing is concealed; or if exposed, before substantial performance.

3.5 CLOSEOUT ACTIVITIES

.1 Patching and Repair:

.1 Perform all patching and repair of damaged spray-applied fire resistive material, under this Section, and paid for by the trade responsible for the damage.

.2 Repair damage to fire resistant material caused by installation of subsequent Work.

.2 Cleaning:

.1 Remove equipment and clean exposed wall and floor areas to remove deposits of sprayed fireproofing materials after completion of fireproofing work.

END OF SECTION

1 General

1.1 SUMMARY

.1 Supply and install materials in accordance with published 'Through-Penetration Firestop Systems' in UL's Fire Resistance Directory or the publication of another approved independent laboratory.

1.2 REFERENCE STANDARDS

.1 Underwriters Laboratories of Canada (ULC):

.1 CAN/ULC S115-05, Standard Method of Fire Tests and Firestop Systems

.2 American Society for Testing and Materials (ASTM):

.1 ASTM E814-11a, Standard Test Method for Fire Tests of Penetration Firestop Systems

1.3 SUBMITTALS

.1 Provide submittals in accordance with Division 01.

.2 Shop Drawings:

.1 Provide details indicating all reinforcing, anchorages, fastening and proposed method of installation for the various conditions within the project.

.3 Samples:

.1 Submit samples of each type of firestop and smokeseal material and accessory.

1.4 QUALITY ASSURANCE

.1 Applicator shall be licensed by the manufacturer of fireproofing materials.

.2 Conform to flame and temperature ratings established by CAN/ULC-S115-05 and ASTM E814-11a.

.3 Submit manufacturer's certification that materials meet or exceed specified requirements.

.4 Maintain flame and temperature ratings equal to surrounding materials.

1.5 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.

1.6 SITE CONDITIONS

.1 Do not apply materials when temperature of substrate material is below 4 deg C and surrounding air temperature is below 4 deg C, for 24 hours prior to application.

2 Products

2.1 MATERIALS

.1 Bears UL, ULC or Warnock Hersey label and confirmation of compliance with ASTM E814-11a or CAN/ULC-S115.

.2 Provide fire stopping and smoke sealing systems in accordance with CAN/ULC-S115-M and shall also conform to special requirements in part 3.5 of the Building Code.

.3 Fire-resistant rating of fire stopping material assemblies must meet or exceed the fire-resistance rating of the floor or wall section being penetrated.

.4 Fire stopping and smoke seals at openings around penetrations for pipes, ductwork and other mechanical items requiring sound and vibration control shall be elastomeric seal type. Do not use a cementitious, or rigid seal at such locations.

.5 Primers shall be to manufacturer's recommendation for specific material, substrate, and end use.

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

.7 Sealants for vertical joints, shall be non-sagging type.

3 Execution

3.1 PROTECTION

.1 Mask adjacent work of other Sections as necessary to avoid spillage onto adjoining surfaces. Remove stains on adjacent surfaces as required.

3.2 PREPARATION

.1 Examine sizes and conditions to establish correct thickness and installation of backup materials. Ensure surfaces are dry and frost free.

.2 Clean bonding surfaces of deleterious substances including dust, paint, rust, oil, grease and other foreign matter which may otherwise impair effective bonding.

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

.4 Prepare surfaces in accordance with manufacturer's instructions.

.5 Priming and Sealing: Prime surfaces in accordance with manufacturer's instructions.

3.3 APPLICATION

.1 Mix materials in accordance with manufacturers' written instructions.

.2 Apply in strict accordance with ULC certification and manufacturer's recommendations to provide a temperature and flame rated seal equal as a minimum to the rating of the wall or floor surrounding.

.3 Seal all holes or voids made by penetrations to ensure an air and water resistant seal.

.4 Seal all joints to ensure an air and water resistant seal, capable to withstand compression due to thermal, wind or seismic joint movement.

.5 Consult with Mechanical Engineer and project manager prior to installation of UL firestop systems that might hamper the performance of fire dampers as it pertains to duct work.

.6 Apply to mechanical and electrical service through-penetrations, to formed, sleeved, or cored openings in smoke and fire rated masonry, or gypsum wallboard stud walls and structural floors and ceilings.

.1 Coordinate with plumbing, HVAC and electrical contractors to ensure proper firestopping application, providing smokeseal around penetrations through fire rated assemblies. Ensure that end joints between lengths of firestopping material have been properly sealed.

.7 Apply to head of smoke and fire rated gypsum wallboard stud wall abutting underside of structure (concrete or steel deck).

.8 Apply to control joints in rated stud walls.

.9 Apply to penetrations for passage of duct, cable, cable tray, conduit, piping, electrical busways and raceways through fire rated vertical barriers (walls and partitions), horizontal beams (floor/ceiling assemblies) and vertical service shaft walls and partitions.

.10 Apply to safing slots gaps between edge of floor slabs and curtain walls.

.11 Apply to openings between structurally separate sections of walls and floors.

.12 Apply to gaps between tops of walls and ceiling or roof assemblies.

.13 Apply to expansion joints in fire rated walls and floors.

.14 Apply to openings and penetrations in fire rated partitions or walls containing fire doors.

.15 Apply to openings around structural members which penetrate fire rated floors or walls.

.16 Apply firestop and smokeseal materials in accordance with manufacturer's directions, with sufficient pressure to properly fill and seal openings.

.17 Tool or trowel exposed surfaces.

.18 Remove excess compounds promptly as work of this Section progresses and upon completion of work of this Section.

3.4 CURING

.1 Cure materials in accordance with manufacturer's instructions.

.2 Do not cover up materials until proper curing has taken place.

3.5 IDENTIFICATION

.1 Identify through-penetration firestop systems with pressure-sensitive, self-adhesive, prepreinted 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"

.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.

3.6 CLEAN UP AND REPAIRS

.1 Clean adjacent surfaces immediately and leave work neat and clean.

.2 Remove excess materials using recommended procedures, as work progresses.

.3 Remove dams after initial set of firestops and smokeseals as required.

.4 Correct staining and discolouring of adjacent surfaces as directed by Consultant.

.5 Remove all debris and excess materials entirely from the site and leave the work in a neat and tidy condition.

.6 Perform one simulated smoke test for each penetration type once per day. Simulate smoke at a rate of four seconds/100 cubic feet (2.8 cubic metres) and maintain the fog density until inspection is complete.

.7 After inspection is complete, repair all defective firestopping and smokeseals and test again. Continue this procedure until all firestopping and smokeseals passes test.

END OF SECTION

1 General

1.1 SUMMARY

.1 Read other Sections of the Specification for extent of sealant specified in those Sections. Do all other sealing indicated, specified or required.

.2 Provide all items, articles, materials, operations or methods listed, mentioned or scheduled on drawings and/or herein, including all labour, materials, equipment and incidentals necessary and required for the completion of the sealant.

1.2 REFERENCE STANDARDS

.1 American Society for Testing and Materials (ASTM):

.1 ASTM C509-06(2011), Standard Specifications for Elastomeric Cellular Performed Gasket and Sealing Material

.2 ASTM C920-11, Standard Specification for Elastomeric Joint Sealants

.3 ASTM C-1382-11, Standard Test Method for Determining Tensile Adhesion Properties of Sealants when Used in Exterior Insulation and Finish Systems (EIFS) Joints

.4 ASTM D2240-05(2010), Standard Test Method for Rubber Property - Durometer Hardness

.2 Canadian General Standards Board (CGSB):

.1 CAN/CGSB-19.13-M87, Sealing Compound, One-Component, Elastomeric, Chemical Curing

1.3 SUBMITTALS

.1 Provide submittals in accordance with Division 01.

.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 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 Mock-Up:

.1 If requested by the Consultant, construct mock-ups where directed to show location, size, shape, colour and depth of joints complete with back-up material, primer and sealant. Mock-up may be part of finished work.

.2 Allow 24-hours for inspection of work before proceeding with work.

.4 Safety Data Sheets: 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.

1.4 QUALITY ASSURANCE

.1 Adhere to Manufacturer's recommendations for mixing or preparation of materials listed in this Section.

.2 Pot life or installation times shall not be exceeded.

.3 Integral materials which compose a joint detail shall be compatible.

.4 Component parts, where possible, shall have the same manufacturer.

.5 A representative of sealant material manufacturer shall visit the site during application to ensure that all Work is carried out according to the manufacturer's printed instructions.

1.5 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.

1.6 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 materials manufacturer.

.3 Maintain containers and labels in undamaged condition.

1.7 WARRANTY

.1 Provide a written warranty endorsed and issued in the name of the Owner stating that all sealant work of this Section is warranted against leakage, cracking, crumbling, melting, running, deterioration, shrinkage, loss of cohesion, loss of adhesion, staining of adjoining or adjacent work or surfaces, or failure to provide intended seal for a period of five (5) years from the Date of Substantial Performance of the Work, and that any defects will be made good including, related materials and installation at no additional cost to the Owner.

2 Products

2.1 MATERIALS

.1 Joint Cleaner:

.1 Non-corrosive solvents as recommended by sealant manufacturer for applicable substrate material(s).

.2 Primer:

.1 Non-staining type as recommended by sealant manufacturer, for use on substrate conditions outlined, and compatible with specified sealant being applied.

.3 Joint Back-Up – Backer Rod:

.1 Round, closed cell, reticulated foam, 50% compression, compatible with sealant and primer, non-adhering to sealant.

.4 Bond Breaker:

.1 Pressure sensitive plastic tape, not bondable to sealant as recommended by sealant manufacturer.

.5 Sealant Type "A" – Joints around Interior Door Frames, Windows and Under Exterior Thresholds:

.1 One-part, low or medium modulus, neutral curing 100% silicone joint sealant, conforming to ASTM C920-11, Type S, Grade NS, Class 35.

.1 DC CWS by Dow Corning.

.2 SWS by GE

.3 SikaSil WS-305CN by Sika

.4 Or approved equivalent.

OR

.2 One component, low modulus, moisture curing, polyurethane joint sealant, conforming to ASTM C920-11, Type S, Grade NS, Class 25.

.1 Dymonic FC by Tremco Ltd., division of RPM Company.

.2 Sikaflex 1A by Sika Canada Inc.

.3 Sonolastic NP1 by BASF.

.4 Pourthane NS by W.R MEADOWS

.5 Or approved equivalent.

.6 Sealant Type "B" – Exterior Wall Joints; Control Joints; Expansion Joints:

.1 One-part, ultra low modulus, non-staining neutral curing 100% silicone joint sealant, conforming to ASTM C920-11, Type S, Grade NS, Class 50.

.1 DC 790 by Dow Corning.

.2 Spectrem 1 by Tremco

.3 SCS2700 SilPruf LM by GE

.4 SikaSil WS-290 by Sika

.5 Or approved equivalent.

.7 Sealant Type "C" – Floor Control Joints:

.1 Multi-component, chemical curing, self-levelling, polyurethane joint sealant, conforming to ASTM C920-11, Type M, Grade P, Class 25.

.1 THC-900 by Tremco (Canada) Ltd., division of RPM Company.

.2 Sonolastic SL2 by Sonneborn Building Products, division of BASF Building Systems.

.3 Sikaflex 2c SL by Sika Canada Inc.

.4 Or approved equivalent.

.8 Sealant Type "E" – Mould and Mildew Resistant:

.1 Mould and mildew resistant, Shore A Hardness 15-25, conforming to ASTM C920-11, Type S, Grade NS, Class25, use NT, G, and A:

.1 SCS1700 by GE

.2 DC 786 by Dow Corning

.3 Tremsil 200 by Tremco

.4 Omni Plus by Sonneborn

.5 SikaSil –GP by Sika

.6 Or approved equivalent.

.9 Sealant Type "F" – Glazing Joints:

.1 Silicone Sealant: Butt glazing, one part, moisture curing, shore A hardness 15-25, conforming to CAN/CGSB-19.13-M, Classification C-1-40-B-N and C-1-25-B-N and ASTM C920-11, Type S, Grade NS, Class 25, use NT, G, A, O; Colour: clear (translucent):

.1 DC 795 by Dow Corning

.2 SCS2000 by GE.

.3 Multiseal by Chemtron.

.4 Spectrum 2 by Tremco

.5 SikaSil WS-295 by Sika

.6 Or approved equivalent.

.10 Sealant Type "H" – Saw Cut Sealant:

.1 Multi-component, self-levelling, conforming to ASTM D2240-05(2010):

.1 Tremco Control Joint Sealant

.2 BASF Masterfill 300

.3 Sika Loadflex

.4 Rezi-Weld Flex by W.R MEADOWS

.5 Or approved equivalent.

.11 Sealant Type “I” – HVAC Sealant:

.1 One-part, RTV, acetoxy-cure silicone sealant for heating, ventilation, air conditioning and refrigeration applications:

.1 Dow Corning HVAC Silicone Sealant

.2 Or approved equivalent.

.12 Sealant Type “J” – Electrical Sealant:

.1 One-part, white, non-flowing moisture cure adhesive for electrical applications:

.1 Dow Corning 738 Electrical Sealant

.2 Or approved equivalent.

.13 Sealant Type “K” - Interior Acoustical Sealant:

.1 Non-skinning, non-hardening, single component synthetic rubber sealant, conforming to CAN/CGSB-19.21-M:

.1 Tremco Acoustic Sealant

.2 Chemtron Metaseal

.3 Or approved equivalent.

.14 Preformed Compression Seal:

.1 Compartmental open cell neoprene extrusion type conforming to ASTM C509-06(2011), complete with liquid lubricant adhesive recommended by manufacturer.

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 commending 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 Consultant 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 commended, 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 Consultant, 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 Consultant and change primer and sealant to approved compatible types or clean concrete to Consultant's approval.

3.3 APPLICATION

.1 Apply sealant in accordance with manufacturer's directions, using a gun with proper nozzle size, ensuring to fill voids and joints completely, to leave a weathertight, airtight installation. Superficial pointing with skin bead is not acceptable.

.2 Neatly tool surface to a slight concave profile. Surface of sealant shall be smooth, free from ridges, wrinkles, sags, air pockets and embedded impurities.

.3 Clean adjacent surfaces immediately and leave Work neat and clean. Remove excess sealant and droppings, using recommended cleaners as Work progresses. Remove masking tape after tooling of joints.

3.4 CLEANING AND PROTECTION

.1 Remove all waste materials from site. Sealant shall be cleaned of all foreign material as recommended by the sealant manufacturer. Leave work in a condition satisfactory to the Consultant.

END OF SECTION

PART 1 - GENERAL

1.1 Work Included: As detailed or scheduled in the contract documents, supply of:

.1 Steel frame products including frames, transom frames (glazed or paneled), sidelight and window assemblies, fire-rated and non-rated, interior and exterior.

.2 Steel panels, fixed or removable, flush or rabbetted, similar in construction to steel doors, for use in steel frame product.

.3 Steel doors, swing type, flush, with or without embossed face sheets, with or without glazed or louvered openings, fire-rated, with or without temperature rise ratings, and non-rated.

1.2 References

.1 ANSI/NFPA 80-1999, Standard for Fire Doors and Fire Windows

.2 ASTM A653/A653M-05a, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process

.3 ASTM C553-02, Specification for Mineral Fiber Blanket Insulation for Commercial and Industrial Applications

.4 ASTM C578-05, Specification for Rigid, Cellular Polystyrene Thermal Insulation

.5 ASTM C591-01, Specification for Un-Faced Pre-formed Rigid Cellular Polyisocyanurate Thermal Insulation

.6 ASTM C592-04, Specification for Mineral Fiber Batt and Blanket Thermal Insulation for Light Frame Construction

.7 ASTM C1289-05a, Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board

.8 CAN4-S104-M80, Standard Method for Fire Tests of Door Assemblies

.9 CAN4-S106-M80, Standard Method for Fire Tests of Window and Glass Block Assemblies

.10 CGSB 41-GP-19MA (1984), Rigid Vinyl Extrusions for Windows and Doors

.11 CSA W59-2003, Welded Steel Construction (Metal Arc Welding)

.12 CSDMA, Recommended Dimensional Standards for Commercial Steel Doors and Frames, 2000

.13 CSDMA, Selection and Usage Guide for Steel Doors and Frames, 1990

.14 CSDMA, Recommended Specifications for Commercial Steel Door and Frame Products – 08 11 00, 2006

1.3 Submittals

.1 Submit shop drawings in accordance with Division 01.

.2 Indicate each type of door, frame, steel, construction and core.

.3 Indicate material thickness, mortises, reinforcements, anchorages, locations of exposed fasteners, openings (glazed, paneled or louvered) and arrangement of standard hardware.

.4 Include schedule identifying each unit, with door marks and numbers relating to numbering on drawings and door schedule of the Architect.

.5 Contractor responsible for coordination and installation of products provided under this Section shall;

.1 Verify and provide to the contractor responsible for the supply of steel door and frame products, actual opening sizes and field conditions by field measurement before fabrication. Submittal drawings shall reflect measurements and conditions provided, and product manufactured accordingly. Coordinate field measurements with fabrication and construction schedules to avoid delays.

.2 Verify that substrate conditions, whether existing or installed under other Sections, are as detailed in the Architect's drawings, and are acceptable for product installation in accordance with the manufacturer's instructions.

.6 Manufacturer shall not proceed with fabrication without receipt of approved submittal drawings and approved hardware schedule.

1.4 DEFINITIONS

.1 Base Metal Thickness: Thickness dimensions are minimums as defined in referenced ASTM standards for both uncoated steel sheet and the uncoated base metal of metallic coated steel sheets.

.2 Opening Sizes: Standard metric door sizes indicated on the 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 QUALITY ASSURANCE

.1 Manufacturer: Obtain hollow metal doors and frames from single source of supply and from a single manufacturer, and as follows:

.1 Fabricate work of this Section to meet the requirements of the Canadian Steel Door and Frame Manufacturer's Association, Manufacturing Specification for Doors and Frames as a minimum, and as further modified in this section.

.2 Fabricator shall be a member in good standing of the Canadian Steel Door and Frame Manufacturer's Association.

.2 Supplier: Obtain hollow metal doors and frames from single source of supply and from a single manufacturer.

.3 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 Project.

.4 Testing Agencies: Provide doors produced under label service program of a testing agency acceptable to Authorities Having Jurisdiction, and as follows:

.1 Steel Fire Rated Doors and Frames: Labelled and listed by an organization accredited by Standards Council of Canada for ratings specified or indicated.

.2 Provide fire labelled frame products for those openings requiring fire protection ratings, as scheduled:

.1 List by nationally recognized agency having factory inspection service and construct as detailed in Follow-up Service Procedures/Factory Inspection Manuals issued by listing agency to individual manufacturers.

.2 Fabricate all rated doors, frames and screens to labelling authority standard.

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. 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.

1.7 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.

1.8 Warranty

.1 Materials and workmanship shall be warranted by the manufacturer for a period of one (1) year from date of substantial performance.

PART 2 - PRODUCTS

2.1 Materials

.1 Acceptable Materials: Steel doors and frame product manufactured in accordance with this Specification by CSDMA members, are eligible for use on this project.

.2 Steel: Commercial grade steel to ASTM A653, CS, Type B, Coating Designation ZF75 (A25) minimum. Minimum steel thicknesses shall be in accordance with Appendix 1 of the CSDMA, "Recommended Specifications for Commercial Steel Door and Frame Products".

.3 Door Core Materials

.1 Honeycomb (Interior Doors). Structural small cell 25.4 mm (1") maximum kraft paper 'honeycomb'. Weight: 36.3 kg (80lb.) per ream minimum, density: 16.5 kg/m3 (1.03 pcf) minimum, sanded to required thickness.

.2 Polyisocyanurate (Exterior Doors). Rigid, modified polyisocyanurate, fire retardant treated, closed cell board. Density; 32 kg/m3 (2.0 pcf) minimum, thermal values; RSI 1.9 (R 11.0) minimum, in accordance with ASTM C591 (un-faced) or C 1289 (faced).

.4 Primers

.1 Rust inhibitive touch-up only.

.5 Miscellaneous

.1 Door Silencers. Single stud rubber/neoprene type.

.2 Exterior Top Caps. Rigid polyvinylchloride extrusion conforming to CGSB 41-GP-19MA.

.3 Frame Thermal Breaks. Rigid polyvinylchloride extrusion conforming to CGSB 41-GP-19MA.

2.2 Fabrication - Frame Products

.1 Exterior frame product shall be 14 gauge. Exterior frames shall be welded type construction, thermally broken. Exterior transom frames, sidelight and window assemblies shall be welded type construction, thermally broken. Interior frame product shall be 14 gauge. Interior frames and window assemblies shall be welded type construction. Interior transom frames shall be welded type construction. Interior sidelight assemblies shall be welded type construction.

.2 Frame product shall be mortised, blanked, reinforced, drilled and tapped at the factory for templated hardware only, in accordance with the approved hardware schedule and templates provided by the hardware supplier.

.3 Mortised cutouts shall be protected with steel guard boxes (may be omitted on dry wall applications).

.4 Frame product shall be reinforced only, where required, for surface mounted hardware, anchor hinges, thrust pivots, pivot reinforced hinges, or non-templated hardware. Drilling and tapping is by others, on site, at time of installation.

.5 Provide anchorage appropriate to floor, wall and frame construction. Each wall anchor shall be located immediately above or below each hinge reinforcement on the hinge jamb and directly opposite on the strike jamb. For rebate opening heights up to and including 1520 mm (60") provide two (2) anchors, and an additional anchor for each additional 760 mm (30") of height or fraction thereof, except as indicated below. Frames in previously placed concrete, masonry or structural steel shall be provided with anchors located not more than 150 mm (6") from the top and bottom of each jamb, and intermediate anchors at 660 mm (26") on centre maximum. Fasteners for such anchors shall be provided by others.

.6 Minimum reinforcing, anchor and other component gauges shall be in accordance with Table 1 of the CSDMA, "Recommended Specifications for Commercial Steel Door and Frame Products".

.7 Each door opening shall be prepared for single stud rubber door silencers, three (3) for single door openings, two (2) for double door openings, except on gasketed frame product.

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

.9 Fire-rated frame products shall be provided for those openings requiring fire protection as determined and scheduled by the Architect. Frames, transom and sidelight assemblies shall be listed for conformance with CAN4-S104. Window assemblies shall be listed for conformance with CAN4-S106. All fire-rated frame products shall bear the label of, and be listed by a nationally recognized testing agency having a factory inspection service. Labeling shall be in accordance with NFPA 80, the listing authority's policies and label materials, and shall identify the manufacturer. Fire-rated frame products shall be constructed as listed for labeling in the Follow-Up Service Procedures/Factory Inspection Manuals issued by the listing agency to individual manufacturers

.10 Provide grout guards fabricated from not less than 0.016 in. (0.4 mm) thick steel at all hardware mortises on frame product to be grouted.

2.3 Welded Type Construction

.1 Frame product shall be accurately mitered or mechanically jointed.

.2 As defined in Appendix 2 of the CSDMA, "Recommended Specifications for Commercial Steel Door and Frame Products", frame product perimeter corner joints shall be:

.1 Face welded; continuously welded on the profile faces, with exposed faces filled and ground to a smooth, uniform, seamless surface.

.3 Joints at mullions, sills and center rails shall:

.1 Be coped accurately, butted and tightly fitted.

.2 At intersecting flush profile faces, be securely welded, filled and ground to a smooth, uniform, seamless surface.

.3 At intersecting recessed profile faces, be securely welded to concealed reinforcements, with exposed hairline face seams.

.4 At all other intersecting profile elements, have exposed hairline face seams.

.4 Welding shall conform to CSA W59.

.5 Where frame product is to be installed prior to the adjacent partition, a floor anchor shall be securely attached to the inside of each jamb profile. Each floor anchor shall be provided with two (2) holes for securing to the floor. For conditions that do not permit the use of a floor anchor, an additional wall anchor, located within 150 mm (6") of the base of the jamb, shall be substituted.

.6 Weld in two (2) temporary jamb spreaders per door opening to maintain proper alignment during shipment and handling, which shall not be used for installation.

.7 Glazing stops shall be formed steel channel, minimum 16 mm (0.625") height, accurately fitted, butted at corners and fastened to frame sections with counter-sunk oval head sheet metal screws.

.8 When required due to site access, when advised by the contractor responsible for coordination or installation, as specified on the Architect's drawings or due to shipping limitations, frame product for large openings shall be fabricated in sections as designated on the approved submittal drawings, with splice joints for field assembly and welding by others.

.9 Prior to shipment, mark each frame product with an identification number as shown on the approved submittal drawings.

2.4 Fabrication – Doors

.1 General

.1 Exterior doors shall be laminated core construction.

.2 Interior doors shall be welded stiffener construction.

.3 Longitudinal edges shall be continuously welded, filled and sanded with no visible edge seams.

.4 Doors shall be mortised, blanked, reinforced, drilled and tapped at the factory for template hardware only, in accordance with the approved hardware schedule and templates provided by the hardware supplier.

.5 Holes 12.7 mm (0.5") diameter and larger shall be factory prepared, except mounting and through-bolt holes, which are by others, on site, at time of hardware installation. Holes less than 12.7 mm (0.5") diameter shall be factory prepared only when required for the function of the device (for knob, lever, cylinder, thumb or turn pieces) or when these holes over-lap function holes.

.6 Doors shall be reinforced only, where required, for surface mounted hardware, anchor hinges, thrust pivots, pivot reinforced hinges, or non-templated hardware. Drilling and tapping is by others, on site, at time of installation.

.7 Top and bottom of doors shall be provided with inverted, recessed, welded steel channels. Exterior doors, and where otherwise scheduled by the Architect, shall be provided with flush steel top caps.

.8 Minimum reinforcing and component gauges shall be in accordance with Table 1 of the CSDMA, "Recommended Specifications for Commercial Steel Door and Frame Products".

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

.10 Fire-rated doors shall be provided for those openings requiring fire protection and temperature rise ratings, as determined and scheduled by the Architect. Such products shall be listed for conformance with CAN4-S104. All fire-rated doors shall bear the label of, and be listed by a nationally recognized testing agency having a factory inspection service. Labeling shall be in accordance with NFPA 80, the listing authority's policies and label materials, and shall identify the manufacturer. Fire-rated doors shall be constructed as listed for labeling in the Follow-Up Service Procedures/Factory Inspection Manuals issued by the listing agency to individual manufacturers.

.11 Prior to shipment, mark each door with an identification number as shown on the approved submittal drawings.

.2 Laminated Core Construction

.1 Both face sheets for exterior doors shall be formed from a sheet of minimum 16 gauge (1.34 mm) steel with polyisocyanurate core, laminated under pressure to face sheets.

.2 Both face sheets for interior doors shall be formed from a sheet of minimum 18 gauge (1.06 mm) steel with honeycomb core laminated under pressure to face sheets.

PART 3 - EXECUTION

.1 Site Storage and Protection of Materials

.1 Doors and frame product shall be removed from their wrappings or coverings upon receipt on site, be stored in a vertical position, and be spaced with blocking to permit air circulation between them.

.2 All materials shall be thoroughly inspected upon receipt and all discrepancies, deficiencies and/or damages shall be immediately reported, in writing, to the supplier.

.3 All damages incurred during shipment shall be immediately reported, in writing, to the supplier.

.4 Any scratches or disfigurement of doors or frame product caused by shipping or handling shall be promptly cleaned and touched-up with a zinc-rich primer.

.2 Installation

.1 Prior to installation, remove temporary shipping spreaders.

.2 Prior to installation, the area of floor on which the frame is to be installed, and within the path of the door swing, shall be checked and corrected for flatness.

.3 Door and frame product shall be checked for correct size, swing, rating and opening number.

.4 Caulk perimeter of frames between frame and adjacent material.

.5 Set frames plumb, square, level and at correct elevation.

.6 Fire-rated door and frame product shall be installed in accordance with the terms of their listings, NFPA-80, or the local Authority Having Jurisdiction (AHJ).

.7 Secure anchorages and connections to adjacent construction.

.8 Brace frames rigidly in position while building-in. Install wood spreaders at third points of frame rebate height to maintain frame width. Provide vertical support at centre of head for openings exceeding 1200 mm (48") in width.

.9 During the setting of frame product, check and correct as necessary for opening width, opening height, square, alignment, twist and plumb, in accordance with the CSDMA, "Recommended Dimensional Standards for Commercial Steel Doors and Frames".

.10 Grout guards and junction boxes are intended to protect hardware mortises and tapped holes from masonry grout of 4 in. (101 mm) maximum slump consistency that is hand troweled in place.

.11 Frame products are not intended or designed to act as forms for grout or concrete. Grout hollow metal sections in "lifts" or take precautions otherwise to ensure that frames are not deformed or damaged by the hydraulic forces that occur during this process.

.12 Keep hollow metal surfaces free of grout, tar, and/or other bonding materials or sealers. Promptly clean grout, tar, and/or other bonding materials or sealers off of frame product and doors.

.13 Remove wood spreaders after frames have been built-in.

.14 Make allowance for deflection to ensure structural loads are not transmitted to frame product.

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

.16 Adjust operable parts for correct clearances and function.

.17 Install louvers, glazing and door silencers.

.18 Finish paint in accordance with Section 09 90 00.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

.1 Work Included: Provide factory-fabricated floor access doors.

1.2 SUBMITTALS

.1 Product Data: Submit manufacturer's product data.

.2 Shop Drawings: Submit shop drawings including profiles, accessories, location, adjacent construction interface, anchorage and dimensions.

.3 Warranty: Submit executed copy of manufacturer's standard warranty.

1.3 QUALITY ASSURANCE

.1 Manufacturer: A demonstrated experience manufacturing similar products.

.2 Installer: Demonstrated competence installing similar products.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver products in manufacturer's original packaging. Store materials in a dry, protected, well-vented area. Inspect product upon receipt and report damaged material immediately to delivering carrier and note such damage on the carrier's freight bill of lading.

1.5 WARRANTY

.1 Manufacturer's Warranty: Provide manufacturer's standard warranty. Materials shall be free of defects in material and workmanship for a period of five years from the date of Substantial Performance. Should a part fail to function in normal use within this period, manufacturer shall furnish a new part at no charge.

PART 2 - PRODUCTS

2.1 MANUFACTURER

.1 Basis-of-Design Manufacturer: Type J Channel Frame Floor Access Door by The Bilco Company, Web: www.bilco.com.

2.2 ACCESS DOOR

.1 Furnish and install where indicated on plans floor access door, size as scheduled. The floor access door shall be single leaf and pre-assembled from the manufacturer.

.2 Performance characteristics:

.1 Cover: Shall be reinforced to support AASHTO H-20 wheel load with a maximum deflection of 1/150th of the span. Manufacturer to provide structural calculations stamped by a registered professional engineer upon request. (Note: For installation in an off-street location where not subject to high density, fast moving traffic.)

.2 Operation of the cover shall be smooth and easy with controlled operation throughout the entire arc of opening and closing.

.3 Operation of the cover shall not be affected by temperature.

.3 Cover: Shall be 1/4" (6mm) steel diamond pattern.

.4 Frame: Channel frame shall be 1/4" (6mm) steel with full anchor flange around the perimeter.

.5 Hinges: Shall be specifically designed for horizontal installation and shall be through bolted to the cover with tamperproof Type 316 stainless steel lock bolts and shall be through bolted to the frame with Type 316 stainless steel bolts and locknuts.

.6 Drain Coupling: Provide a 1-1/2” (38mm) drain coupling located in the right front corner of the channel frame.

.7 Lifting mechanisms: Manufacturer shall provide the required number and size of compression spring operators enclosed in telescopic tubes to provide, smooth, easy, and controlled cover operation throughout the entire arc of opening and to act as a check in retarding downward motion of the cover when closing. The upper tube shall be the outer tube to prevent accumulation of moisture, grit, and debris inside the lower tube assembly. The lower tube shall interlock with a flanged support shoe fastened to a formed 1/4” (6mm) gusset support plate.

.8 A removable exterior turn/lift handle with a spring loaded ball detent shall be provided to open the cover and the latch release shall be protected by a flush, gasketed, removable screw plug.

.9 Hardware

.1 Hinges: Heavy forged Type 316 stainless steel hinges, each having a minimum 1/4” (6mm) diameter Type 316 stainless steel pin, shall be provided and shall pivot so the covers do not protrude into the channel frame.

.2 Cover shall be equipped with a hold open arm that automatically locks the cover in the open position.

.3 Cover shall be fitted with the required number and size of compression spring operators.

.4 A Type 316 stainless steel snap lock with fixed handle shall be mounted on the underside of the cover.

.5 Hardware: Hardware: All hardware shall be zinc plated and chromate sealed with type 316 stainless steel fasteners.

A. Finishes: Factory finish shall be red oxide primed steel.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Examine substrates and openings for compliance with requirements for installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

.1 Install products in strict accordance with manufacturer’s instructions and approved submittals. Locate units level, plumb, and in proper alignment with adjacent work.

.1 Test units for proper function and adjust until proper operation is achieved.

.2 Repair finishes damaged during installation.

.3 Restore finishes so no evidence remains of corrective work.

3.3 ADJUSTING AND CLEANING

.1 Clean exposed surfaces using methods acceptable to the manufacturer which will not damage finish.

END OF SECTION

1 General

1.1 SUMMARY

.1 This Section includes requirements for design, supply and installation of a low-rise, narrow sightline, four-sided capped glazed curtain wall system consisting of, but not limited to, the following:

.1 Fixed, low emissivity (Low E) sealed glass units.

.2 Connections to structural support systems, fasteners, and accessories required for a complete installation of the glazed aluminum curtain wall system.

.2 Work of this Section is intended to be designed and supplied by a single source curtain wall manufacturer and installed by a manufacturer trained and approved glazing installer; having experience designing and installing systems of similar complexity and scope to that described in this Section including glazing, and architectural structural steelwork required for complete installation.

1.2 REFERENCE STANDARDS

.1 American Society for Testing and Materials (ASTM):

.1 ASTM A653/A653M-17, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process

.2 ASTM B209-14, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate

.3 ASTM B221-14, Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles and Tubes

.4 ASTM C542-05(2017), Standard Specification for Lock-Strip Gaskets

.5 ASTM E283-04(2012), Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen

.6 ASTM E330/E330M-14, Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference

.7 ASTM E331-00(2016), Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors and Curtain Walls by Uniform Static Air Pressure Difference

.2 Canadian General Standards Board (CGSB):

.1 CAN/CGSB-12.1-M90, Tempered or Laminated Safety Glass

.2 CAN/CGSB-12.3-M91, Flat, Clear Float Glass

.3 CAN/CGSB-12.8-97, Insulating Glass Units

.4 CAN/CGSB-12.9-M91, Spandrel Glass

.5 CGSB 12.20-M89, Structural Design of Glass for Buildings

.6 CAN/CGSB-51.11-92, Mineral Fibre Thermal Insulation Blanket

.7 CAN/CGSB-1.108-M89, Bituminous Solvent Type Paint

.8 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating

.3 American Architectural Manufacturers Association (AAMA):

.1 AAMA 505-17, Dry Shrinkage and Composite Performance Thermal Cycling Test Procedure

.2 AAMA 1503-09, Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections

.4 Canadian Standards Association (CSA):

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

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

1.3 WORK SUPPLIED BUT INSTALLED BY OTHER SECTIONS

.1 Supply inserts, anchors and other items to be built into work of other Sections and required for support of wall system.

.2 Provide clear instructions and, if required setting templates to ensure accurate setting of components.

1.4 DESIGN AND PERFORMANCE REQUIREMENTS

.1 Within parameters specified assume complete design responsibility for entire curtain wall system.

.2 Details and information indicated on drawings are schematic, showing general intent only and shall not be considered or construed to be the engineering design for the system or to be complete or adequate to meet the design criteria.

.3 Make thorough examination of drawings and details, check anchorage, structural deflections, shading factors, size and shape of glass, system of sealing, location of heating units, interfacing requirements with work of other Sections and other factors influencing design and performance of curtain wall system, and be fully cognizant of requirements.

.4 Design, fabricate and erect curtain wall system to meet or exceed the minimum requirements identified in this Section.

1.5 SUBMITTALS

.1 Provide submittals in accordance with Division 01.

.2 Shop Drawings:

.1 Furnish complete shop and erection drawings required for the work of this Section to the Consultant for review prior to fabrication.

.2 Co-ordinate shop drawings for work of this Section with those for other trades to ensure correct interface details required to provide watertight installation.

.3 Shop drawings shall incorporate plans, elevations, sections and details for all work in this Section. The details shall show and specify all metal and glass thicknesses, types and finishes, areas to be sealed and sealant materials, gaskets, glazing methods, direction and magnitude of thermal expansion, type of construction including joinery, fasteners and welds, all anchorage assemblies and components, the fabrication and erection tolerances for the work in this Section and the adjoining related work of other Sections.

.4 Upon Consultant's request furnish complete design calculations for the curtain wall bearing seal of the professional engineer responsible for their preparation and all pertinent information affecting the design, including wind reactions, shading effects and the failure probability for the thermal glazing units as evidence of compliance with the design criteria.

.3 Test Data:

.1 If requested by Consultant, submit test data from a recognized independent testing agency, acceptable to Consultant, verifying that specified requirements are being met. Test results may be from a previous testing program conducted on a system similar to that specified herein.

.4 Samples:

.1 Submit duplicate minimum 2" x 4" samples of each type of aluminum finish specified.

.2 Upon Consultant's request furnish samples of glass types, gaskets, tapes and sealants.

.5 Maintenance and Glazing Instructions:

.1 On completion of work of this Section, supply maintenance and glazing instructions for insertion into the Operating and Maintenance Manual.

1.6 QUALITY ASSURANCE

.1 System Manufacturer's Qualifications:

.1 Minimum five (5) years continuous experience in successful production of work of type and quality specified. Submit proof of experience upon Consultant's request.

.2 Erector's Qualifications:

.1 Manufacturer's forces or forces licensed by manufacturer. Work of this Section shall be performed by workers especially trained and experienced in this type of work. A senior, qualified manufacturer's representative shall be at the site during erection of system to direct the various stages of operations.

1.7 STORAGE, DELIVERY, 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 Assembled units and their component parts shall be transported, handled and stored in a manner to preclude damage of any nature.

.3 Ship and store pre-glazed units in upright position only or use method which will positively prevent extrusion of sealants and shifting of glass within framing.

.4 Accessory materials required for erection at the site shall be delivered to the site in manufacturer's labelled containers.

.5 Remove all units or components which are cracked, bent, chipped, scratched or otherwise unsuitable for installation and replace with new.

1.8 SITE CONDITIONS

.1 Provide safe and adequate equipment on the site to execute the work of this Section, including scaffolding, staging, hoisting, safety protection equipment, tools, plant and other equipment required for the completion of the work of this Section.

.2 Coordinate and verify, by measurement at the job site, all dimensions affecting the work of this Section. Submit written notifications to the Consultant any field dimensions and conditions which are at variance with those on the reviewed shop drawings. The decision regarding corrective measures shall be obtained from the Consultant prior to the fabrication of the item affected.

1.9 WARRANTY

.1 Warrant work of this Section against any defects in materials and workmanship in accordance with the General Conditions, but for a period of two (2) years and agree to promptly and without cost to Owner and Tenant make good defects which become evident during warranty period. Without restricting the generality of the warranty, defects shall include leaking, deformation of members, breaking of glass due to thermal or structural movement, discolouration of finishes and failure of sealants.

.2 Warrant insulating glass units in accordance with General Conditions for a period of five (5) years. Warrant that units will be free from material obstruction of vision as a result of dust or film formation on internal glass surfaces by any cause other than extrinsic glass breakage.

.3 Warrant that any unit failing shall be removed and replaced without cost to the Owner and Tenant.

2 Products

2.1 MANUFACTURERS

.1 Basis-of-Design products are named in this Section; additional manufacturers offering similar glazed aluminum curtain wall systems may be incorporated into the work provided they meet the performance requirements established by the named products.

.2 Acceptable Materials Manufacturers: Subject to compliance with requirements specified in this Section and as established by the Basis-of-Design Materials, manufacturers offering products that may be incorporated into the Work include; but are not limited to, the following:

.1 Alumicor Limited

.2 Kawneer Canada Ltd

.3 Windspec Inc.

.4 Or approved equivalent.

2.2 DESCRIPTION OF WORK

.1 Responsibility: Professional Engineer is responsible for designing glazed aluminum curtain wall system based on design loads and reactions provided by the Consultant, and verifying that safety factor is appropriate for intended installation and meets requirements of the Authority Having Jurisdiction.

.2 Design Requirements: Design and size system components in accordance with CGSB 12.20 and ASTM E330; free from defects impairing strength, durability and appearance including anchorage capable of withstanding specified loading without failure, and as follows:

.1 Exposed Fasteners: Fabricated from same materials design to prevent high stress concentration at glass connection points, colour and finish as material as that to which they are applied and having exposed surfaces with same inherent texture and colour for similar locations throughout system.

.2 Wind (Horizontal) and Structural (Vertical) Loads: Design and fabricate assemblies and systems to resist loads required by Building Code.

.3 Engineering Design: Use Professional Engineer, registered in the province of the Work, and that has experience in the work required by this Section to prepare structural calculations and design details.

.3 Design Loads and Performance Criteria: Design curtain wall framing system capable of withstanding design loads within limits and under design loads indicated in this Section, and as follows:

.1 Structural Deflection and Movement: Allow for movement and deflection of structural support framing; design tension framing system connections to accommodate structural deflections such that loading is not transferred to glass curtain wall system:

.1 Building Movement: Design for movements of supporting structure including twist, column shortening, long term creep, and deflection from uniformly distributed and concentrated live loads and storey drift under combined wind and gravity loads in accordance with the Building Code.

.2 Lateral Loads: Design for q50 wind loads using low importance factors listed in the Building Code for deflection and strength, modified by the appropriate exposure, gust and pressure (internal and external) factors in accordance with Building Code structural commentaries.

.3 Periodic Maintenance Equipment Loads: Account for loads arising from window cleaning or other maintenance equipment.

.4 Deflection of Framing Members: Limit deflection to the following requirements with full recovery of glazing materials:

.1 Deflection Normal to Wall Plane: Limited to L/175 of clear span for spans up to 14', and to L/240 of clear span plus 1/4" for spans greater than 14' or an amount that restricts edge deflection of individual glazing lites to 19mm, whichever is less.

.2 Deflection Parallel to Glazing Plane: Limited to amount not exceeding an amount that reduces glazing bite to less than 75% of design dimension and that reduces edge clearance between framing members and glazing or other fixed components to less than 1/8".

.3 Limit length of cantilever deflection to 2/175 length of the cantilevered member where framing members overhang an anchor point.

.2 Thermal Loads and Movement: Allow for glass movement arising from thermal changes as follows, accounting for surface temperatures of materials due to both solar heat gain and night time sky heat loss:

.1 Normal Ambient Temperature Range: 40 deg C based on -16 deg C ambient winter and 24 deg C ambient summer; adjust calculations to account for colour treatments or coatings on curtain wall framing members and glass

.2 Structural Movement: Allow for thermal movement with no buckling of structural components, stress on glass, glazing edge seal failure, sealant failure, excess stress on curtain wall framing, anchors and fasteners, or reduction of performance in accordance with AAMA 505.

.3 Building Envelope Performance Criteria: Design glass and glazing systems to allow for the following:

.1 The building envelope shall be designed and constructed to control air leakage into, or out of the conditioned space, for a targeted post-retrofit air leakage rate of 1.5 L/s/m^2 at 75 Pa., as indicated in Section 01 83 16.

.2 Water Penetration Under Static Pressure: Design system for zero water penetration when tested in accordance with ASTM E331 at a minimum differential static pressure of 20% of positive design wind load, but not less than 475 Pa.

.3 Design thermal barrier connection to achieve complete metal to metal separation between main framing and glass retention members except fro screw fasteners. Assembled framed section shall have a maximun “U: Factor of 0.865 W/m2*K.

2.3 MATERIALS

.1 Aluminum:

.1 Extrusions: AA6063-T5 alloy, anodizing quality, conforming to ASTM B221-12.

.2 Plate and Sheet: AA1100-H14 alloy, anodizing quality unless otherwise indicated minimum 0.125" thick, conforming to ASTM B209-10, with special hardness for flat aluminum spandrel panels.

.3 Exposed surfaces of aluminum shall be free of die marks, scratches, blisters, "leave-off" marks, or other blemishes, whether left unfinished or finished.

.2 Structural Steel Sections and Steel Plate:

.1 CSA-G40.20/G40.21, Grade 260W.

.3 Galvanized Steel Sheet:

.1 Commercial grade, stretcher levelled or temper rolled, with galvanized zinc G90 (Z275) coating conforming to ASTM A653/A653M.

.4 Glass:

.1 Types and Composition: As indicated in Section 08 80 00.

.2 Glazing Materials:

.1 Glass Retaining Member Seals: PVC or neoprene conforming to ASTM C542-90, 75 to 85 Durometer A hardness, teflon coated, compressible, with corner joints under compression to ensure vertical to horizontal neoprene pressure contact.

.2 Glazing Tape: Extruded high-grade macro-polyisobutylene tape with continuous integral synthetic rubber spacer having a 50 shore A hardness.

.3 Setting Blocks: Neoprene conforming to ASTM C542, with 75 to 85 Durometer A hardness.

.3 Insulation Materials:

.1 Packing Insulation: Loose mineral fibre insulation, Type II, as indicated in Section 07 20 00.

.4 Perimeter Sealant Materials:

.1 Sealant: Multi-component, chemical curing type sealant conforming to ASTM C920.

.2 Provide cleaners, primers and bond breakers as recommended by the sealant manufacturer.

.3 Basis of Design Materials:

.1 DYmeric 240 by Tremco (Canada) Ltd.

.2 Sonolastic NP2 by Sonneborn Building Products, division of ChemRex Inc.,

.3 CWS/CCS by Dow Corning,

.4 or approved equivalent.

.4 Joint Back-Up: Round, closed cell extruded polyethylene non-outgassing foam, Shore A hardness of 20, tensile strength 140 to 200 KPa, oversized 30-50%, compatible with sealant and primer, non-adhering to sealant.

.5 Zinc Rich Paint:

.1 Ready mixed, zinc rich primer conforming to CAN/CGSB-1.181, 'Sealtight Galvafroid Zinc-Rich Coating' by W.R. Meadows of Canada Limited, or 'Zinc Clad No.7 Organic Zinc Rich Primer' by Sherwin Williams Company of Canada Ltd., or approved equivalent.

.6 Bituminous Paint:

.1 Conforms to CAN/CGSB-1.108, Type 2.

.7 Fasteners: '400' Series stainless steel, or '300' Series stainless steel.

.8 Flexible Flashings: Proglaze ETA by Tremco, or approved equivalent.

.9 Provide door adapters and other components as required to complete the work of this Section.

2.4 CURTAIN WALL FRAMING

.1 Manufacturer's standard extruded aluminum framing members of thickness required and reinforced as required to support imposed loads.

.2 Exterior Frame – Curtain Wall:

.1 Construction: Thermally broken, pressure plate glazed.

.2 Dimensions of Frame Profile: 2” sightline; Glazing throat to accommodate insulated glazing units indicated in Section 08 80 00.

.3 Cover: Matching width of frame profile, and supplied by aluminum framed entrance and storefront manufacturer to ensure compatibility.

.4 Glazing Method: Glazed from exterior.

.5 Installation Method: Single span, storefront.

.6 Basis-of-Design Material: Alumicor Thermawall TW2200 or approved equivalent.

2.5 OPEARABLE GLAZED VENTS

.1 Zero sightline operable vents, fully compatible for insertion into curtain wall system.

.2 Exterior Frame:

.1 Construction: zero sightline, 4-sides SSG

.2 Depth: 108mm overall; glazing throat to accommodate insulated glazing units indicated in Section 08 80 00.

.3 Operation: awning/casement, as indicated on drawings

.4 Basis-of-Design Material: Alumicor Phantom Vent 5000 or approved equivalent.

2.6 ALUMINUM ENTRANCE SWING DOORS

.1 Manufacturers extruded aluminum glazed doors for manual swing operation, reinforced as required to withstand traffic conditions.

.2 Exterior Door Type – Medium stile, high-performance thermally broken frame sections:

.1 Glazing Method: Square stops for sealed glazing, with non-removable glazing stops on outside of door.

.2 Sizes:

.1 Stiles: 100mm (4")

.2 Top Rail: 98mm (3-7/8”)

.3 Bottom Rail: 178mm (7")

.3 Basis-of-Design Material: ThermaPorte 7700 Entrance Doors Series T400A by Alumicor Limited, or approved equivalent.

2.7 DOOR HARDWARE

.1 Provide door hardware in accordance with the requirements of this Section; using products that are recommended and supplied by entrance system manufacturer; in accordance with referenced standards, meeting requirements for description, quality, type, and function listed in hardware schedule.

.2 Manufacturer’s heavy duty hardware units in sizes and types as required to meet entrance use as indicated on Drawings, with the following opening force limitations:

.1 Egress Doors: Maximum 135 N to set door in motion and not more than 70 N to open door to minimum required width.

.2 Accessible Interior Doors: Maximum 20 N to operate door through entire range of movement.

.3 Delayed Egress Locks: Lock releases within 15 seconds after applying a force of not more than 70 N for not more than 3 seconds.

.4 Latches and Exit Devices: Not more than 70 N required to release latch.

.3 Hinges: Heavy duty aluminum hinges with stainless steel covers at two (2) locations.

.4 Trims:

.1 Strikes: Provide strike with black plastic dust box for each latch or lock bolt; fabricated for aluminum framing.

.2 Concealed Overhead Holders: In accordance with BHMA A156.8, Grade 1.

.3 Surface Mounted Holders: In accordance with BHMA A156.16, Grade 1.

.4 Door Stops: In accordance with BHMA A156.16, Grade 1, floor or wall mounted as appropriate for door location indicated with integral rubber bumper.

.1 GJ-100 Series by Glynn-Johnson, to suit condition.

.5 Silencers: In accordance with BHMA A156.16, Grade 1.

.6 Thresholds: Raised thresholds bevelled with a slope of not more than 1:2, with maximum height of ½”; in accordance with BHMA A156.21.

.1 Thresholds by K.N. Crowder Mfg. Inc., or approved equal, to suit condition.

2.8 FABRICATION

.1 Fit and assemble component parts in shop as far as practicable. Work that cannot be permanently shop assembled shall be fitted, assembled, marked and disassembled to assure proper fitting in field. Identify shop assembled components on shop drawings for location and erection at Site.

.2 Aluminum components shall be extruded sections and shapes, unless otherwise specified or shown.

.3 Components required, for which extruded sections are not available shall be accurately formed to profiles indicated. Use minimum 14 gauge sheet aluminum unless otherwise indicated.

.4 All fastenings and connections shall be concealed unless approved by Consultant.

.5 Joints between horizontal and vertical mullions shall be accurately cut and fitted. Horizontal and vertical mullions shall be in true plane with interior and exterior faces in line.

.6 Mechanically joined sections shall have "hairline" joints.

.7 Reinforce members as required to withstand loads and to maintain deflection within allowable limits.

.8 Internally reinforce framing members where work of other trades is to be fastened thereto.

.9 Fabricate expansion joints between mullion sections with formed extruded aluminum internal sleeve sections, secure to permit joint function and maintain true alignment of sections.

.10 Install air cut-offs in continuous vertical members to prevent stack effect of enclosed air columns.

.11 Framing members shall have internally formed keyed slots to receive and retain preformed gaskets, seals and thermal separators.

.12 Pressure plates shall be designed with integrally formed keyed slots to receive seals and of thickness necessary to provide permanent, uniform, sealing pressures for glazing units, without deformation.

.13 Provide inconspicuous, baffled weep holes to properly drain curtain wall cavities to exterior.

.14 Fabricate system to accommodate and interface with work of other Sections by means of rabbets, interlocks, miscellaneous angles, trim and filler sections as required.

.15 Factory glaze system modules as far as practicable. Effect glazing seal in accordance with wall system and glass manufacturer's recommendations and so as to meet specified design and performance requirements.

.16 Fabricate extruded or formed aluminum sills to profiles indicated to suit wall condition and minimum 3/32" thick. Provide drip deflectors at sill ends and at abutting vertical surfaces. Open ends of sills shall be fitted with neatly applied closure plates. Anchors shall be designed not to work loose after installation. Unless otherwise detailed provide "flush" slip joint at intermediate sill joints.

.17 Prepare aluminum curtain wall framing for installation of doors, finish door hardware including, but not limited to; deadlocks, handicap power door operators and other door finish hardware as specified within these documents.

.18 Install all door hardware on doors. Test all doors on completion of installation and adjust as required for smooth and efficient operation.

.19 Form covers, closures, mouldings and trim integral with, or immediately adjacent to work of this Section to profiles indicated on drawings, and as required for a complete installation.

2.9 FINISHES

.1 Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

.1 .Exterior extrusion finish: exposed aluminum surfaces To AA DAF-45-M12C22A44, Architectural [Class I], anodized [18 µm (0.0007 inches)] minimum thickness coloured clear.

.2 .Interior exposed aluminum surfaces: To AA DAF-45-M12C22A44, Architectural Class I, anodized [18 µm (0.0007 inches)] minimum thickness coloured clear.

.3 Protect finish with strippable protective film.

.2 Steel (Concealed):

.1 Hot-dip galvanized in accordance with CAN/CSA-G164, with minimum coating of 2 oz./sq.ft., or zinc rich paint.

.3 Isolate where necessary to prevent electrolysis due to dissimilar metal-to-metal contact or metal-to-masonry and concrete contact. Use bituminous paint, butyl tape or other approved divorcing material.

3 Execution

3.1 EXAMINATION

.1 Check structural elements and adjoining work of other Sections on which work of this Section is dependent, verify governing dimensions, floor elevations, floor to floor heights, minimum clearances between curtain wall and structural frame. Confirm that conditions are satisfactory before proceeding. Commencement of work of this Section indicates acceptance of surfaces and conditions.

3.2 ERECTION

.1 Erect curtain wall system plumb, level and square, in correct relation to work of other Sections, within a maximum non-cumulative deviation of 1/8" per 12' length of member, and with members accurately fitted and aligned at joints and intersections.

.2 Anchor system to building structure, adjusting as required to meet erection tolerances and secure to prevent movement other than that which is expected due to structural deflection and creep and thermal expansion and contraction.

.3 Provide all devices and components required for erection of system.

.4 Provide flashings, fillers, covers and sealants indicated and as required to render system weathertight and to meet specified performance criteria. Ensure effective seal at laps, end joints and changes of direction.

.5 Provide continuity of thermal and air seal/vapour barriers with adjacent thermal and air seal/vapour barrier systems. Pack spaces between frames and adjacent building elements and where shown with fibrous insulation.

.6 Seal joints between wall system and adjacent building elements with sealant in strict accordance with requirements of Section 07 92 00.

.7 Use concealed fastenings only.

.8 Touch up steel anchoring components, after installation, with zinc rich paint.

.9 Erection Tolerances: Install glazed aluminum curtain wall systems to the following maximum tolerances:

.1 Plumb: 3mm in 3048mm (1/8" in 10') with aggregate total not exceeding 6mm in 12192mm (1/4" in 40’).

.2 Level: 3mm in 6069mm (1/8" in 20') with aggregate total not exceeding 6mm in 12192mm (1/4" in 40’).

.3 Alignment: Limit misalignment of two adjoining glass panes abutting in the same plane as follows:

.1 Limit offset from true alignment to 1.6mm (1/16") where surfaces meet in-line or are separated by reveal or protruding element up to 13mm (1/2") wide.

.2 Limit offset from true alignment to 3mm (1/8") where surfaces are separated by reveal or protruding element from 13mm to 25mm (1/2" to 1") wide.

.3 Limit offset from true alignment to 6mm where surfaces are separated by reveal or protruding element of 25mm (1") or wider.

.4 Joint Width: Maintain sealant space between glass and adjacent construction to an average of 16mm (5/8"), with a variation of no more than +3mm (1/8") and -6mm (1/4").

.5 Location: Limit variation from plane to 3mm in 3658mm (1/8" in 12') with aggregate total not exceeding 13mm (1/2") over total length.

3.3 FINAL CLEANING

.1 Remove protective coatings and coverings from prefinished components; clean structural components and fittings; remove excess sealants and other substances that detract from finished appearance after completion of installation.

.2 At completion of work of this Section, remove all labels from glass and clean inner and outer faces of glass and all exposed metal surfaces at interior and exterior. Replace scratched or broken glass and make good any damaged materials, all in accordance with Division 01.

.3 Coordinate protective measures required to prevent damage or deterioration of structural glass system from subsequent construction activities.

END OF SECTION

1 General

1.1 SUMMARY

.1 Supply and install door hardware listed in the Hardware Schedule, establishes the quality standards, finishes, manufacturers and functions, and meets all current barrier free design standards required by authorities having jurisdiction.

1.2 ADMINISTRATIVE REQUIREMENTS

.1 Submission of Substitutions: Materials other than the named products for the Project may be acceptable to the Consultant, subject to Specification 01 25 00.

.2 Pre-installation Conference: Arrange a preconstruction meeting in accordance with Division 01 to discuss the following:

.1 Keying Conference: Conduct keying conference between the Owner, the Contractor and manufacturer to review and finalize requirements, at the Project site and incorporate decisions into final keying schedule after reviewing door hardware keying system.

.2 Electrified Hardware Conference: Conduct pre-installation conference at Project site and review methods and procedures related to electrified door hardware.

.3 Coordination: Obtain and distribute templates for doors, frames, and other work specified to be factory prepared for installing door hardware. Coordinate with shop drawings of other work to confirm that adequate provisions are made for locating and installing door hardware.

1.3 SUBMITTALS

.1 Provide required information in accordance with Division 01.

.2 Action Submittals: Provide the following submittals before starting any work of this Section:

.1 Product Data: Submit product data indicating installation details, material descriptions, dimensions of individual components and profiles, and finishes.

.2 Shop Drawings: Submit shop drawings indicating details of electrified door hardware including, but not limited to, the following:

.1 Wiring Diagrams: Detail wiring for power, signal, and control systems and differentiate between manufacturer installed and site installed wiring.

.3 Samples:

.1 Submit samples of complete line of hardware and finishes, if and when requested, to accompany any proposal for substitution. Fully label each sample as to manufacture, type, size and location for use proposed.

.4 Hardware Schedule: Submit door hardware schedule prepared by Architectural Hardware Consultant (AHC), detailing fabrication and assembly of door hardware, including make, model, material, function, size, finish, and other pertinent information.

.3 Do not order hardware from manufacturers until samples have been approved. Hardware and finishes supplied shall be identical with approved samples.

1.4 PROJECT CLOSEOUT SUBMISSION

.1 Operation and Maintenance Data: Provide operations and maintenance information in accordance with Division 01.

.2 Spare Parts and Tools: Submit unique parts and tools for maintaining hardware system in accordance with Division 01.

1.5 DELIVERY, HANDLING AND PROTECTION

.1 Pack hardware in suitable wrappings and containers to protect from injury during shipping and storage. Enclose accessories, fastening devices and other loose items with each item. Mark packages for easy identification as indicated on approved delivery schedule. Hand over hardware to designated installer.

1.6 WARRANTY

.1 Warrant door closers to remain free from defects in materials and workmanship in accordance with the General Conditions, but for a period of five (5) years, and locks and locksets for two (2) years. Agree to promptly make good defects which become apparent within warranty periods without cost to Owner.

2 Products

2.1 GENERAL

.1 Supply to the job site all items of finishing hardware as indicated in the Hardware Scheduled appended to this Section. All items to be supplied with complete and adequate fixing and anchoring devices necessary for satisfactory installation into or upon the various surfaces to which it is to be affixed.

.2 Cooperate with all trades using hardware supplied under this Section.

.3 Render a complete service to the metal fabrication contractor wherein full cooperation is assured them of the supply of hardware information, and templates as requested.

.4 Supply for installation by others where specified, as scheduled or indicated on the drawings.

.5 Provide six, (6) copies of the hardware specification for field construction and office use.

.6 All hardware shall be of the best quality and design, construction and finish, free from all defects.

.7 All blank strikes shall be ASA with no lip.

.8 Lock strikes shall be ASA with lip.

.9 All deadlock strikes shall be ASA with no lip.

.10 Where door pulls are scheduled on one side of door and a push plate on the other side, the contractor shall be responsible for fixing, so that the pull shall be secured through the door from the reverse side and the push plate installed to cover the thru bolts which will be countersunk flush with door.

.11 All door closers shall be non sized and where possible non handed. They shall be sized and adjusted by the installer to suit the site conditions.

.12 Panic sets are to be of style specified and completely plated.

.13 Before installing any hardware, carefully check all architectural drawings of Work requiring hardware, verify door swings, door and frame material and operating conditions. Ensure hardware will fit Work.

.14 Provide ULC approved hardware to ULC labelled doors.

.15 Check shop drawings and frame and door lists affecting hardware type and installation. Certify to correctness or advise Consultant in writing of required revisions.

.16 Templates:

.1 Check hardware schedule, drawings and specifications. Furnish promptly to applicable trades any patterns, templates, template information and manufacturer's literature required for proper preparation for and application of hardware, in ample time to facilitate progress of Work.

.2 Exposed screws for installing hardware shall have Phillips or Robertson heads.

.3 All door closers shall have back-checking features and shall be of proper size to operate door efficiently.

.4 Use no wall stops on drywall.

.5 Rim Panic Device strikes shall be mortise type application. Equip panic devices with hex bolts.

.17 Hinges

.1 Provide mortise type hinges, steel based for interior doors and stainless steel or brass for exterior doors or interior doors exposed to moisture.

.2 Provide hinges with stainless steel pins; non removable for exterior and public interior exposure, non rising for non security exposure.

.3 Provide full length continuous geared hinges, continuous pin and barrel hinges or full mortise type heavy weight butt hinges on all high frequency use or extreme weighted doors.

.4 Where doors are required to swing 180 degrees, provide ball bearing type swing clear hinges sufficient to clear trim.

.18 Locks, Cylinders, Latches and Bolts

.1 Locks are to be ANSI Grade 1 mortise type unless specified otherwise.

.2 Equip all locks with anti-friction latches with auxiliary latch guard. All fire rated doors must have a minimum latch throw as indicated on the fire door label.

.3 Where lever trim is required, provide levers containing concealed mounting and constructed of solid cast or forged material.

.4 Locks must be lever type.

.5 Provide locks in accordance with current barrier free accessibility requirements as set out by the OBC or by the jurisdiction having authority, when located in the barrier free path of travel.

.6 Strikes shall be ANSI standard size with curved lip strikes for latch bolts and no lip strikes for deadlocks. Provide complete with wrought iron boxes finished to match strike.

.7 Provide Cylinders and thumb turns with the correct cam or tailpiece to operate hardware correctly. Coordinate with Section 08 44 13 Glazed Aluminum Curtain Wall when applicable.

.8 Automatic flush bolts are to be equipped on all fire rated pairs of doors with regular use. Provide a coordinator in conjunction with automatic flush bolts.

.9 Provide a filler bar when using coordinators for a clean architectural appearance.

.19 Keying

.1 Provide a keying system for approval by the Owner.

.2 Costs of final keying shall be paid for by project Cash Allowance.

.20 Exit Device

.1 All exit devices installed on labelled fire doors shall carry a ULC or Warnock Hersey Label.

.2 Coordinate exit devices with astragals, coordinators, carry open bars and thresholds for correct and safe operation.

.3 All exit devices shall have exposed metal to match architectural finishes used on other hardware.

.4 Exit devices are push pad style only.

.5 Provide non-fire rated exit devices with hex key dogging feature (Cylinder dogging may be required in lieu of hex key dogging).

.6 Provide Power supplies of same manufacturer when using electrified exit devices.

.7 Match style and finish of trims on exit devices for locksets used.

.21 Closers

.1 All closers shall be hydraulically controlled and full rack and pinion in operation.

.2 All closers shall be fully adjustable including the following features: back check, speed control, and latch speed control.

.3 Provide mounting plates where required on special frame applications.

.4 Install all necessary attaching brackets, mounting channels, and cover plates where necessary for correct application of door closers.

.5 Supply to the Owner any special keys and wrenches as usually packed with door closers.

.6 Closers complete with a cover unless specified otherwise by the Consultant. Provide cover of matching architectural finish to the other hardware used in the project.

.7 Coordinate closers with overhead stops & holders.

.22 Push Plates and Door Pulls

.1 Provide and install stainless steel plates in type #304 stainless steel and install secure with screw fastening.

.2 Length of kick plates shall be 1-1/2" less than door width for single doors and 1" less than door width for doors in pairs.

.3 All stainless steel plates are 0.050" thick, free of rough or sharp edges. Corners and edges to have slight radiuses. Install kick plates and armor plates on both sides of the door with 3M tape or counter sunk screws as specified.

.4 Where door pulls are scheduled on one side of door and push plates on other side, issue installations instructions to ensure that the pull is secured through door from reverse side and countersunk flush with door installation of push plate. Locate push plate to cover fasteners for door pulls.

.23 Door Stops and Holders

.1 Wall stops are only to be used on wall conditions such as block or masonry. If necessary to mount on drywall, provide proper backing to ensure no damage to the wall.

.2 Supply floor stops of sufficient height to suit floor conditions and the undercut of the door.

.3 Provide gray rubber exposed resilient parts.

.4 Surface mount overhead door stops may be used unless they conflict with the door closer. All overhead stops are to be set to 90 degree opening unless stated otherwise.

.5 All door stops shall be heavy duty and of high quality.

.24 Door Seals and Thresholds

.1 Perimeter seals must be provided that fully seal all gaps between the floor, door and frame. Perimeter seal must protect against weather, smoke and sound.

.2 Frame gasketing must be constructed of neoprene. The aluminum housing must have a rib to prevent against distortion during installation.

.3 Provide aluminum frames with felt inserts by door supplier.

.4 Install Thresholds in a manner that ensures the door bottom comes in full contact.

.5 All thresholds shall be aluminum and installed with lead shields and stainless steel screws.

.6 Cut ends of thresholds to follow exactly the door frame profile.

.7 Provide barrier-free thresholds to all units identified as barrier free (BF) on balcony doors.

3 Execution

3.1 INSTALLATION

.1 Subcontractor installing the hardware shall carefully follow manufacturers' instructions for installation of all finish hardware.

.2 For mounting heights of various hardware items refer to the following, unless otherwise indicated on the Drawings:

.1 Locksets: 1024mm (40-5/16") from centre of lever to finished floor.

.2 Deadlocks: 1220mm (48") from centre of cylinder to finished floor.

.3 Mortise Night Latches: 1024mm (40-5/16") from centre of cylinder to finished floor.

.4 Panic Bolts: 1024mm (40-5/16") from centre of crossbar to finished floor.

.5 Push Plates: 1143mm 45" from centre of plate to finished floor.

.6 Guard Bars: 1024mm (40-5/16") from centre of bar to finished floor.

.7 Door Pulls: 1067mm (42") from centre of pull to finished floor.

.8 Blank Strike: 1024mm (40-5/16") from centre of strike to finished floor.

.9 Blank Fronts: 1024mm (40-5/16") from centre of strike to finished floor.

3.2 PERFORMANCE

.1 Adjustment and Cleaning:

.1 Provide services of competent mechanic without additional cost to Owner. Mechanic shall inspect installation of all hardware furnished under this Section and supervise all adjustments (by trades responsible for fixing) necessary to leave hardware in perfect working order.

3.3 HARDWARE SCHEDULE

.1 Refer to attached Schedule of Finishing Hardware.

Hardware Group No. 01

For use on Door #(s):
D000
Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	HARDWARE	ALL HARDWARE BY HATCH PROVIDER		UNK

Hardware Group No. 02

For use on Door #(s):
D100A D100B
Provide each BP door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	HARDWARE	ALL HARDWARE BY ELEVATOR MANUFACTURER		UNK

Hardware Group No. 03

For use on Door #(s):
D101
Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 5 X 4.5 NRP		630	IVE
1	EA	STOREROOM LOCK	ALX80P6 TLR CMK		626	SCH
1	EA	MORTISE CYLINDER	BY OWNER		626	UNK
1	EA	SURFACE CLOSER	4040XP SCUSH		689	LCN
1	EA	KICK PLATE	8400 8" X LDW		630	IVE
2	EA	GASKETING	328AA (2 X HEIGHT)		AA	ZER
1	EA	GASKETING	429AA (1 X W) HEAD		AA	ZER
1	EA	ASTRAGAL	43STST X SECURITY SCREW ASTRAGAL TO BE MOUNTED ON ACTIVE LEAF.		STST	ZER
1	EA	DOOR SWEEP	8192AA (1 X WIDTH)		AA	ZER
1	EA	THRESHOLD	625A (1 X WIDTH)		A	ZER
1	EA	DOOR CONTACT	679-05 (TO SUITE FRAME)	✓	BLK	SCE

Hardware Group No. 04

For use on Door #(s):
D102A D102C D200
Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 5 X 4.5		652	IVE
1	EA	FIRE EXIT HARDWARE	98-L-BE-F-4'-03		626	VON
1	EA	SURFACE CLOSER	4040XP REG OR PA AS REQ		689	LCN
1	EA	KICK PLATE	8400 8" X LDW		630	IVE
1	EA	WALL STOP	WS406/407CVX		626	IVE
1	EA	SMOKE SEAL	188SBK (1 X W, 2 X H)		BK	ZER

Hardware Group No. 05

For use on Door #(s):
D103A
Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 5 X 4.5		652	IVE
1	EA	PASSAGE SET	ALX10 TLR		626	SCH
1	EA	SURFACE CLOSER	4040XP REG OR PA AS REQ		689	LCN
1	EA	KICK PLATE	8400 8" X LDW		630	IVE
1	EA	WALL STOP	WS406/407CVX		626	IVE
1	EA	SMOKE SEAL	188SBK (1 X W, 2 X H)		BK	ZER

Hardware Group No. 06

For use on Door #(s):
D102B D103B
Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1HW 5 X 4.5 NRP		630	IVE
1	EA	RIM CYLINDER	BY OWNER		626	UNK
1	EA	PANIC HARDWARE	98-NL-4'		626	VON
1	EA	RIM CYLINDER	20-021 CMK		626	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH		689	LCN
1	EA	KICK PLATE	8400 8" X LDW		630	IVE
2	EA	GASKETING	328AA (2 X HEIGHT)		AA	ZER
1	EA	GASKETING	429AA (1 X W) HEAD		AA	ZER
1	EA	DOOR SWEEP	8192AA (1 X WIDTH)		AA	ZER
1	EA	THRESHOLD	625A (1 X WIDTH)		A	ZER
1	EA	DOOR CONTACT	679-05 (TO SUITE FRAME)	✓	BLK	SCE

CURRENTLY ONLY SHOWING EXIT ONLY, IF DOOR IS REQUIRED FOR ENTRY KEY WILL BE REQUIRED EACH TIME

Hardware Group No. 07

For use on Door #(s):
D103C
Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 5 X 4.5		652	IVE
1	EA	CLASSROOM LOCK	ALX70P6 TLR CMK		626	SCH
1	EA	K/L CYLINDER	BY OWNER		626	UNK
1	EA	SURFACE CLOSER	1461 REG		689	LCN
1	EA	KICK PLATE	8400 8" X LDW		630	IVE
1	EA	WALL STOP	WS406/407CVX		626	IVE
1	EA	SMOKE SEAL	188SBK (1 X W, 2 X H)		BK	ZER

Hardware Group No. 08

For use on Door #(s):
D104
Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 5 X 4.5		652	IVE
1	EA	STOREROOM LOCK	ALX80P6 TLR CMK		626	SCH
1	EA	K/L CYLINDER	BY OWNER		626	UNK
1	EA	OH STOP	90S		630	GLY
1	EA	SURFACE CLOSER	1461 REG		689	LCN
1	EA	KICK PLATE	8400 8" X LDW		630	IVE
1	EA	WALL STOP	WS406/407CVX		626	IVE

Hardware Group No. 09

For use on Door #(s):
D105
Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 5 X 4.5		652	IVE
1	EA	CLASSROOM LOCK	ALX70P6 TLR CMK		626	SCH
1	EA	K/L CYLINDER	BY OWNER		626	UNK
1	EA	SURFACE CLOSER	1461 REG		689	LCN
1	EA	KICK PLATE	8400 8" X LDW		630	IVE
1	EA	WALL STOP	WS406/407CVX		626	IVE

Hardware Group No. 10

For use on Door #(s):
D104A D104B D300
Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	HARDWARE	ALL HARDWARE BY DOOR MANUFACTURER		UNK

Hardware Group No. 11

For use on Door #(s):
D106
Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 5 X 4.5		652	IVE
1	EA	ENTRANCE/OFFICE LOCK	ALX50P6 TLR		626	SCH
1	EA	K/L CYLINDER	BY OWNER		626	UNK
1	EA	WALL STOP	WS406/407CVX		626	IVE

Hardware Group No. 12

For use on Door #(s):
D201A D201B D202A
Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 5 X 4.5 NRP		652	IVE
1	EA	STOREROOM LOCK	ALX80P6 TLR CMK		626	SCH
1	EA	K/L CYLINDER	BY OWNER		626	UNK
1	EA	SURFACE CLOSER	1461 SCUSH STD		689	LCN
1	EA	KICK PLATE	8400 8" X LDW		630	IVE
1	EA	SMOKE SEAL	188SBK (1 X W, 2 X H)		BK	ZER

Hardware Group No. 13

For use on Door #(s):
D202
Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 5 X 4.5 NRP		652	IVE
1	EA	STOREROOM LOCK	ALX80P6 TLR CMK		626	SCH
1	EA	K/L CYLINDER	BY OWNER		626	UNK
1	EA	SURFACE CLOSER	1461 DEL SCUSH STD		689	LCN
1	EA	KICK PLATE	8400 8" X LDW		630	IVE
1	EA	SMOKE SEAL	188SBK (1 X W, 2 X H)		BK	ZER

Hardware Group No. 14

For use on Door #(s):
D203
Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 5 X 4.5		652	IVE
1	EA	PASSAGE SET	ALX10 TLR		626	SCH
1	EA	OH STOP	90S		630	GLY
1	EA	SURFACE CLOSER	1461 SCUSH STD		689	LCN
1	EA	KICK PLATE	8400 8" X LDW		630	IVE

Hardware Group No. 15

For use on Door #(s):
D204
Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER			FINISH	MFR
3	EA	HINGE	5BB1 5 X 4.5			652	IVE
1	EA	STOREROOM LOCK	ALX80P6 TLR CMK			626	SCH
1	EA	K/L CYLINDER	BY OWNER			626	UNK
1	EA	INTERFACE BOX	JB7				VON
1	EA	ELECTRIC STRIKE	6400 FSE 12/24 VAC/VDC		✓	630	VON
1	EA	LED Annunicator	CM-AF500				CAM
1	EA	SURF. AUTO OPERATOR	9131 MS AS REQ (120 VAC)		✓	ANCLR	LCN
1	EA	AURA PUSH TO LOCK	CM-45/855/SFE1		✓	630	CAM
2	EA	ILLUMINATED ACTUATOR	CM-45/4/FGR/SFE1		✓		CAM
1	EA	KICK PLATE	8400 10" X LDW			630	IVE
1	EA	WALL STOP	WS406/407CVX			626	IVE
1	EA	DOOR CONTACT	679-05 (TO SUITE FRAME)		✓	BLK	SCE
1	EA	ADVANCED LOGIC RELAY	CX-33		✓		CAM
1	EA	EMERG CALL KIT UNIV RESTRMS	CX-WEC10K2				CAM
1	EA	POWER SUPPLY	PS902 900-8F 120/240 VAC		✓	LGR	SCE

Hardware Group No. 16

For use on Door #(s):
D205
Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 5 X 4.5		652	IVE
1	EA	PRIVACY LOCK W/ OUTSIDE INDICATOR	ND40S TLR OS-OCC		626	SCH
1	EA	KICK PLATE	8400 10" X LDW		630	IVE
1	EA	WALL STOP	WS406/407CCV		626	IVE

Hardware Group No. 17

For use on Door #(s):
D206
Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 5 X 4.5		652	IVE
1	EA	PANIC HARDWARE	98-L-BE-4'-03		626	VON
1	EA	SURFACE CLOSER	4040XP REG OR PA AS REQ		689	LCN
1	EA	KICK PLATE	8400 8" X LDW		630	IVE
1	EA	WALL STOP	WS406/407CVX		626	IVE

CONFIRM IF EXIT DEVICES ARE REQUIRED FOR EGRESS INTO STAIRWELL?

Hardware Group No. 18

For use on Door #(s):
D207A
Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 5 X 4.5		652	IVE
1	EA	CLASSROOM LOCK	ALX70P6 TLR CMK		626	SCH
1	EA	K/L CYLINDER	BY OWNER		626	UNK
1	EA	OH STOP	90S		630	GLY
1	EA	SURFACE CLOSER	1461 REG		689	LCN
1	EA	KICK PLATE	8400 8" X LDW		630	IVE

Hardware Group No. 19

For use on Door #(s):
D207B
Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
2	EA	CONT. HINGE	112XY		628	IVE
2	EA	MANUAL FLUSH BOLT	BY ALUM DOOR SUPPLIER		626	UNK
1	EA	DUST PROOF STRIKE	DP1		626	IVE
1	EA	THUMBTURN	4066		689	ADA
1	EA	MORTISE CYLINDER	BY OWNER		626	UNK
1	EA	DEADBOLT	MS1850 (SPECIFY BACKSET)		689	ADA
1	EA	MORTISE CYLINDER	20-013 CMK		626	SCH
2	EA	PUSH/PULL BAR	9145EZHD-10"-NS		630	IVE
2	EA	OH STOP	100S		630	GLY
2	EA	SURFACE CLOSER	4040XP TOP JAMB LONG		689	LCN
2	EA	TOP JAMB MTG PLATE	4040XP-18TJ		689	LCN
1	EA	WEATHER STRIPPING	WEATHER STRIP BY DOOR SUPPLIER			UNK
2	EA	DOOR SWEEP	8192AA (1 X WIDTH)		AA	ZER
1	EA	THRESHOLD	625A (1 X WIDTH)		A	ZER
2	EA	DOOR CONTACT	679-05 (TO SUITE FRAME)		BLK	SCE

END OF SECTION

1 General

1.1 SUMMARY

.1 Furnish glazing materials and accessories to complete the fabrication and installation of:

.1 Tempered Glass Doors and Interior Glazed Screens

.2 Exterior Insulated Glass Unit

.3 Fire Rated, Ceramic Fire-Rated Glass

1.2 REFERENCE STANDARDS

.1 American Society for Testing and Materials (ASTM):

.1 ASTM C542-05(2011), Standard Specification for Lock-Strip Gaskets

.2 ASTM C920-11, Standard Specification for Elastomeric Joint Sealants

.3 ASTM C1172-09e1, Standard Specification for Laminated Architectural Flat Glass

.2 Canadian General Standards Board (CGSB):

.1 CAN/CGSB-12.1-M90, Tempered or Laminated Safety Glass

.2 CAN/CGSB-12.3-M91, Flat, Clear Float Glass

.3 CAN/CGSB-12.8-97, Insulating Glass Units

.4 CGSB-12.20-M89, Structural Design of Glass for Buildings

.3 National Fire Protection Association (NFPA):

.1 NFPA 80-2013, Standard For Fire Doors and Other Opening Protectives

1.3 SUBMITTALS

.1 Provide submittals in accordance with Division 01.

.2 Action Submittals: Provide the following submittals before starting any work of this Section:

.1 Product Data: Submit manufacturer's product data for each type of product specified. Data shall indicate compliance with specification and installation recommendations of manufacturer of products being used.

.2 Samples: Submit samples of materials if required by Consultant before commencing work of this section. Samples shall be clearly labeled with manufacturer's name and type.

.3 Shop Drawings: Submit shop drawings, to the Consultant for review prior to fabrication.

.4 Samples for Verification: Submit samples for verification including sample sets showing the full range of variations expected where products involve normal colour variations.

.5 Maintenance Data: Upon completion of installation, supply instructions covering re-glazing, adjustments and other relevant maintenance data.

.3 Thermal Performance

.1 Submit Test Report(s) prepared by independent testing laboratory, certifying IGUs achieve the required thermal performance (U-Values) as scheduled in these specifications.

1.4 QUALITY ASSURANCE

.1 Conform to the requirements of the Flat Glass Marketing Association Glazing Manual, latest Edition.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Delivery and Acceptance Requirements: Deliver packaged materials in their original containers with manufacturer's labels and seals intact.

.2 Storage and Handling Requirements: Store vertically, blocked off the floor in a weatherproof enclosure in original containers with manufacturers labels and seals intact until read for installation, and as follows:

.1 Install glass as soon as possible after delivery to site.

.2 Handle glass carefully to its place of installation.

.3 Prevent damage to glass, adjacent materials and surfaces.

1.6 SITE CONDITIONS

.1 Ambient Conditions: Maintain temperature, humidity and solar exposure conditions of Glass Glazing materials during shipping, storage and site installation as required by manufacturer to maintain warranty and performance of installed products.

1.7 WARRANTY

.1 Provide manufacturer’s warranty for the following types of glass listed, against defects in materials and workmanship for the period indicated, commencing from the date of Substantial Performance of Work:

.1 Seal Failure: Failure of hermetic seal under normal use that is attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning insulating glass contrary to manufacturer's written instructions.

.2 Evidence of Failure: Obstruction of vision by dust, moisture, or film on interior surfaces of glass.

.3 Allowable Specific Exclusions: Breakage resulting from thermal stress will be accepted as a limitation to the warranty in accordance with CAN/CGSB 12.20.

.4 Warranty Period: Ten (10) Years.

2 Products

2.1 MATERIALS

.1 Float Glass: In accordance with CAN/CGSB-12.3, glazing quality and as follows:

.1 Clear Glass: No tint

.2 Tempered Glass:

.1 Clear, conforming to CAN/CGSB-12.1, Type 2, Class 'B'. Tempering shall be performed using horizontal tong free method.

.3 Fire Rated, Ceramic Fire-Rated Glass (FGL-01): Material used in door and screen applications with fire rating requirements of 60 minutes with hose stream test.

.1 Fire Rated Glass: Two-ply of glass ceramic, laminated with Teflon or PVB interlayer and as follows:

.1 Thickness: 8mm

.2 Finish: Sandblasted Finish.

.3 Fire Rating: as scheduled.

.4 Labelled: Permanent logo listing name of product, manufacturer, testing laboratory, fire rating period and safety requirements

.5 Basis-of-Design Materials:

.1 Technical Glass Products, FireLite Plus

.2 VetroTech, Keralite Select L

.3 SAFTI: Pyran Platinum L

.4 Gaskets:

.1 Neoprene/EPDM thermoplastic rubber type gaskets of sufficient thickness to be compressed 25% when installed, having 2,000 psi tensile strength, with 50 durometer shore A hardness plus/minus 5, maximum 30% resistance to permanent set, resistance to ozone without cracking, minimum elongation at break of 300% and conforming to ASTM C542.

.2 Colour - "Black".

.5 Sealant:

.1 One component, silicone base, solvent curing sealant conforming to ASTM C920. Colour as selected Later by Consultant.

.6 Glazing Compound:

.1 Non-hardening modified oil type glazing compound.

.7 Setting Blocks:

.1 Neoprene/EPDM rubber type, 4" long, with 40 to 50 durometer shore A hardness plus/minus 5; resistant to sunlight, weathering, oxidation and permanent deformation under load and wide enough to extend from fixed stop to opposite face of glass of thickness suitable to glazing condition to provide adequate glazing "bite".

.8 Spacer Shims:

.1 Neoprene/EPDM rubber type, with 40 to 50 durometer shore A hardness plus/minus 5; resistant to sunlight, weathering, oxidation and permanent deformation under load and of adequate thickness to provide correct glass to face clearance at least 1/8".

.9 Glazing Tape:

.1 Macro-polyisobutylene preformed glazing tape, 'Polyshim' or 'Vision Strip' by Tremco Ltd., division of RPM Company, or approved equal.

2.2 INSULATING GLASS

.1 Insulating Glass Units: Provide sealed insulating glass units in accordance with CAN/CGSB-12.8 in configurations indicated, and as specified herein.

.2 Manufacture sealed insulating glass units without edge channels or tape, that is, with bare glass edges.

.3 Use two stage seal method of manufacture, as follows:

.1 Primary Seal: Polyisobutylene sealing compound between glass and metal spacer/separator. Colour: Black.

.2 Secondary Seal: Structural silicone based, filling gap between the two lites of glass at the edge up to the spacer/separator and primary seal. Colour: Black.

.4 Insulating Glass Units (IGU):

.1 Insulated Glass Unit: Factory sealed type insulating glass units conforming to CAN/CGSB 12.8, and as follows:

.1 Outer Lite:

.1 Minimum 4mm (5/32") thick, clear, heat strengthened glass conforming to CAN/CGSB-12.1-M, Type 2, Class "B" with low emissivity coating on the 2nd surface. Tempering shall be performed using horizontal tong-free method.

.2 Gas Infill: 13mm (½") Argon Filled.

.3 Inner Lite: Minimum 6mm (1/4") thick, clear, tempered glass conforming to CAN/CGSB-12.1-M, Type 2, Class "B". Tempering shall be performed using horizontal tong-free method.

.4 Basis of Design Manufacturer: Guardian Glass, or approved equivalent.

.2 Insulating Glass Units (IGU) Design Characteristics:

.1 Solar Heat Gain Coefficient (SHGC): 0.341

.2 Shading Coefficient (SC): 0.392

.3 Glass U-Value: 1.35 (w/m2*K)

.4 Visible Light Transmittance: 52%

2.3 FABRICATION AND MANUFACTURE

.1 Label each light of glass with the registered name of the product and the weight and quality of the glass.

.2 Check dimensions on site before cutting materials.

.3 Minimum bite or lap of glass on stops and rabbets as recommended by glass manufacturer. Finish surfaces shall be free of tong marks.

.4 Cut glass true to dimensions, square, plumb and level. Verify all dimensions prior to fabrication.

.5 Distortion, pock marking or defects detrimental to appearance and/or performance, as determined by the Consultant, will be rejected.

2.4 GLAZING COMPOUND FOR FIRE RATED GLAZING MATERIALS

.1 Glazing Tape: Closed cell polyvinyl chloride foam, coiled on release paper over adhesive on two sides, maximum water absorption by volume of 2%, designed for compression of 25% to effect an air and vapour seal.

.2 Silicone Sealant: One-part neutral curing silicone, medium modulus sealant, Type S; Grade NS; Class 25 with additional movement capability of 50% in both extension and compression (total 100%); Use (Exposure) NT; Uses (Substrates) G, A, and O as applicable.

.1 Acceptable materials:

.1 Dow Corning Corp., Dow Corning 795

.2 General Electric Co., Silglaze-II 2800

.3 Tremco Inc., Spectrum 2

.4 Or approved equivalent.

.3 Setting Blocks: Hardwood, glass width by 4"x ¼" thick.

.4 Spacers: Neoprene or other resilient blocks of 40 to 50 Shore A durometer hardness, adhesive-backed on one face only, tested for compatibility with specified glazing compound.

.5 Cleaners, Primers, and Sealers: Type recommended by manufacturer of glass and gaskets.

2.5 FABRICATION: FIRE RATED GLASS

.1 Fabricate glass and other glazing products in sizes required to glaze openings indicated for project, with edge and face clearances, edge and surface conditions, and bite complying with recommendations of product manufacturer and referenced glazing standards as required to comply with system performance requirements.

3 Execution

3.1 EXAMINATION

.1 Examine areas of work affecting the work of this section. Report in writing all defects, errors and discrepancies immediately to the Consultant.

.2 Commencement of work implies acceptance of surfaces and conditions.

3.2 PREPARATION

.1 Openings shall be free from moisture, frost, rust, dirt and foreign matter.

.2 Clean surface to receive sealant with a clean cloth dampened with xylol or a 50-50 mixture of acetone and xylol. Wipe dry with a clean, dry cloth.

3.3 INSTALLATION

.1 Conform to the recommendation of the glazing manual, Flat Glass Marketing Association, latest edition and as specified herein.

.2 Unless otherwise indicated on drawings otherwise, provide tempered glass at all doors, transoms, sidelights and vision lites within 2'-6" of grade and/or finished floor.

.3 Glaze doors scheduled to be glazed.

.4 Set sheet glass with draw lines horizontal.

.5 Glaze interior openings using compound or glazing tapes or gaskets.

.6 Install removable stops. Insert spacer shims between glass and stops at 24" O.C. and not less than 1/4" below "sight lines". Fill remaining voids with sealant or glazing compound to "sight lines" and trim sealant/glazing compound to produce clean, sharp, straight lines without voids or depressions.

.7 Replace loose stops in their original positions, tighten all screws.

.8 Refer to drawings and door and frame schedule for locations of each type of glass.

3.4 INSTALLATION – FIRE RATED GLASS

.1 Comply with GANA standards and instructions of manufacturers of glass, glazing sealants, and glazing compounds.

.2 Protect glass from edge damage during handling and installation. Inspect glass during installation and discard pieces with edge damage that could affect glass performance.

.3 Place hardwood setting blocks located at quarter points of glass with edge block no more than 150mm (6") from corners.

.4 Glaze vertically into labelled fire rated metal frames or partition walls with same fire rating as glass and push against tape for full contact at perimeter of pane or unit.

.5 Place glazing tape on free perimeter of glazing in same manner described above.

.6 Do not remove protective edge tape.

.7 Install removable stop and secure without displacement of tape.

.8 Do not pressure glaze. Knife trim protruding tape.

.9 Provide minimum ¼” edge clearance.

.10 Install vision panels in fire rated doors to requirements of NFPA 80.

.11 Install so that appropriate fire rating labels and markings remain permanently visible.

3.5 CLEANING

.1 Repair all defects caused by the work of this section. Remove as work progresses, all excess or foreign materials or droppings which would set or become difficult to remove from surfaces at time of final cleaning.

.2 Immediately prior to acceptance of work of this section by Consultant, remove temporary protection, clean and polish exposed surfaces of all work of this section. Use proper cleaning materials and methods to prevent damage to surfaces, finishes, sealer or work of other trades. Make good such damage to Consultant's satisfaction.

.3 Do not use steel wool, wire brushes or steel scrapers on any finished surfaces.

.4 Replace or make good to Consultant's satisfaction, upon completion of work of this section, all defective, scratched or damaged work, at no extra cost to the Owner.

END OF SECTION

1 General

1.1 SUMMARY

.1 This Section includes requirements for supply and installation of fixed louvers, bird screens, blank-off panels and attachment brackets as shown on drawings, as specified and as required for complete and proper installation.

1.2 REFERENCE STANDARDS

.1 American Society for Testing and Materials (ASTM):

.1 ASTM B209-10, Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate

.2 ASTM B211-12e1, Standard Specification for Aluminum and Aluminum Alloy Rolled or Cold Finished Bar, Rod, and Wire

.3 ASTM B221-12, Standard Specification for Aluminum and Aluminum Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes

.4 ASTM E90-09, Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements

.2 Canadian Standards Association (CSA):

.1 CAN/CSA-S157-05/S157.1-05 (R2010), Strength Design in Aluminum / Commentary on CSA S157-05, Strength Design in Aluminum

.2 CAN/CSA-S136-07, North American Specification for the Design of Cold-Formed Steel Structural Members

.3 Architectural Aluminum Manufacturers Association (AAMA):

.1 AAMA 605.2-95, Voluntary Specification for High Performance Organic Coatings on Aluminum Extrusions and Panels

.2 AAMA 800-10, Voluntary Specifications and Test Methods for Sealants

.3 AAMA 2605-11 Superior Performing Organic Coatings on Aluminum Extrusions and Panels

.4 AAMA TIR Metal Curtain Wall Fasteners (2000 Addendum)

.4 Air Movement and Control Association International Inc. (AMCA):

.1 AMCA Standard 500-L-12, Laboratory Methods of Testing Louvers for Rating

.2 AMCA Publication 501-09, Application Manual for Louvers

.3 AMCA Publication 511-10 (Rev. 8/12), Certified Ratings Program - Product Rating Manual for Air Control Devices

1.3 ADMINISTRATIVE REQUIREMENTS

.1 Coordination: Coordinate the Work of this Section with the installation of ductwork; Sequence work so that installation of louvers coincides with installation of HVAC materials without causing delay to the Work.

.2 Pre-Construction Conference: Arrange a site meeting, to coincide with regular bi-weekly site meetings, attended by the Contractor, the Subcontractor's representative and foreman for this project, the Consultant, materials supplier(s), and other relevant personal before commencement of work for this Section; agenda for meeting will include; but not be limited to, the following:

.1 Review methods and procedures related to installation, including manufacturer's written instructions;

.2 Examine substrate conditions for compliance with manufacturers installation requirements;

.3 Review temporary protection measures required during and after installation.

1.4 SUBMITTALS

.1 Provide requested information in accordance with Division 01.

.2 Action Submittals: Provide the following submittals before starting any work of this Section:

.1 Product Data:

.1 Air flow and water entrainment performance test results

.2 Material types and thickness

.2 Shop Drawings: Submit shop drawings showing the location, finished appearance and dimensions of each type of louver. Show all material, thicknesses, connections, fastenings, shapes and finishes.

.3 Coating Samples: Submit samples of factory applied coatings and finishes for Consultant’s initial selection.

.4 Samples: Submit for approval 305mm (12") long sample lengths of each type of louver blade and frame extrusion prior to full scale production, showing finish colour.

.3 Information Submittals:

.1 Certification: Submit product test reports based on evaluation of comprehensive tests performed by a qualified testing agency for each type of louver required for this project.

.2 Performance Requirements: Provide AMCA test data as required to confirm that the louvers have the specified air and water performance characteristics.

.3 Acoustical Performance: Where applicable, submit test reports to confirm that the louvers meet the specified STC and Noise Reduction requirements.

.4 Structural Requirements: Design all materials to withstand wind load of 20 psf (955 Pa) and snow loads as required by the applicable building code, and recommended by the louver manufacturer.

.1 Ensure louver members deflect no more than L/180 of span between supports when subjected to wind load applied horizontally to louver face.

.5 Delegated Design Submittals: Furnish complete design calculations and details, fabrication and erection shop drawings and site review for fixed louvers, bearing the seal of a Professional Engineer registered in the Province of the Work, in accordance with applicable Building Code and Contract Documents.

1.5 CLOSEOUT SUBMITTALS

.1 Operation and Maintenance Data: Submit manufacturer's written instructions for cleaning solutions, materials and procedures, include name of original installer and contact information in accordance with Division 01.

.1 Provide specific warning of any maintenance practice or materials that may damage or disfigure the finished Work.

1.6 QUALITY ASSURANCE

.1 Qualifications: Provide proof of qualifications when requested by Consultant:

.1 Manufacturer / Supplier: Obtain materials from one source with resources to provide products from the same production run for each contiguous area of consistent quality in appearance and physical properties.

.2 Installers: Execute Work of this Section using qualified personnel skilled in installation of work of this Section, having a minimum of three (3) years proven experience of installations similar in material, design, and extent to that indicated for this Project.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Delivery: At the time of delivery, visually inspect all materials for damage. Note any damaged boxes, crates, or louver sections on the receiving ticket and immediately report to the shipping company and the material manufacturer.

.2 Storage: Store louver raised off the ground and cover with a weather proof flame resistant sheeting or tarpaulin.

.3 Handling:

.1 Material shall be handled in accordance with sound material handling practices and in such a way as to minimize racking.

.2 Louver sections may be hoisted by attaching straps to the jambs and lifting the section while it is in a vertical position.

.3 Louver sections should only be lifted and carried by the jambs. Heads, sills and blades are not to be used for lifting or hoisting louver sections.

1.8 SITE CONDITIONS

.1 Verify dimensions of actual opening by field measurements before fabrication and indicate measurements on Shop Drawings where fixed louvers are indicated to fit walls and other construction.

.2 Establish dimensions and proceed with fabricating fixed louvers where field measurements cannot be made without delaying the work; allow for trimming and fitting.

1.9 WARRANTY

.1 Warrant the work of this section in accordance with General Conditions but for a period of one (1) year and agree to repair or replace faulty materials or work which becomes evident during the warranty period without cost to the Owner and at the Owner's convenience.

.2 Special Finish Warranty: Submit a written warranty, signed by manufacturer, covering failure of the factory-applied exterior finish on aluminum louvers within the specified warranty period and agreeing to repair finish or replace louvers that show evidence of finish deterioration. Deterioration of finish includes, but is not limited to, colour fade, chalking, cracking, peeling, and loss of film integrity for a period of ten (10) years from date of Substantial Performance.

2 Products

2.1 MANUFACTURER

.1 Basis-of-Design products are named in this Section; additional manufacturers offering similar fixed metal louvers may be incorporated into the work provided they meet the performance requirements established by the named products.

.2 Acceptable Materials Manufacturers: Subject to compliance with requirements specified in this Section and as established by the Basis-of-Design Materials, manufacturers offering products that may be incorporated into the Work include; but are not limited to, the following:

.1 McGill Architectural Products

.2 TenPlus Architectural Products Ltd.

.3 Construction Specialties

2.2 MATERIALS

.1 Aluminum Extrusions: ASTM B211, Aluminum Alloy 6063-T52.

.2 Aluminum Sheet: ASTM B209, Aluminum Alloy 6063-T52.

.3 Fastenings: Provide zinc plated steel or AISI Type 304 stainless steel for screws and fasteners.

.4 Structural Support: Designed and furnished by louver manufacturer to support wind load of 955 Pa (20 psf), unless otherwise specified.

2.3 FIXED LOUVER SYSTEMS

.1 Stormproof Louvers (LV-01):

.1 102mm (4") deep fixed type, stormproof aluminum louver, with 6063-T52 aluminum alloy extrusion, and as described in the following performance criteria:

.1 Performance Rating Standard: AMCA Standard 500L

.2 Certification: Louver AMCA tested, certified and licensed to bear the AMCA seal for the following:

.1 Air performance

.2 Water penetration

.3 Extrusion Thickness:

.1 Head, Sill, Jambs and Mullions: Minimum 2mm (0.080") thick.

.2 Blades: Minimum 2mm (0.080") thick.

.4 Louver Type: Horizontal fixed blade.

.5 Basis of Design Product: Model HP-445 Rain Defence High Performance Louver by McGill Architectural Products, (or approved alternate).

2.4 ACCESSORIES

.1 Sill Flashing: Provide sill flashing of same material and finish as adjacent louver, as approved by the Consultant.

.2 Structural Support:

.1 Louver Support: Designed and furnished by louver manufacturer to support wind load of 955 Pa (20 psf), unless others specified.

.3 Bird Screens:

.1 12mm (1/2") opening, 1.13mm (0.044") re-galvanized steel wire mesh, in an extruded aluminum frame. Removable screen frame to be independent to louver assembly, attaching to the interior face of the louver, providing continuous coverage.

.4 Insect Screens:

.1 Supply manufacturer's standard aluminum mesh insect screen, welded to aluminum frame. Removable screen frame to be independent to louver assembly, attaching to the interior face of the louver, providing continuous coverage.

2.5 FABRICATION

.1 Fabricate as required for optimum performance with respect to water penetration, strength, durability and uniform appearance.

.2 Fabricate louvers to outside dimensions indicated, with allowance of 10mm (3/8”) on each side for sealant joints. Coordinate size, location and placement of units, with installer, prior to fabrication.

.3 Fabricate louvers to minimize field adjustments, splicing, mechanical joints and field assembly of units. Assemble units in shop to greatest extent possible and disassemble as necessary for shipping and handling.

.4 Clearly mark units for assembly and coordinated installation. Include vertical structural supports, where required.

.5 Provide vertical mullions of type and spacing indicated but not greater than 1524mm (5') o/c. Mechanically assemble louvers using stainless steel or zinc plated steel fasteners recommended by manufacturer.

.6 Provide supports, anchors and accessories required for a complete assembly.

2.6 FINISHES

.1 Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

.2 Protect finish with strippable protective film.

.3 Concealed Aluminum: As Fabricated Finish (Mill Finish); AA-M10 fabricated mechanical finish.

.4 High Performance Organic Finish:

.1 Two (2) Coat PVDF or FEVE Coating:

.1 Manufacturer's standard 2 coat, thermo-cured system consisting of specially formulated inhibitive primer and colour topcoat, and apply coating to exposed metal surfaces in accordance with AAMA 2605 and with coating and resin manufacturers' written instructions.

.2 Colour: As selected by Consultant from manufacturer's full product range.

.3 Basis of Design Materials: PPG Duranar, (or approved alternate).

.5 Steel (Concealed):

.1 Hot-dip galvanized in accordance with CAN/CSA-G164, with minimum coating of 2 oz./sq.ft., or zinc rich paint.

.6 Isolate where necessary to prevent electrolysis due to dissimilar metal-to-metal contact or metal-to-masonry and concrete contact. Use bituminous paint, butyl tape or other approved divorcing material.

3 Execution

3.1 EXAMINATION

.1 Verification of Conditions:

.1 Examine openings to receive work and surrounding adjacent surfaces for conditions affecting installation. Coordinate with related sections providing openings to ensure proper dimensions are maintained.

.2 Verify dimensions of supporting structure by accurate field measurements so that work will be accurately designed, fabricated and fitted to the structure.

.2 Notify Contractor in writing of any conditions that are not acceptable.

.3 Proceed with installation after verification and correction of surface conditions acceptable to manufacturer.

3.2 INSTALLATION

.1 Comply with manufacturer's instructions and recommendations for installation of the work, as shown on approved Shop Drawings.

.2 Anchor louvers to the building substructure as indicated on Shop Drawings and architectural drawings.

.3 Erection Tolerances:

.1 Maximum variation from plane or location shown on the approved shop drawings 3mm in 3048mm (1/8" in 10').

.2 Maximum offset from true alignment between two members abutting end to end, edge-to-edge in line: 1.6mm (1/16").

.3 Erection tolerances shall prevail under both load and no load conditions.

.4 Cut and trim component parts during erection only with the approval of the manufacturer, and in accordance with the manufacturer' recommendations. Restore finish completely.

.5 Remove and replace members where cutting and trimming has impaired the strength or appearance of the assembly. Set units level, plumb and true to line, with uniform, tight joints to adjacent work.

.6 Provide necessary fastenings, anchors, clip angles, sills and sill flashings required to complete the installation.

3.3 PROTECTION

.1 Protect installed materials to prevent damage by other trades. Use materials that may be easily removed without leaving residue or permanent stains.

3.4 CLEANING

.1 Progress Cleaning: Leave work area clean at the end of each work day, ensuring safe movement of passing pedestrians.

.2 Final Cleaning: At completion of installation, clean all surfaces so they are free of foreign matter using cleaners recommended by material manufacturer.

.3 Restore louvers and accessory components damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by the Consultant, remove and replace damaged systems with new at no additional cost to the Owner.

.4 Waste Management: Co-ordinate recycling of waste materials and packaging at appropriate facility, diverting waste from landfill. Certified installer shall be responsible for ensuring waste management efforts are practiced.

END OF SECTION

1 General

1.1 SUMMARY

.1 Section Includes the following:

.1 Non-load-bearing steel framing systems for interior partitions.

.2 Non-load bearing steel framing systems for ULC fire rated shaftwall assemblies.

.3 Suspension systems for interior ceilings and soffits.

.4 Grid suspension systems for gypsum board ceilings.

1.2 REFERENCE STANDARDS

.1 Canadian Standards Association (CSA):

.1 CSA S136-07, North American Specification for the Design of Cold-Formed Steel Structural Members.

.2 Canadian General Standards Board (CGSB):

.1 CAN/CGSB-7.1-98, Lightweight Steel Wall Framing Components

.3 American Society for Testing and Materials International (ASTM):

.1 ASTM A641/A641M-09a, Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.

.2 ASTM A653/A653M-11 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.3 ASTM A792/A792M-10, Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.

.4 ASTM A875/A875M-10, Specification for Steel Sheet, Zinc-5% Aluminum Alloy-coated by the Hot Dip Process.

.5 ASTM A1003/A1003M-12, Specification for Steel Sheet, Carbon, Metallic and Non-Metallic Coated for Cold Formed Framing Members.

.6 ASTM C11-10a, Standard Terminology Relating to Gypsum and Related Building Materials.

.7 ASTM C473-12, Standard Test Methods for Physical Testing of Gypsum Panel Products.

.8 ASTM C645-11a, Standard Specification for Nonstructural Steel Framing Members.

.9 ASTM C665-12, Standard Specification for Mineral-Fibre Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

.10 ASTM C754-11, Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.

.11 ASTM C834-10, Standard Specification for Latex Sealants.

.12 ASTM C841-03(2008)e1, Standard Specification for Installation of Interior Lathing and Furring.

.13 ASTM C954-11, Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033" to 0.112" in Thickness.

.14 ASTM C955-11c, Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases

.15 ASTM C1002-07, Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.

.4 Canadian Sheet Steel Building Institute (CSSBI):

.1 CSSBI S6-2011, Guide Specification for Lightweight Steel Framing

1.3 SUBMITTALS

.1 Provide submittals in accordance with Division 01.

.2 Action Submittals: Provide the following submittals before starting any work of this Section:

.1 Product Data: Submit manufacturer’s product data for each materials specified including recommended application rates and methods of installation.

.3 Informational Submittals: Provide the following submittals during the course of the work:

.1 Product Certificates: For each type of code-compliance certification for studs and tracks.

.2 Shop Drawings: Submit shop drawings showing the design, construction and relevant details of furring, enclosures and partitions which require a fire rating.

1.4 QUALITY ASSURANCE

.1 Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the product-certification program of the Steel Stud Manufacturers Association (SSMA).

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

1.5 DELIVERY, STORAGE, HANDLING AND PROTECTION

.1 Coordinate deliveries to comply with construction schedule and arrange ahead for off the ground, enclosed, 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, in accordance with GA-238 and manufacturer's recommendations.

2 Products

2.1 PERFORMANCE REQUIREMENTS

.1 Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E119 by an independent testing agency.

.2 STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated on Drawings, according to ASTM E90 and classified according to ASTM E413 by an independent testing agency.

2.2 FRAMING SYSTEMS

.1 Framing Members, General: Comply with ASTM C754 for conditions indicated.

.1 Steel Sheet Components: Comply with ASTM C645 requirements for steel unless otherwise indicated.

.2 Steel sheet components shall comply with ASTM C645 requirements for metal, unless otherwise indicated.

.3 Steel for non-loadbearing members shall have metallic coats that conform to ASTM A653M or ASTM A792M with minimum metallic coating weighs (mass) of Z120 and AZM150 respectively.

.4 Framing members shall comply with the CAN/CSA S136 - North American Specification for the Design of Cold Formed Steel Structural Members, for conditions indicated.

.5 Isolate where necessary to prevent electrolysis due to dissimilar metal-to-metal contact or metal-to-masonry and concrete contact. Use bituminous paint, butyl tape or other approved divorcing material.

.2 Studs and Tracks: ASTM C645.

.1 Steel Studs and Tracks:

.1 Minimum 0.0179" (25 gauge), screwable with crimped web and returned flange. Provide knockout openings in web at 150mm (6") O.C. to accommodate (if required) horizontal mechanical and electrical service lines, and bracing. Widths as indicated on drawings. Provide structural studs where indicated.

.2 Framing behind all fire resistant gypsum board shall be minimum 0.0329" (20 gauge).

.3 Where metal stud framing forms walls are to be thermally insulated as indicated on drawings, provide metal studs with integrated fastening system for glass fibre/mineral fibre insulation.

.4 Provide special shapes indicated on drawings as part of steel stud/drywall assemblies.

.3 Steel Framing for Shaft Wall Assemblies

.1 CT profile stud framing in 2 ½”, 4” or 6” depth as scheduled, gauge to suit installation.

.2 J-tabbed track profile for use at floor and ceiling of shaft wall assembly.

.4 Slip-Type Head Joints: Where indicated, provide one of the following:

.1 Clip System: Clips designed for use in head-of-wall deflection conditions that provide a positive attachment of studs to tracks while allowing 2” (51-mm) minimum vertical movement.

.2 Double-Track System: ASTM C645 top outer tracks, inside track with 2” (51 mm) deep flanges in thickness not less than indicated for studs and fastened to studs, and outer track sized to friction-fit over inner track.

.3 Deflection Track: Steel sheet top track manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.

.5 Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.

.1 Minimum Base-Steel Thickness: As indicated on Drawings.

.6 Cold-Rolled Channel Bridging: Steel, 0.0538” (1.367 mm) minimum base-steel thickness, with minimum ½” (13 mm) wide flanges.

.1 Depth: As indicated on Drawings.

.2 Clip Angle: Not less than 1-1/2” x 1-1/2” (38 mm x 38 mm), 0.068” (1.72 mm) thick, galvanized steel.

.7 Hat-Shaped, Rigid Furring Channels: ASTM C645.

.1 Depth: As indicated on Drawings.

.8 Resilient Furring Channels: ½” (13 mm) deep, steel sheet members designed to reduce sound transmission.

.1 Configuration: hat shaped.

.9 Cold-Rolled Furring Channels: 0.053” (1.34 mm) uncoated-steel thickness, with minimum ½” (13 mm) wide flanges.

.1 Depth: As indicated on Drawings

.2 Furring Brackets: Adjustable, corrugated-edge-type steel sheet with minimum uncoated-steel thickness of 0.0329” (0.8 mm).

.3 Tie Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper, 0.062” (1.59 mm) diameter wire, or double strand of 0.048” (1.21 mm) diameter wire.

.10 Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4” (32 mm), wall attachment flange of 7/8” (22 mm), minimum uncoated-steel thickness of 0.0179” (0.455 mm), and depth required to fit insulation thickness indicated.

2.3 SUSPENSION SYSTEMS

.1 Tie Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper, 0.062” (1.59 mm) diameter wire, or double strand of 0.048” (1.21 mm) diameter wire.

.2 Wire Hangers: ASTM A641/A641M, Class 1 zinc coating, soft temper, 0.16” (4.12 mm) in diameter.

.3 Flat Hangers: Steel sheet, in size indicated on Drawings.

.4 Carrying Channels (Main Runners): Cold-rolled, commercial-steel sheet with a base-steel thickness of 0.0538” (1.367 mm) and minimum ½” (13 mm) wide flanges.

.1 Depth: As indicated on Drawings.

.5 Furring Channels (Furring Members):

.1 Cold-Rolled Channels: 0.0538” (1.367 mm) uncoated-steel thickness, with minimum ½” (13 mm) wide flanges, ¾” (19 mm) deep.

.2 Steel Studs and Tracks: ASTM C645.

.1 Depth: As indicated on Drawings.

.3 Hat-Shaped, Rigid Furring Channels: ASTM C645, 7/8 inch (22 mm) deep.

.4 Resilient Furring Channels: 1/2'" (13 mm) deep members designed to reduce sound transmission.

.1 Configuration: Hat shaped.

.6 Grid Suspension System for Gypsum Board Ceilings: ASTM C645, direct-hung system composed of main beams and cross-furring members that interlock.

2.4 AUXILIARY MATERIALS

.1 General: Provide auxiliary materials that comply with referenced installation standards.

.1 Fasteners for Steel Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

.2 Isolation Strip at Exterior Walls: Provide one of the following:

.1 Asphalt-Saturated Organic Felt: ASTM D226/D226M, Type I (No. 15 asphalt felt), nonperforated.

.2 Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8” (3.2 mm) thick, in width to suit steel stud size.

3 Execution

3.1 EXAMINATION

.1 Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.

.2 Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

.1 Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.

.1 Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

.2 Coordination with Sprayed Fire-Resistive Materials:

.1 Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling tracks to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24” (610 mm) o.c.

.2 After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of non-load-bearing steel framing. Do not reduce thickness of fire-resistive materials below that are required for fire-resistance ratings indicated. Protect adjacent fire-resistive materials from damage.

3.3 INSTALLATION, GENERAL

.1 Installation Standard: ASTM C754.

.1 Gypsum Plaster Assemblies: Also comply with requirements in ASTM C841 that apply to framing installation.

.2 Gypsum Board Assemblies: Also comply with requirements in ASTM C840 that apply to framing installation.

.2 Install framing and accessories plumb, square, and true to line, with connections securely fastened.

.3 Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

.4 Install bracing at terminations in assemblies.

.5 Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING FRAMED ASSEMBLIES

.1 Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

.2 Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

.3 Install studs so flanges within framing system point in same direction.

.4 Install tracks at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts that penetrate partitions above ceiling.

.1 Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.

.2 Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install track section (for cripple studs) at head and secure to jamb studs.

.1 Extend jamb studs through suspended ceilings and attach to underside of overhead structure.

.3 Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.

.4 Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.

.5 Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.

.6 Curved Partitions:

.1 Bend track to uniform curve and locate straight lengths so they are tangent to arcs.

.2 Begin and end each arc with a stud, and space intermediate studs equally along arcs. On straight lengths of no fewer than two studs at ends of arcs, place studs 6” (150 mm) o.c.

.5 Direct Furring:

.1 Screw to wood framing.

.2 Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches (610 mm) o.c.

.6 Z-Shaped Furring Members:

.1 Erect insulation, vertically and hold in place with Z-shaped furring members spaced 24” (610 mm).

.2 Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24” (610 mm) o.c.

.3 At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12” (305 mm) from corner and cut insulation to fit.

.7 Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8” (3 mm) from the plane formed by faces of adjacent framing.

3.6 INSTALLATION - VERTICAL SHAFTWALLS

.1 Layout per construction drawings. Secure J-Tabbed Track as perimeter framing and plumb to ceiling, floor and sides. Attached with suitable fasteners, spaced not more than 24" o.c. Apply a bead of non-hardening, flexible sealant to the perimeter.

.2 Pre-plan the stud layout 24" o.c. and adjust the spacing at either end so the end studs will not fall closer than 12" from the end.

.3 Erect the first 1" Shaftliner panel, cut 3/4"-1" less than the total height of the framed section. Plumb the panel against the web of the J-Tabbed Track and bend out tabs in J-Tabbed Track to secure panels in place.

.4 Insert C-T Stud, cut 3/4" less than overall height, into the top and bottom J-Tabbed Tracks and fit tightly over previously installed 1" panel. Allow equal clearance between top and bottom J-Tabbed Track.

.5 Install the next 1" Shaftliner inside the J-Tabbed Track and within the tabs of the C-T stud.

.6 Progressively install succeeding studs and panels as described above until the wall section is enclosed. The final panel section may be secured with tabs from the J-Tabbed Track at 12" o.c.

.7 Where wall heights exceed the standard or available length of Shaftliner panels, the panels may be cut and stacked with joints occurring within the top or bottom third points of the wall. Joints of adjacent panels should be alternately staggered to prevent a continuous horizontal joint. Gypsum panels must engage a minimum of 2 tabs.

.8 C-T Studs cannot be spliced. They must be installed full height, one piece.

.9 For doors, ducts or other large penetrations or openings, install J-Tabbed Track as perimeter framing. Use 20-gauge track with a 3" back leg for elevator doors and block cavity with 12" wide gypsum filler strips for doors exceeding 7'-0" height.

3.7 INSTALLING CEILING SUSPENSION SYSTEMS

.1 Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

.1 Hangers: 48” (1219 mm).

.2 Carrying Channels (Main Runners): 48” (1219 mm)

.3 Furring Channels (Furring Members): 24” (610 mm), unless otherwise indicated on the Drawings.

.2 Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

.3 Suspend hangers from building structure as follows:

.1 Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.

.1 Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

.2 Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.

.1 Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.

.3 Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.

.4 Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.

.5 Do not attach hangers to steel roof deck.

.6 Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.

.7 Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.

.8 Do not connect or suspend steel framing from ducts, pipes, or conduit.

.4 Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.

.5 Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

.6 Installation Tolerances: Install suspension systems that are level to within 1/8” in 12’ (3 mm in 3.6 m) measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION

1 General

1.1 SUMMARY

.1 This Section includes requirement for supply and installation of components required for a complete gypsum board assembly with proprietary components as follows:

.1 Gypsum Board Panels:

.1 Standard Gypsum Board

.2 Fire-Rated Gypsum Board 'Type X'

.3 Glass Mat Liner Board for Fire Rated Shaftwall assembly

.4 Gypsum Ceiling Board

.5 Tile Backer Board

.6 Abuse Resistance Gypsum Board

.7 Exterior Sheathing Board

.8 Exterior Soffit Board

.2 Gypsum Wallboard Accessories:

.1 Screws, tape, joint compound and all other accessories required for gypsum board ceiling and wall partitions.

1.2 REFERENCE STANDARDS

.1 American Society for Testing and Materials International (ASTM):

.1 ASTM A641/A641M-09a, Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.

.2 ASTM A653/A653M-11 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.3 ASTM A792/A792M-10, Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.

.4 ASTM A875/A875M-10, Specification for Steel Sheet, Zinc-5% Aluminum Alloy-coated by the Hot Dip Process.

.5 ASTM A1003/A1003M-12, Specification for Steel Sheet, Carbon, Metallic and Non-Metallic Coated for Cold Formed Framing Members.

.6 ASTM C11-10a, Standard Terminology Relating to Gypsum and Related Building Materials.

.7 ASTM C473-12, Standard Test Methods for Physical Testing of Gypsum Panel Products.

.8 ASTM C475/C475M-12, Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.

.9 ASTM C514-04(2009)e1, Standard Specifications for Nails for the Application of Gypsum Board.

.10 ASTM C645-11a, Standard Specification for Nonstructural Steel Framing Members.

.11 ASTM C665-12, Standard Specification for Mineral-Fibre Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

.12 ASTM C754-11, Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.

.13 ASTM C834-10, Standard Specification for Latex Sealants.

.14 ASTM C840-11, Standard Specification for Application and Finishing of Gypsum Board.

.15 ASTM C841-03(2008)e1, Standard Specification for Installation of Interior Lathing and Furring.

.16 ASTM C954-11, Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033" to 0.112" in Thickness.

.17 ASTM C955-11c, Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases

.18 ASTM C1002-07, Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.

.19 ASTM C1047-10a, Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.

.20 ASTM C1177/C1177M-08, Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.

.21 ASTM C1178/C1178M-11, Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel.

.22 ASTM C1186-08, Standard Specification for Flat Fiber-Cement Sheets.

.23 ASTM C1278/C1278M-07a(2011), Standard Specification for Fiber-Reinforced Gypsum Panel.

.24 ASTM C1396/C1396M-11, Standard Specification for Gypsum Board.

.25 ASTM C1629/C1629M-06(2011), Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels.

.26 ASTM C1658/C1658M-12, Standard Specification for Glass Mat Gypsum Panels.

.27 ASTM D3273-12, Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.

.28 ASTM D3274-09, Standard Test Method for Evaluating Degree of Surface Disfigurement of Paint Films by Fungal or Algal Growth, or Soil and Dirt Accumulation.

.29 ASTM D3678-97(2008)e1, Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Interior-Profile Extrusions.

.2 Gypsum Association (GA):

.1 GA-214-10, Recommended Levels of Gypsum Board Finish.

.2 GA-216-10, Application and Finishing of Gypsum Board.

.3 GA-231-06, Assessing Water Damage to Gypsum Board.

.4 GA-238-03, Guidelines for the Prevention of Mold Growth on Gypsum Board.

.3 Underwriters Laboratories of Canada (ULC):

.1 CAN/ULC S101-07, Standard Methods of Fire Endurance Tests of Building Construction and Materials

.2 CAN/ULC S102-10, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies

.3 ULC List of Equipment and Materials

.4 Underwriters' Laboratories (UL), Standards for Safety acceptable to the Standards Council of Canada (SCC)

1.3 QUALITY ASSURANCE

.1 Contractor executing work of this Section shall have a minimum of five (5) years continuous experience in successful installation of work of type and quality shown and specified.

.2 Submit proof of experience upon Consultant's request.

1.4 SUBMITTALS

.1 Provide submittals in accordance with the requirements of Division 01.

.2 Shop Drawings: Submit shop drawings showing the design, construction and relevant details of furring, enclosures and partitions which require a fire rating.

.3 Product Data: Submit manufacturer's current technical literature for each component.

.4 Samples: Supply for Consultant's review, if requested, samples of the following:

.1 Board: Submit sample of each panel product specified, 150mm (6") square.

.2 Trim: Submit sample of each type of trim specified, 305mm (12") long.

.5 Quality Assurance Submittals:

.1 Design Data, Test Reports: Provide manufacturer's test reports indicating product compliance with indicated requirements.

.2 Manufacturer's Instructions: Provide manufacturer's written installation instructions.

1.5 DELIVERY, STORAGE, HANDLING AND PROTECTION

.1 Coordinate deliveries to comply with construction schedule and arrange ahead for off the ground, enclosed, 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, in accordance with GA-238 and manufacturer's recommendations.

.4 Protect bagged products from excessive moisture or wetting. Store metal component sections in crates to prevent damage to material. Do not use bent or deformed material.

1.6 PROJECT CONDITIONS

.1 Establish and maintain environmental conditions for application and finishing gypsum wallboard to comply with ASTM C 840 and in accordance with manufacturer's written instructions.

.2 In cold weather (outdoor temperatures less than 13 deg. C, controlled heat in the range of 13 deg. C to 21 deg. C must be provided. Recommended temperature must be maintained twenty-four (24) hours before, during, and after entire gypsum board joint finishing and until the permanent heating system is in operation or the building is occupied.

.1 Minimum temperature of 10 deg. C shall be maintained during gypsum board application.

.3 Ventilate building spaces to remove excess moisture and humidity during the drying process. Avoid drafts during dry, hot weather to prevent materials from drying too rapidly.

2 Products

2.1 MATERIALS – WALLBOARD (GWB)

.1 Standard Gypsum Board:

.1 Conforming to ASTM C1396, ivory paper faced, tapered edges, 1220mm (48") wide sheets of maximum practical lengths to minimize end joints, 1/2" thick unless indicated otherwise on drawings.

.1 Sheetrock Brand Gypsum Panels by CGC Inc.

.2 ProRoc Regular by CertainTeed.

.3 ToughRock Gypsum Wallboard by Georgia-Pacific Canada.

.4 Or approved equivalent.

.2 Fire-Rated Gypsum Board 'Type X':

.1 Conforming to ASTM C1396, 1220mm (48") wide sheets of maximum practical lengths to minimize end joints, tapered edges, 16mm (5/8") thick, as indicated on drawing.

.1 Sheetrock Brand Gypsum Panels, Firecode Core by CGC Inc.

.2 ProRoc Type X by CertainTeed.

.3 ToughRock Fireguard Gypsum Board by Georgia-Pacific Canada.

.4 Or approved equivalent.

.3 Gypsum Ceiling Board:

.1 Sag Resistant Gypsum Board: Meeting requirements of ASTM C1396M, ceiling board manufactured to have more sag resistance than regular type gypsum board with long edges tapered, and as follows:

.1 Location: Ceiling surfaces.

.2 Acceptable Materials:

.1 Sheetrock Interior Ceiling Board by CGC Inc.

.2 Tough Rock CD Ceiling Board by Georgia Pacific Canada.

.3 ProRoc Interior Ceiling Board by CertainTeed.

.4 Or approved equivalent.

.4 Tile Backer Board:

.1 Glass Mat Water Resistant Gypsum Backer Board: Manufactured in accordance with ASTM C1178 and C1658 to produce greater resistance to water penetration and to provide improved surface bonding characteristics for ceramic tile than standard gypsum board:

.1 Location: Substrate for ceramic tile.

.2 Acceptable Materials:

.1 Fiberock Aqua Tough Tile Backerboard by CGC Inc.

.2 Diamondback Tile Backer by CertainTeed.

.3 GlasRoc Tile Backer by Georgia-Pacific Canada.

.4 Or approved equivalent.

.5 Abuse Resistant Gypsum Board:

.1 Manufactured to produce greater resistance to surface indentation and impact penetration resistance than standard gypsum panels:

.1 Gypsum panels with glass fibre reinforced core, tapered edges, minimum 5/8” thickness, Type X ULC fire rating, conforming to ASTM C1396M and tested to the following performance ratings.

.2 Acceptable Materials:

.1 Sheetrock Abuse Resistant Firecode by CGC Inc.

.2 Abuse Resistant Type X by CertainTeed.

.3 ToughRock Abuse Resistant Fireguard by Georgia Pacific Canada.

.4 Or approved equivalent.

.6 Glass-Mat Liner Board:

.1 Glass Mat faced with water resistant treated gypsum core to ASTM C1658, Type X, 25mm (1’) thick, 610mm (2’0”) wide x maximum practical length. Score of 10 (no mould growth) as per ASTM D3273. Stamped with UL or ULC Classification label documenting UL or ULC Classifications for fire resistance, surface burning characteristics and noncombustibility.

.2 Acceptable product:

.1 Glass-Mat Liner Panel by CGC

.2 Equivalent per Division 01.

.7 Exterior Sheathing Board:

.1 Glass mat faced, water-resistant treated core gypsum board, 1220mm (48") wide sheets of maximum practical lengths to minimize end joints, 13mm (1/2") thick, silicone treated gypsum core, front and back faces penetrated with inorganic glass fibre mats, square edge, conforming to ASTM C1177. Mould resistant panel score of 10 when tested in accordance with ASTM D3273 and evaluated to ASTM D3274.

.1 Securock Glass-Mat Sheathing by CGC Inc.

.2 Dens-Glass Gold by Georgia-Pacific Canada.

.3 GlasRoc Sheathing by CertainTeed.

.4 Or approved equivalent.

.8 Exterior Soffit Board:

.1 Mould and moisture resistant cement board, non-combustible, 1220mm (48") wide sheets of maximum practical lengths to minimize end joints, 13mm (1/2") thick, aggregated portland cement core wrapped in polymer-coated, glass-fiber mesh. panel score of 10 when tested in accordance with ASTM D3273:

.1 Acceptable Materials:

.1 Durock by CGC Inc.

.2 PermaBase Cement Board by CertainTeed

.3 ToughRock Fireguard Soffit Board by Georgia-Pacific Canada.

.4 Or approved equivalent.

2.2 ACCESSORIES

.1 Concrete Anchors:

.1 Self-drilling tie wire anchors, "Red-Head No. T-32" by Phillips Drill Company, Division of ITT Industries of Canada Ltd., (or approved alternate).

.2 Concrete Inserts:

.1 Hot-dip galvanized "turtle back" type concrete inserts to suit conditions as approved by Consultant, by Acrow-Richmond National Concrete Accessories, Division of Premetalco Inc., (or approved alternate).

.3 Mineral Fibre Acoustical Insulation: As indicated in Section 07 21 16.

.4 Gypsum Wallboard Accessories:

.1 In general, gypsum wallboard accessories shall conform to ASTM C1047.

.2 Corner Beads:

.1 Made from galvanized steel sheet conforming to ASTM A653, minimum 0.0179" (25 gauge). Minimum width of flanges 28mm for 13mm (1-1/8" for 1/2") thick wallboard and 32mm for 16mm (1-1/4" for 5/8") thick wallboard.

.3 Casing Beads:

.1 Made from galvanized steel sheet conforming to ASTM A653, minimum 30 gauge, U-shaped designed for finishing with joint compound.

.4 Control Joints:

.1 Made from galvanized sheet steel conforming to ASTM A653, minimum 0.0179" (25 gauge), or roll-formed zinc-alloy to resist corrosion, with expansion joint material perforated flanges.

.1 'Zinc Control Joint No. 093' by CGC Inc.

.2 (or approved alternate).

.5 Reveals:

.1 Galvanized sheet steel conforming to ASTM A653, minimum 0.0179" (25 gauge), in profiles as indicated on drawings.

.5 Wallboard Screws:

.1 Corrosion resistant, self-drilling, self-tapping gypsum wallboard screws conforming to ASTM C1002 (Type S) and ASTM C954 (Type S-12), 25mm (1") long No. 6 for single layer application, 41mm (1-5/8") long No. 7 for double layer application.

.2 At fire rated construction, type and size of wallboard screw shall be same as used in fire-rating test.

.6 Joint Compound for Interior Gypsum Board:

.1 Conforming to ASTM C475 and as recommended by gypsum wallboard, fire-rated gypsum wallboard and exterior wallboard manufacturers to suit conditions.

.7 Joint Compound for Tile Backing Panels:

.1 Gypsum based tile backing board: Use setting type taping and setting type, sandable topping compounds.

.8 Joint Compound for Exterior Sheathing Boards and Soffit Panels:

.1 Fibreglass mesh tape.

.9 Joint Compound for Abuse-Resistant Panels:

.1 ToughRock™ Sandable Joint Compound, by Georgia-Pacific.

.2 Durabond/Sheetrock Setting-Type Joint Compound, by CGC Canada Inc.

.3 Or approved equivalent.

.10 Resilient Sponge Tape:

.1 Closed cell neoprene sponge type tape with self-sticking adhesive on one side. 'Permastik 122X' by Jacobs and Thompson Ltd., or foamed vinyl type tape, 'Arnofoam' by Arno Adhesive Tape Incorporated, (or approved alternate).

.11 Adhesive:

.1 Conforming to CGSB 71-GP-25M, and as recommended by manufacturer and compatible with contacted surfaces.

3 Execution

3.1 EXAMINATION

.1 Examine gypsum wallboard panels for damage and existence of mould. Install only undamaged panels.

.2 Examine gypsum wallboard in accordance with GA-231 for water damage.

.3 Examine areas and substrates, with installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance.

.4 Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

.1 Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.

.2 Coordinate installation of gypsum board suspension systems with installation of acoustical ceiling tiles (ACT) suspension systems. Where gypsum board suspension systems abut ACT systems, ensure that ceiling tiles grid fit into gypsum grid without affecting overall design and appearance.

.3 Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

3.3 INSTALLATION - GENERAL

.1 Conform to ASTM C840, except as otherwise specified herein. Co-operate with mechanical, electrical and other trades to accommodate fixtures, fittings and other items in wallboard areas.

.2 Review extent of temporary heat provided. Carry out the work of this Section only when temperature is maintained and controlled in the range of 13 deg. C to 21 deg. C for at least twenty-four (24) hours before installing gypsum board and shall be maintained until joint compound and adhesives are dried or cured.

.3 Bring gypsum board into contact, but do not force into place.

3.4 GYPSUM WALLBOARD - SINGLE LAYER APPLICATION

.1 Metal Studs:

.1 Apply gypsum wallboard with screws. Erect wallboard with long dimension at right angles to supports. For fire rated partitions, erect board vertically or horizontally according to the ULC listing. Locate end joints over supporting members.

.2 Locate vertical joints at least 305mm (12") from the jamb/head/sill lines of openings.

.3 For parallel application space screws at 200mm (8") O.C. at board edges at 305mm (12") O.C. on board fields.

.2 Fasteners:

.1 Perimeter screws shall be not less than 10mm (3/8") from edges and ends and shall be opposite the screws on adjacent boards.

.2 Screws shall be driven with a power screw gun and set with countersunk head slightly below the surface of the board.

.3 Joints:

.1 Finish all joints.

3.5 GYPSUM WALLBOARD - DOUBLE LAYER APPLICATION

.1 General:

.1 Lay out work to minimize end joints on the face layer and to offset parallel joints between face and base layers by at least 254mm (10"). Apply the face layer at right angles to the base layer.

.2 Base Layer:

.1 The base layer shall be same as face layer or wallboard backing board applied at right angles to framing members. Secure base layers with screws spaced 305mm (12") O.C. to each member. Perimeter screws shall be opposite the screws on adjacent boards.

.2 The surface of the erected base layer shall be straight, plumb or level, and without protrusions before the face layer is applied.

.3 Face Layer:

.1 Apply face layer at right angles to base layer with adhesive. Apply adhesive with a notched spreader to leave 10mm x 13mm (3/8" x 1/2") ribbons, 38mm (1-1/2") apart over entire back side of face layer. Erect wallboard immediately after spreading adhesive.

.2 Supplement adhesive with screw fasteners. Provide temporary support for wallboard until adhesive bond has fully developed.

.3 As an alternative to adhesive specified, joint compound mixed with water in accordance with manufacturer's directions may be used. Allow joint compound and water mixture to stand thirty (30) minutes before using.

.4 Joints:

.1 Finish joints in face layers only, unless otherwise required to achieve fire resistant ratings indicated, as hereinafter specified.

3.6 TILE BACKING PANELS

.1 Install standard gypsum board panels in areas not subject to wetting to produce a flat surface.

.2 Install water resistant gypsum board in locations requiring tile applications in washrooms, and as indicated on the Drawings.

.3 Shim surfaces to produce a uniform plane across panel surfaces where tile backing panels abut other types of panels in the same plane.

3.7 EXTERIOR SHEATHING BOARD

.1 Install exterior sheathing board to exterior walls in accordance with manufacturer's written instructions. Seal all cut edges, ends, utility holes and fastener heads, as recommended by manufacturer.

.2 Sufficient anchors must be provided on each structural stud prior to erection of stud. Sequentially lift anchors as exterior sheathing board is being installed such that each anchor rests on edge of the exterior sheathing board.

.3 Tape and fill all joints and fastener heads using materials recommended by exterior sheathing board manufacturer.

3.8 FIRE RESISTANT ASSEMBLIES

.1 Fire resistance rating of gypsum board assemblies and framing shall be as called for on drawings or schedules, and as required to conform with applicable codes and requirements of authorities having jurisdiction.

.2 Appropriate ULC designs as listed in current ULC list of equipment and materials, Volume II, Building Construction, shall be placed when applicable. Extend partitions full height through ceiling space unless otherwise noted on drawings.

.3 Vertical bulkheads in ceiling spaces over fire rated glazed partitions, doors and the like shall have same fire rating as the door or partition over which they occur. All such bulkheads shall be of drywall construction unless otherwise noted.

.4 Use fire rated gypsum board as specified.

.5 Where lighting fixtures, diffusers, and the like are recessed into fire rated ceilings or bulkheads, provide enclosure to maintain required fire rating. Form removable panel to give access to fixture outlet box.

.6 Where fire hose cabinets or other fixtures or equipment are recessed in fire rated walls or partitions, provide drywall enclosure or backing to maintain required fire rating, unless otherwise detailed.

3.9 CONTROL JOINTS

.1 Install control joints using metal control joint strip as specified where:

.1 A partition, furring or column fireproofing abuts a structural element, dissimilar wall or partition assembly, or other vertical penetration, or ceiling.

.2 A ceiling or soffit abuts a structural element, dissimilar wall or partition assembly or other vertical penetrations.

.3 Wings of "L", "U" and "T"-shaped ceiling/soffit areas are joined;

.4 Construction changes within the plane of the partition or ceiling or soffit.

.5 Partition, restrained ceiling or furring run exceeds 9144mm (30').

.6 Unrestrained ceiling dimensions exceed 15240mm (50') in either direction.

.7 Expansion or control joints occur in the base exterior wall.

.8 Wallboard is installed over masonry control joints.

.9 And elsewhere as indicated on the drawings.

.2 Install in accordance with manufacturer's instructions. Where application is on furring members and double furring members at control joints, place one furring member on each side of the control joint.

3.10 BULKHEADS

.1 Fur out bulkheads in areas indicated and as required to conceal mechanical, electrical or other services in rooms where drywall finishes are scheduled, and elsewhere if called for on drawings.

.2 Ensure hangers are installed as to prevent splaying.

3.11 PRESSED STEEL (HOLLOW METAL) FRAMES

.1 Install pressed steel (hollow metal) frames where they occur in gypsum wallboard partitions.

.2 Anchor frames securely to studs using a minimum of three (3) anchors per jamb for jambs up to 2134mm (7') high and minimum of four (4) anchors per jamb for jambs over 2134mm (7') high.

3.12 THERMAL BREAK

.1 Install self-sticking resilient sponge tape at edges of wallboard in contact with metal windows and exterior door frames to provide a thermal break.

.2 Adhere tape to casing bead and compress during installation.

3.13 FINISHING

.1 Before proceeding with installation of finishing materials ensure the following:

.1 Wallboard is fastened and held close to framing and furring.

.2 Fastening heads in wallboard are slightingly below surface in dimple formed by driving tool.

.2 Levels of Gypsum Wallboard Finish:

.1 Level 0: Temporary construction only.

.2 Level 1: Plenum areas and above ceilings. Where a fire-resistance rating is required finishing should be in accordance with reports of fire tests of assemblies that have met the requirements of the fire rating imposed.

.3 Level 2: Areas of water resistant gypsum backing board under tile, exposed areas where appearance is not critical.

.4 Level 3: Service corridors and areas to receive heavy or medium textured coatings or heavy-duty wall coverings.

.5 Level 4: Areas to receive light textured coatings or lightweight wall coverings.

.6 Level 5: Areas to receive gloss, semi-gloss or flat sheen paints and critical lighting conditions. Embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges, and apply skim coat over entire surface for corridors, long hallways, walls and ceilings longer than 7500 mm or walls higher than 3600 mm , and for all curved or angled wall surfaces.

.3 Finish gypsum wallboard in strict accordance with ASTM C840, GA-214 and GA-216 and as follows:

.1 Fill and tape joints and internal corners and fill screw depressions in board face and smooth out along corner beads and metal strip with joint compound.

.2 Mix joint compound (powder) in accordance with manufacturer's written instructions.

.3 Prefill "V" grooves of rounded edges with special setting type joint compound using a 127mm to 150mm (5" to 6") joint finishing knife. Finish flush with tapered surface ready for tape reinforcing application. Allow prefill material to dry thoroughly before application of embedding compound and tape.

.4 Apply joint compound in thin uniform layer. Embed reinforcing tape accurately centred on joint and securely pressed in, leaving sufficient compound under tape to provide proper bond. Immediately apply skim coat over tape application. Allow to dry thoroughly before application of next coat.

.5 Apply fill coat finishing the tapered depression flush with board surfaces. Allow to dry thoroughly before application of finish coat.

.6 Apply finish coat extending slightly beyond the filler coat and feathered out onto the board surface. Do not apply finish coat to gypsum board scheduled to be sprayed with acoustic surfacing finish.

.7 Sand between coats and following the finishing coat, where necessary, and leave surface smooth and ready for painting.

.8 Finish screw depressions with filler material and finish coat as specified above.

.9 Joint and depression finish shall in no case protrude beyond the plane of the board surface.

.10 Furnish corner beads and metal trim flush with board surface using filler and finishing coats feathered out approximately 50mm (2") and 100mm (4") respectively onto the board surface.

.11 Provide metal casing beads at exposed edges, at junctions of gypsum board with dissimilar material, at control joints and at junction with columns. Casing beads are required at perimeter of gypsum wallboard ceilings and soffits. Fasten with screws at 305mm (12") O.C. along entire length.

.12 Finish gypsum board to receive a Level 4 finish, unless indicated on the Drawings as a Level 5 finish.

3.14 REPAIRS

.1 After taping and finishing has completed, and before decoration, repair all damaged and defective work, including non-decorated surfaces.

.2 Patch holes or openings 13mm (1/2") or less in diameter, or equivalent size, with a setting type finishing compound or patching plaster.

.3 Repair holes or openings over 13mm (1/2"), or equivalent size, with 16mm (5/8") thick gypsum wallboard secured in such a manner as to provide solid substrate equivalent to undamaged surface.

.4 Tape and refinish scratched, abraded or damaged finished surfaces including cracks and joints in non-decorated surface to provide smoke tight construction, fire protection equivalent to the fire rated construction and STC equivalent to the sound rated construction.

3.15 PROTECTION

.1 Protect installed products from damage during remainder of construction period.

.2 Remove and replace panels that are damaged.

END OF SECTION

1 General

1.1 SUMMARY

.1 The work in this section includes supply and installation for the following:

.1 Porcelain Wall Tile

.2 Porcelain Floor Tile

.3 Ant-Fracturing Waterproof Membrane

.4 Edge trims, Transition Strips and Accessories

1.2 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 C627-10, Standard Test Method for Evaluating Ceramic Floor Tile Installation Systems Using the Robinson-Type Floor Tester

.3 ASTM C920-11, Standard Specification for Elastomeric Joint Sealants

.4 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

.3 Canadian General Standards Board (CGSB):

.1 CAN/CGSB-75.1-M88, Tile, Ceramic

.4 Terrazzo, Tile and Marble Association of Canada (TTMAC):

.1 2019-2021 Specification Guide 09 30 00, Tile Installation Manual

.2 Hard Surface Maintenance Guide

1.3 EXAMINATION

.1 Examine all areas and conditions affecting work of this Section and report any discrepancies or defects which would affect finished results.

1.4 SUBMITTALS

.1 Submit submittals in accordance with Division 01.

.2 Samples:

.1 Submit sample panel of each type and colour tile, 610mm x 610mm (24" x 24").

.2 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.

.3 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.

.4 Upon Consultant's request submit samples of base, trim and fittings.

.3 Material Lists:

.1 Prior to ordering any materials submit list of products to be used. Products proposed must be recommended by their manufacturer for purpose intended. Upon Consultant's request submit evidence of manufacturer's endorsement.

.2 Take care to ensure compatibility of all materials. Consult the manufacturers in case of doubt.

.3 The supplementary materials shall come from the same production batch as installed materials.

.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 Instructions:

.1 Upon completion of the Work, furnish Consultant with copies of maintenance instructions, containing complete detailed and specific instructions for maintaining, preserving and keeping clean the surfaces of this Work and in particular, giving adequate warning of maintenance practices of materials detrimental to the work of this Section for inclusion in the Operation and Maintenance Manual.

.6 Maintenance Materials:

.1 Supply five percent (5%) extra of each colour of tile and of each tile type for future repairs by the Owner.

.2 Place maintenance materials where directed by the Owner and store in their original containers.

1.5 QUALITY ASSURANCE

.1 Subcontractor executing work of this Section shall employ installers having a minimum of five (5) years continuous experience in successful installation of work of type and quality shown and specified. Submit proof of experience upon Consultant's request.

.2 Work of this Section shall be executed by workers especially trained and experienced in this type of work. Have a full time, qualified representative at the Site to direct the work of this Section at all times.

.3 Ensure proper use of proprietary materials in strict accordance with the material manufacturer's directions. It shall be the responsibility of the material manufacturer or supplier to furnish these directions to the Contractor and to check periodically at the site to ensure that they are being carried out.

1.6 PRE-INSTALLATION CONFERENCE

.1 Pre-Construction Conference: Arrange a site meeting, to coincide with regular bi-weekly site meetings, attended by the Contractor, the Subcontractor's representative and foreman for this project, the Consultant, materials supplier(s), and other relevant personal before commencement of work for this Section; agenda for meeting will include; but not be limited to, the following:

.1 Substrate conditions, non-structural cracks, structural cracks and preparation requirements;

.2 Floor and wall surface irregularities and levelness tolerances, including all remedial requirements;

.3 Installation of anti-fracturing membranes and setting bed materials;

.4 Installation of tiles and grouting;

.5 Edge details and treatments;

.6 Installation of tile and grout sealers.

1.7 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 100mm (4") and taped.

.6 Heavily travelled areas shall have additional 13mm (1/2") thick fibreboard sheet protection with taped joints over polyethylene sheet protection as specified above.

.7 Protect exposed edges of floor tile with same thickness as tile x 100mm (4") wide tapered strip of plywood adhered to floor until adjoining floor finish is to be installed.

1.8 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 forty-eight (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.

1.9 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 the Owner.

.2 Defects shall include but not be limited to the following:

.1 Cracking and crazing;

.2 Discolouration and staining;

.3 Pitting, splitting, and;

.4 Deformation of tiles and grout.

2 Products

2.1 PERFORMANCE REQUIREMENTS

.1 Dynamic Coefficient of Friction (DCOF): Tile installed on walkway surfaces having following values as determined by testing identical products per ANSI A137.1:

.1 Level Interior Wet Spaces: A minimum wet DCOF AcuTest Value of 0.42 or higher.

.2 Level Interior Dry Spaces: A minimum wet DCOF AcuTest Value below 0.42

.2 Floor Level Tolerances: Provide materials to attain floor levelness tolerances required by this Section.

.1 Calculate quantity of materials based on the difference between the specified tolerance and the initial tolerance specified in Section 03 35 00.

.2 Measurements: As indicated in Section 03 35 00.

2.2 MATERIALS

.1 Porcelain Floor Tiles (POR-01):

.1 Size: 300mm x 600mm

.2 Finish: matte

.3 Basis of Design Model and Manufacturer: Olympia Tile, Regal Series; Or approved equivalent.

.1 Colour to be selected from full colour range, allow for 2 colours.

.2 Ceramic Wall Tile (CER-01):

.1 Size: 200mm x 500mm

.2 Finish: matte

.3 Basis of Design Model and Manufacturer: Olympia Tile; Colour and Dimension; Or approved equivalent.

.1 Colour to be selected from full colour range, allow for 2 colours

.3 Ceramic Wall Tile (CER-02):

.1 Size: 100mm x 400mm

.2 Finish: matte

.3 Basis of Design Model and Manufacturer: Olympia Tile; Colour and Dimension; Or approved equivalent.

.1 Colour to be selected from full colour range, allow for 2 colours

.4 Control Joint Caulking:

.1 As supplied by the Grout Manufacturer.

.2 Colour: To match adjacent grout, as approved by the Consultant.

.5 Tile Straight Edge Trim:

.1 Extruded clear satin anodized aluminum edge trim, 3mm (1/8”) wide at top edge; Height as required to suit tile installation; with integral perforated anchoring leg for setting the strip into the setting material.

.2 Basis of Design Materials: Schlüter Schiene AE by Schlüter.

2.3 MORTAR SETTING MATERIALS

.1 Manufacturers: Mortar and grout materials listed in this Section shall be of a uniform quality for each mortar, and grout component from a single manufacturer and each aggregate from one source or producer as follows:

.1 Flextile Ltd.

.2 MAPEI Inc.

.3 Custom Building Products Ltd.

.4 Laticrete International Inc.

.5 Or approved equivalent.

.2 Surface Preparation Materials: As indicated in Section 03 35 00.

.3 Interior Thin Set Wall System: Dry set mortar meeting or exceeding the requirements of ANSI A108.1 formulated for thin set applications of ceramic biscuit tile, factory sanded mortar consisting of portland cement, sand and additives requiring only potable water to be added for installation:

.1 Acceptable mortar materials:

.1 #51 Floor and Wall Mix by Flextile Ltd.

.2 Kerabond by MAPEI Inc.

.3 Premium Blend Thinset by by Custom Building Products.

.4 Laticrete 317 Mortar by Laticrete International Inc.

.5 Or approved equivalent.

.4 Interior Thin Set Floor System: Dry set mortar meeting or exceeding the requirements of ASTM C627 for Heavy installation using latex modified, portland cement mortar meeting requirements of ANSI A108.1:

.1 Acceptable mortar materials:

.1 #53 Floor Mix by Flextile Ltd.

.2 Kerabond by MAPEI Inc.

.3 Master Blend Thinset by by Custom Building Products.

.4 Laticrete 253 Thinset by Laticrete International Inc.

.5 Or approved equivalent.

2.4 GROUT MATERIALS

.1 Grout Colours: As selected by the Consultant from manufacturer's full product range.

.2 Portland Cement Grout for Wall and Floor Joints ≤3mm (1/8") Interior Only: factory blended polymer modified mixture meeting requirements of ANSI A108.1:

.1 Acceptable Materials:

.1 500 Series Unsanded Grout by Flextile Ltd.

.2 Ker 800 Unsanded Grout by MAPEI Inc.

.3 Polyblend Unsanded Grout by Custom Building Products.

.4 Peracolor Grout Laticrete International Inc.

.5 Or approved equivalent.

.3 Latex-Portland Cement Grout for Floors with Joints ≥3mm (1/8") Interior or Exterior: factory blended stain resistant latex modifiers, portland cement and graded silica sand and dry-set grout and meeting requirements of A108.1:

.1 Acceptable Materials:

.1 600/100 Series Sanded Grout by Flextile Ltd.

.2 Keracolour S Sanded Grout by MAPEI Inc.

.3 Polyblend Sanded Grout by Custom Building Products.

.4 Peracolor Grout Laticrete International Inc.

.5 Or approved equivalent.

2.5 WATERPROOFING ANTI-FRACTURING MEMBRANES

.1 Waterproofing Anti-Fracturing Membranes: Load bearing, reinforced, liquid applied membrane; manufactured to accommodate flood testing and reduce the incidence of thermal shock cracking to tiling installations; meeting requirements of ANSI A108.1 and as follows:

.1 Acceptable Membrane Materials:

.1 Flex WP-980 Waterproof and Crack Isolation Membrane by Flextile Ltd.

.2 Mapelastic 315 Waterproofing and Reinforcing Fabric by MAPEI Inc.

.3 Level Quik Waterproof and Anti-Fracture Membrane by Custom Building Products.

.4 Hydroban Waterproofing by Laticrete International Inc.

.5 Or approved equivalent per Specification 01 25 00

.2 Reinforcing Fabric: strong, absorbent, flexible, alkali-resistant, polyester reinforcing fabric for use at coves, corners, cracks and around drains.

.1 Acceptable product: Reinforcing Fabric by Mapei

.2 Or approved equivalent per Specification 01 25 00

2.6 ACCESSORY MATERIALS

.1 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.

3 Execution

3.1 EXAMINATION

.1 Maintain minimum temperature of 13 deg C at tile installation area for twenty-four (24) hours prior to curing and for twenty-four (24) hours after installation. Do not apply work to frozen surfaces.

.2 Examine carefully surfaces to which tile is to be installed and report any defects to the Consultant.

.3 Anti-Fracturing Membranes:

.1 Prepare all surfaces of non-structural and structural cracks in strict accordance with the anti-fracturing membrane manufacturer's written instructions.

.2 Prime and fill all surfaces of non-structural and structural cracks in strict accordance with the anti-fracturing membrane manufacturer's written instructions.

.4 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 3mm in 2439mm (±1/8” in 8’) for walls and 3mm in 3048mm (±1/8” in 10’) for floors using levelling bed mortar.

.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 five percent (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.

3.3 INSTALLATION – ANTI-FRACTURING MEMBRANES

.1 Install waterproofing anti-fracturing membrane 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 membrane until waterproofing has cured and been tested to determine that it is watertight.

.3 Prepare floor and wall substrates in accordance with manufacturers written instructions.

.1 All substrates should be structurally sound, stable, dry, clean and free of any substance or condition that may reduce or prevent proper adhesion.

.2 Do not use chemicals (acid etching or stripping) to prepare approved substrates.

.3 Concrete substrates should have a concrete surface profile of #2 per the International Concrete Repair Institute (ICRI). Mechanically clean and profile by diamond-cup grinding or other engineer-approved method when necessary.

.4 Application

.1 Fill all cracks, control joints and gaps in corners and coves that are greater than 1/32" (1 mm) with an appropriate filler material. Force material into crack and finish smooth with trowel. Let dry.

.2 Pre-treat cracks, corners, coves and floor wall intersections with 2 coats of waterproof membrane.

.3 Pre-treat drains by filling space between drain pipe and substrate with appropriate expansion joint materials and apply 2-coards of waterproof membrane

.5 Fabric Reinforcing Application

.1 Lay reinforcing fabric into wet waterproof membrane at all “pre-treat” sections as outlined in application section below (cracks, coves, corners and penetrations). Allow for 50mm fabric on horizontal surface and 100mm fabric on vertical surface. Use brush to press fabric into corners until liquid comes through fabric. Work out any wrinkles or bubbles.

.2 While fabric is wet, apply additional waterproof membrane over fabric until completely covered to create void-free surface. Let dry. Apply a second coat and let dry.

.3 Install reinforcing fabric through main/field areas by placing into wet first coat of waterproof membrane. Using a roller, apply pressure to the fabric, working out wrinkles or bubbles while forcing liquid waterproof membrane to come through

the fabric. Overlap seams and ends of the fabric by 2" (50mm). While fabric is still wet, apply additional liquid waterproof membrane over the fabric until completely covered, creating a void-free surface. Let dry completely.

.4 Apply a second coat of liquid waterproof membrane to entire area. Let dry.

.5 Apply a bead of commercial-grade silicone or urethane sealant between the membrane and the drain flange, about 1/2" (12 mm) in from the drain opening.

.6 Bolt the drain collar into place while the sealant is still fresh.

.7 Install tile as per following section below.

3.4 INSTALLATION - GENERAL

.1 Unless otherwise specified, execute tile work according to the latest issue of Specification Guide 09 30 00, Tile Installation Manual - published by Terrazzo, Tile and Marble Association of Canada, as the minimum standard except as varied by this Specification.

.2 Thoroughly clean surfaces to which tile is to be applied.

.3 Back butter all floor tile.

.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: 1.6mm (1/16”)

.2 Floor Tile: 6mm (1/4”), unless otherwise indicated on the Drawings.

.3 Quarry Tile: As per manufacturers recommendations.

.4 Make joints consistent width and alignment within tile area.

.5 Maintain 2/3 of grout joint depth free of setting material.

.7 Joints in base shall match floor 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 floor finishes.

3.5 MORTAR APPLICATION METHOD

.1 Thin-Set Application Method:

.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 Apply floor tile and prepare floor slabs in strict accordance with tile manufacturers written installation instructions as per the pre-installation conference.

3.6 GROUTING

.1 Grout tiles in accordance with ANSI A108.10 and as specified herein.

.2 When grouting a fresh laid floor, make certain that traffic and grouting will not cause movement of floor in setting bed. Protect floor by using kneeling boards or gypsum board to defend floor against traffic while grouting.

.3 Mix grouts and install in strict accordance with the manufacturer's instructions.

.4 Excess grout shall be removed from the surface of tiles using the edge of a rubber float held at a 45 deg angle, moving it diagonally to the joints. Fill all gaps and air holes.

.5 Do not allow grout to harden on face of tile. Refer to manufacturer's instructions for thorough removal.

.6 Floors which required damp curing shall be cured for the required length of time using heavy kraft paper, not polyethylene sheets. Consult manufacturer for instructions.

3.7 CONTROL JOINTS AND SEALING

.1 Control joints of a flexible caulking material shall be placed every 4877mm to 6096mm (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.

.2 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.

.3 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.

.4 Locate expansion, control, contraction, and isolation joints, as indicated below, unless specifically indicated otherwise on the Drawings:

.1 Interior: 4877mm (16’) maximum: 6mm (1/4") joint width.

.5 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 Consultant.

3.8 CLEANING AND PROTECTION

.1 Clean tiled areas after grouting has cured, using compatible solutions and methods as recommended by the manufacturer.

.2 Remove 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.

END OF SECTION

1 General

1.1 SUMMARY

.1 This Section includes requirements for supply and installation of ceilings consisting of the following, complete with exposed suspension system and trim:

.1 Acoustical tiles for interior ceilings.

.2 Suspension grid systems.

1.2 REFERENCE STANDARDS

.1 American Society for Testing and Materials (ASTM):

.1 ASTM C635/C635M-13a, Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings

.2 ASTM C636/C636M-13, Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels

.3 ASTM E1264-14 Standard Classification for Acoustical Ceiling Products

.2 Underwriters Laboratories of Canada (ULC):

.1 CAN/ULC S102-10, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies

1.3 ADMINISTRATIVE REQUIREMENTS

.1 Coordination: Coordinate layout and installation of acoustic tile ceiling and suspension system with other construction that penetrates ceilings or is supported by them including; but not limited to, light fixtures, HVAC equipment, fire suppression system, and partition assemblies, and as follows:

.1 Schedule and coordinate installation of ceiling to occur after completion of overhead mechanical and electrical work.

.2 Schedule and coordinate ceiling installation with mechanical and electrical trades building in components into ceiling finish panels.

.2 Pre-Installation Conference: Conduct conference at Project site in accordance with requirements of Division 01 to discuss coordination issues with Contractor, Subcontractor and Consultant present.

1.4 SUBMITTALS

.1 Provide submittals in accordance with Division 01.

.2 Action Submittals: Provide the following submittals before starting any work of this Section:

.1 Product Data: Submit product data for each type of product specified.

.2 Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling mounted items indicating the following:

.1 Ceiling suspension system members.

.2 Method of attaching suspension system hangers to building structure.

.3 Ceiling mounted items including light fixtures; air outlets and inlets; speakers; sprinklers; and special mouldings at walls, column penetrations, and other junctures of acoustic ceilings with adjoining construction.

.3 Samples for Initial Selection: Manufacturer's colour charts consisting of sections of acoustic panels, suspension systems, and trim showing the full range of colours, textures, and patterns available for each type of ceiling assembly indicated.

.4 Samples for Verification: Full size units of each type of ceiling assembly indicated; in sets for each colour, texture, and pattern specified, showing the full range of variations expected in these characteristics:

.1 150mm (6") square samples of each acoustic panel type, pattern, and colour

.2 Set of 305mm (12") long samples of exposed suspension system members, including trim, for each colour and system type required.

.5 Maintenance and Materials:

.1 Provide five percent (5%) of each type of acoustic ceiling panels and two percent (2%) of each suspension system and trim for future repairs. Identify cartons and place where directed by the Owner.

.2 Maintenance materials shall be of same production run as installed materials.

1.5 INFORMATIONAL SUBMITTALS

.1 Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

.1 Ceiling suspension-system members.

.2 Structural members to which suspension systems will be attached.

.3 Method of attaching hangers to building structure.

.4 Carrying channels or other supplemental support for hanger-wire attachment where conditions do not permit installation of hanger wires at required spacing.

.5 Size and location of initial access modules for acoustical tile.

.6 Items penetrating finished ceiling and ceiling-mounted items including the following:

.1 Lighting fixtures.

.2 Diffusers.

.3 Grilles.

.4 Speakers.

.5 Sprinklers.

.6 Access panels.

.7 Perimeter moldings.

.7 Show operation of hinged and sliding components adjacent to acoustical tiles.

.8 Minimum Drawing Scale: ¼” = 1’ (1:48).

1.6 QUALITY ASSURANCE

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

.2 Single-Source Responsibility: Provide acoustic ceilings and grid components by a single manufacturer to ensure compatibility.

.3 Letter of Certification:

.1 Contractor together with manufacturer, shall submit a written confirmation, signed by manufacturer's registered professional Engineer, stating that the suspended ceiling system will provide adequate support for electrical fixtures.

1.7 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.

1.8 SITE CONDITIONS

.1 Ambient Conditions: Install acoustic unit ceilings only when building is enclosed, has sufficient heat, when overhead mechanical and electrical work is complete, and dust and moisture producing activities are complete; maintain uniform temperatures and relative humidity within range recommended by material manufacturer from the time of installation until Substantial Performance for the project; make adjustments to temperature and humidity gradually within tolerances indicated by manufacturer.

1.9 WARRANTY

.1 Acoustical Panel: Submit manufacturers standard ten (10) year written warranty executed by the manufacturer, agreeing to repair or replace panels that fail within the warranty period. Failures include, but are not limited to the following:

.1 Panels: Sagging and warping.

.2 Grid System: Rusting and manufacturer’s defects.

2 Products

2.1 MANUFACTURERS

.1 Acceptable Materials Manufacturers: Subject to compliance with requirements specified in this Section, manufacturers offering products that may be incorporated into the Work include the following:

.1 Armstrong World Industries, Inc.

.2 CertainTeed

.3 CGC Interiors, a USG Company

.4 Or approved equivalent.

2.2 DESIGN CRITERIA

.1 Superimposed Loads: Determine superimposed loads applied to suspension systems by components of the building and verify that adequate hangers are installed to support additional loads in conjunction with normal loads of the ceiling system, and as follows:

.1 Maximum Deflection: Limit deflection to L/360 in accordance with ASTM C635 deflection test.

2.3 MATERIALS

.1 Acoustic Ceilings (ACT-01): Provide manufacturer's fibreglass acoustical ceiling system, tested in accordance with ASTM E84 and as follows:

.1 Surface Texture: Smooth

.2 Composition: Fiberglass

.3 Color: White

.4 Size: 610mm x 610mm x 25mm (24in x 24in x 1in)

.5 Edge Profile: Square

.6 Noise Reduction Coefficient (NRC): ASTM C 423; Classified with UL label on product carton .90

.7 Articulation Class (AC): ASTM E 1111; Classified with UL label on product carton 190

.8 Flame Spread: ASTM E 1264; Class A (UL)

.9 Light Reflectance (LR) White Panel: ASTM E 1477; 0.88

.10 Dimensional Stability: HumiGuard Plus

.11 Material Ingredient Transparency: Health Product Declaration (HPD); Declare Label

.12 Life Cycle Assessment: Third Party Certified Environment Product Declaration (EPD)

.13 Acceptable Product: Optima, 3159 as manufactured by Armstrong World Industries, or equivalent

2.4 METAL SUSPENSION SYSTEM

.1 Metal Suspension-System Standard: Provide manufacturer's standard, direct-hung, metal suspension system and accessories according to ASTM C 635/C 635M and designated by type, structural classification, and finish indicated.

.1 Installation shall be by use of torsion springs, field engaged into factory supplied spring retainers, and field installed on the back of the panel on the coated extruded aluminum panel edge.

.2 Panel assembly is then lifted into place, and the torsion springs are engaged into the factory supplied “butterflies” which have been field installed during the assembly of the suspended factory supplied extruded aluminum grid.

.3 The grid system shall consist of main tees and cross tees, which shall incorporate a continuous “panel location” fin to ensure correct panel alignment during installation and future access.

.1 The suspension system shall be completely engineered and fabricated in the factory, to avoid any field cutting of the suspension components.

2.5 ACCESSORIES

.1 Attachment Devices: Size for five times the design load indicated in ASTM C 635/C 635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.

.2 Wire Hangers, Braces, and Ties: Provide wires as follows:

.1 Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.

.2 Size: Wire diameter sufficient for its stress at three times hanger design load (ASTM C 635/C 635M, Table 1, "Direct Hung") will be less than yield stress of wire, but not less than 0.106” (2.69mm).

.3 Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.

.4 Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.

3 Execution

3.1 INSPECTION

.1 Examine the work upon which the work of this Section depends and report any defects to the Consultant. Do not commence installation until such time as all wet trades have been completed. Commencement of work implies acceptance of surface and conditions.

.2 Ensure that a uniform minimum temperature of 15 deg. C and humidity of 20 - 40% before, during and after installation is maintained.

3.2 INSTALLATION

.1 Cooperate with mechanical, electrical, drywall and other trades to accommodate fixtures, and the like. Examine mechanical and electrical drawings to establish hanger layout and ensure that ceiling hanger layout and furring are designed to span ducts, and the like, where required. Supply all hangers, including inserts for hangers and supplementary framing members as required for complete installation.

.2 Prior to installation of acoustic panels notify the Consultant for inspection and approval of suspension system.

.3 All installations shall be by skilled mechanics and in strict accordance with system manufacturer's printed directions to produce first-class, flush finished surface in true plane, free from drooping, warped, soil or damaged board or grid.

.4 Provide all additional supports, hangers and steel trapeze channel framing required to support fixtures located under mechanical ducts.

.5 Hangers, where required:

.1 Space hangers to support grid on 1220mm (48”) centres each way securely fastened to structure. Hangers shall not, under any circumstances, be secure to pipes, ducts or any electrical or mechanical items.

.2 Frame around recessed fixtures, grilles and openings with an allowance for movement. Hangers shall be plumb and not pressed against ducts, pipes or conduits.

.6 Anchors, where required:

.1 Self-drilling type, installed by means of an electrically powered drill specifically designed for this purpose.

.2 The anchor manufacturer shall evaluate the specific job conditions and advise in writing regarding anchor sizes necessary. The safe working load shall not exceed 25% of the manufacturer's stated average test loads for the anchor.

.3 Receive instruction from the anchor manufacturer regarding correct usage and comply with these requirements.

.7 Assemble ceiling system in accordance with drawings. Install ceilings centered on room axis unless noted otherwise. Lay patterned ceiling panels in one direction with pattern parallel to the shortest room dimension.

.8 Cooperate with the mechanical contractor and cut ceiling panels as required to accommodate air handling diffuser throughout the work.

.9 Install acoustic ceiling panel types as indicated on drawings and schedules.

3.3 CLEANING

.1 Thoroughly clean all acoustic ceiling surfaces upon completion of the installation.

.2 Promptly as the work proceeds and on completion, remove all surplus materials and debris resulting from the work of this Section.

END OF SECTION

1 – GENERAL

1.1 SECTION INCLUDES

.1 Design, labour, Products, tools, equipment and services necessary for resilient flooring installation in accordance with the Contract Documents, including but not limited to: subfloor preparation, flooring system installation, base, stair treads, tactile attention indicators and accessories.

1.2 REFERENCES

.1 ASTM D412: Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension.

.2 ASTM D2047: Standard Test Method for Static Coefficient of Friction of Polish-Coated Floor Surfaces as measured by the James Machine.

.3 ASTM D2240: Standard Test Method for Rubber Property (Durometer Hardness).

.4 ASTM D3389: Standard Test Method for Coated Fabrics Abrasion Resistance (Rotary Platform Abrader).

.5 ASTM E648: Standard Test Method for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source.

.6 ASTM E662: Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials.

.7 ASTM E1643: Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.

.8 ASTM E1745: Standard Specification for Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.

.9 ASTM F386: Standard Test Method for Thickness of Resilient Flooring Materials Having Flat Surfaces.

.10 ASTM F710: Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.

.11 ASTM F925: Standard Test Method for Resistance to Chemicals of Resilient Flooring.

.12 ASTM F970: Standard Test Method for Static Load Limit.

.13 ASTM F1344: Standard Specification for Rubber Floor Tile.

.14 ASTM F1514: Standard Test method for Measuring Heat Stability of Resilient Flooring by Color Change.

.15 ASTM F1515: Standard Test Method for Measuring Light Stability of Resilient Flooring by Color Change.

.16 ASTM F1859: Standard Specification for Rubber Sheet Floor Covering Without Backing.

.17 ASTM F1869: Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.

.18 ASTM F2055: Standard Test Method for Size and Squareness of Resilient Floor Tile by Dial Gage Method.

.19 ASTM F2170: Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.

.20 ASTM F2199: Standard Test Method for Determining Dimensional Stability of Resilient Floor Tile after Exposure to Heat.

.21 ASTM G21: Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

1.4 SUBMITTALS

.1 Provide submittals in accordance with Division 01.

.2 Action Submittals:

.1 Product Data: Submit one copy of product data for each type of product specified.

.2 Shop Drawings: Submit shop drawings indicating:

.1 Location of seams and edges

.2 Location of columns, doorways, enclosing partitions, built-in furniture, cabinets, and cut-out locations

.3 Samples for Selection: Submit manufacturer's colour charts and samples for initial selection consisting of full range of colours and patterns available for each type of product indicated.

.4 Samples for Verification:

.1 Resilient Flooring: Submit samples of each different specified product for verification of colour and pattern in manufacturer's standard size, but not less than 150mm x 150mm (6” x 6”) in size for tile or sheet material.

.3 Informational Submittals: Provide the following submittals during the course of the work:

.1 Site Quality Control Test Results: Submit results or moisture emission testing of concrete subfloors prior to installation of flooring. Results shall include comparison of manufacturer’s recommended moisture content to actual moisture vapour emission rate.

.4 Maintenance Data and Operating Instructions:

.1 Operation and Maintenance Data: Submit manufacturer’s written instructions for maintenance and cleaning procedures, include list of manufacturers recommended cleaning and maintenance products, and name of original installer and contact information in accordance with Division 01.

.5 Safety Data Sheets:

.1 Submit WHMIS safety data sheets for incorporation into the Operation and Maintenance Manual. Keep one copy of WHMIS safety data sheets on site for reference by workers.

.6 Maintenance Materials:

.1 Provide five percent (5%) of each colour and type of resilient flooring specified, boxed and labelled.

.2 Store maintenance materials on the premises as directed by the Owner.

1.5 QUALITY ASSURANCE

.1 Manufacturer must be certified ISO 9001 and ISO 14001.

.2 Manufacturer must have a minimum of fifteen (15) years of experience in the manufacturing of prefabricated resilient rubber flooring.

.3 Manufactured Product must have undergone a vulcanization process; factory lamination should not be accepted as equivalent.

.4 In accordance with ASTM E648, the Manufactured Product must have a critical radiant flux ≥0.45 W/cm^2 (Class 1).

.5 In accordance with ASTM E662, the Manufactured Product must have an optical density of smoke ≤450.

.6 Surfacing Contractor to be recognized and approved by the Manufacturer.

.7 Installer must be approved by the Surfacing Contractor and must have performed installations of the same scale in the last three (3) years.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Products Supplied must be delivered in Manufacturer's original, unopened and undamaged packaging with identification labels intact.

.2 Products Supplied must be protected from exposure to harmful weather conditions and must be safely stored on a clean, dry, flat surface. Store rolls of resilient flooring upright; store tiles of resilient flooring on a flat surface, carefully protecting corners and edges.

.3 Climate controlled storage is recommended. Storage temperature must not be below 40°F (4°C) and must not exceed 100°F (38°C). Materials must be delivered to site a minimum of 24 hours before work is scheduled to begin so that they may acclimate.

.4 Avoid storing Manufactured Product for extended periods of time or additional material trimming may be required.

.5 Products Supplied need not suffer damage during delivery, storage and handling (i.e. dents/scratches, excessive compression or warping, chipped edges, etc.).

1.7 SITE CONDITIONS

.1 Concrete slabs, on or below grade, must be installed over a permanent effective vapor retarder, respecting current versions of the standard practice ASTM E1643 and the standard specification ASTM E1745. The vapor retarder must be placed directly underneath the concrete slab, above the granular fill, as per Manufacturer's instructions. The vapor retarder must have a perm rating of 0.1 or less and must have a minimum thickness of 10 mil (0.010 in).

.2 Substrate surface must be free of all contaminants that can inhibit bond (paint, wax, dust, oil or grease, sealer, curing compound, solvent, asphalt, old adhesive residues, etc.). All contaminants must be removed from the surface via mechanical abatement. Use of abatement chemicals is not recommended.

.3 Concrete must have a smooth finish, proper density and be highly compacted with a tolerance of 1/8th of an inch in a 10-foot radius (3.2 mm in 3.05 m radius). Floor Flatness (FF) and Floor Levelness (FL) numbers are not recognized.

.4 Moisture and alkalinity tests must be performed on all concrete substrates, under in-service conditions. It is recommended to turn on the HVAC unit prior to performing moisture testing, in order to ensure stable testing conditions and accurate results. The concrete's surface pH should be between 7 and 10. Relative humidity of the concrete slab must not exceed the tolerance of the adhesive specified, in accordance with the current version of ASTM F2170 (in situ probes). Moisture vapor emissions from the concrete slab must not exceed the tolerance of the adhesive specified, in accordance with the current version of ASTM F1869 (anhydrous calcium chloride).

.5 Maintain stable room and substrate temperatures prior to moisture testing and flooring installation, during the flooring installation, as well as a minimum of 48 hours after the flooring has been completely installed. Recommended ambient temperature range is between 65°F and 86°F (18°C and 30°C) and recommended ambient humidity range is between 35% and 55%.

.6 Installation of resilient flooring will not commence until the building is enclosed and all other trades have completed their work. It is the General Contractor or Construction Manager's responsibility to maintain a secure and clean working area before, during and after the installation of the resilient flooring.

1.8 WARRANTY

.1 The resilient flooring is warranted to be free from manufacturing defects for a period of two (2) years, beginning from the date of Substantial Performance.

2 – PRODUCTS

2.1 Resilient Tile Flooring (RES-01)

.1 Prefabricated resilient rubber flooring, calendered and vulcanized with a base of synthetic rubber, stabilizing agents and pigmentation.

.2 Health-Conscious Production: free from red listed ingredients (LBC Red List) and is manufactured without bisphenol A (BPA), formaldehyde, halogens, heavy metals, isocyanates, phthalates and polyvinyl chloride (PVC), in addition to being manufactured from 100% renewable electric energy sources: water, wind and solar.

.3 Thickness: 0.079'' (2 mm).

.4 Colors: Provided in standard, solid background colors with randomly dispersed colored chips throughout its surface.

.5 Surface Texture: Smooth.

.6 Finish: Factory applied low-gloss finish, cured by ultraviolet (UV) processing.

.7 Vulcanized, single layer construction. Shore hardness to be recommended by the Manufacturer and to respect limits specified.

.8 Formats: tiles that are 24" x 24" (61 cm x 61 cm).

.9 Performance Criteria

Performance Criterion	Test Method	Requirement	Result*
Modulus at 10% Elongation	ASTM D412	≥300 psi	509.37 psi
Static Coefficient of Friction (neolite heel)	ASTM D2047	≥0.50 (dry)	≥0.80 (dry)
Durometer Hardness (Shore A)	ASTM D2240	≥85	95
Abrasion Resistance (H18 wheel, 1000g, 1000 cycles)	ASTM D3389	≤1.0 g	0.15 g
Critical Radiant Flux	ASTM E648	≥0.45 W/cm2	≥0.45 W/cm2 (Class 1)
Optical Density of Smoke	ASTM E662	≤450	≤450
Thickness	ASTM F386	2 mm (±0.15 mm) 0.079" (±0.006")	Compliant
Resistance to Chemicals	ASTM F925	≤Slight Change	Compliant **
Static Loading (Tested at 250psi)	ASTM F970	≤0.005 in	0.001 in
Static Loading (Tested at 800psi)	ASTM F970	-	0.003 in
Heat Resistance	ASTM F1514	ΔE ≤8.0	Compliant
Light Resistance	ASTM F1515	ΔE ≤8.0	Compliant
Tile Size	ASTM F2055	±0.45 mm	Compliant
Tile Squareness	ASTM F2055	≤0.254 mm	Compliant
Dimensional Stability of Tiles	ASTM F2199	≤0.15%	Compliant

Resistance to Fungi	ASTM G21	-	No Growth
Impact Sound Insulation	ISO 10140-3	-	≈6 dB (ΔL_w)
Indoor Air Quality: CA Section 01350	CA: V1.1-2010	-	Compliant
Indoor Air Quality: Greenguard Gold	Greenguard	-	Compliant
Indoor Air Quality: Greenguard Certification	Greenguard	-	Compliant
Indoor Air Quality: AgBB	ISO 16000-9	-	Compliant

.10 Acceptable product:

.1 Sentica as manufactured by Noraplan/Interface;

.2 Granito as manufactured by Mondo;

.3 Equivalents per 01 25 00.

2.2 Rubber Wall Base:

.1 Rubber thermoplastic wall base to ASTM F1861 consisting of a blend of a thermoplastic and rubber backing covered with a durable colored top layer. Must be free of Red List Chemicals, PVC, thalates and halogens

.2 Dimensions: 101.6mm high x 3.2mm thick x longest practical lengths.

.3 Profile: standard toe.

.4 Surface burning: Class A per ASTM E84/NFPA 253, FSR 50/SDS 175 per CAN/ULC-S102.2

.5 Colour: To be selected by Consultant from manufacturer’s full colour range; allow for 2 colours.

.6 Acceptable product:

.1 Pinnacle rubber base by Roppe

.2 Equivalent per 01 25 00

2.3 Rubber Stair Treads:

.1 Resilient vulcanized rubber stair tread products designed for permanent flooring installations and does not contain any chemicals contained in the Living Future Institute's Red List (Living Building Challenge, Imperative 10), substances of very high concern (SVHC) on the REACH candidate list, or substances restricted under REACH.

.2 Dimensions: to suit stair treads/risers as detailed.

.3 Nose configuration: square nose.

.4 Finish: Raised circular profile complete with integral abrasive nosing strip.

.5 Colour: To be selected by Consultant from manufacturer’s solid colour range; allow for 1 colour.

6 Acceptable product:

.1 Rubber Tread by Roppe

.2 Equivalent per 01 25 00

2.4 Tactile Attention Indicators (TAI-01)

.1 Vitrified Polymer Composite (VPC) Cast in Place Warning tiles shall be an epoxy polymer composition with a ultra-violet coating employing aluminum oxide particles in the truncated domes.

.2 Dimensions: The tile shall incorporate an in-line pattern of truncated domes measuring nominal 0.2” height, 0.9” base diameter, 0.45” top diameter spaced center-to-center 2.35” as measured on a diagonal and 1.67” as measured side by side in-line.

.3 Colour: Homogeneous throughout the tile; Colour: As selected later by Consultant.

.4 Basis of Design Materials: Armor Tile by Kinesik Engineered Products, or approved equivalent.

2.5 Accessories

.1 Adhesives: as approved for use by the resilient flooring manufacturer to suit the subfloor conditions.

.2 Subfloor filler and leveller: as approved for use by the resilient flooring manufacturer to suit the subfloor conditions.

.3 Grout: to CSA A179, Table 3.

.4 Moulded Thresholds: Rubber, tapered shape, size to bridge difference in elevation at the intersection of rubber flooring and adjacent flooring. Colour as selected by Consultant.

3 – EXECUTION

3.1 EXAMINATION

.1 Ensure that concrete surface is free of any contaminant that could inhibit bond (paint, wax, dust, oil or grease, sealer, curing compound, solvent, asphalt, old adhesive residues, etc.). All contaminants must be removed from the surface via mechanical abatement. Use of abatement chemicals is not recommended.

.2 Confirm concrete has a smooth finish, proper density and is highly compacted with a tolerance of 1/8th of an inch in a 10-foot radius (3.2 mm in a 3.05 m radius). Floor Flatness (FF) and Floor Levelness (FL) numbers are not recognized.

.3 Moisture and alkalinity tests must be performed on all concrete substrates, under in-service conditions. It is recommended to turn on the HVAC unit prior to performing moisture testing, in order to ensure stable testing conditions and accurate results. The concrete’s surface pH should be between 7 and 10. Relative humidity of the concrete slab must not exceed the tolerance of the adhesive specified, in accordance with the current version of ASTM F2170 (in situ probes). Moisture vapor emissions from the concrete slab must not exceed the tolerance of the adhesive specified, in accordance with the current version of ASTM F1869 (anhydrous calcium chloride).

.4 Ensure room and substrate temperatures are maintained prior to moisture testing and flooring installation, during the flooring installation, as well as a minimum of 48 hours after the flooring has been completely installed. Recommended ambient temperature range is between 65°F and 86°F (18°C and 30°C) and recommended ambient humidity range is between 35% and 55%.

3.2 PREPARATION

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

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

.3 Old vinyl flooring to be removed only by trained personnel (may contain asbestos).

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

.5 Surface Preparation:

.1 General: Prepare floor substrate in accordance with manufacturer's instructions.

.2 Floor Substrate: Floors shall be sound, smooth, flat, permanently dry, clean, and free of all foreign materials including, but not limited to, dust, paint, grease, oils, solvents, curing and hardening compounds, sealers, asphalt and old adhesive residue.

.3 Concrete Floor Substrate: Comply with ASTM F 710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring

.6 Concrete pH Test: Perform pH tests on concrete floors regardless of the age or grade level. If the pH is greater than 11, it must be neutralized prior to beginning the installation.1

3.3 INSTALLATION – RESILIENT FLOOR TILE

.1 Install resilient floor tiles following manufacturers current printed guidelines.

.2 Lay tiles with straight joints in one direction, offset in the other. Butt tiles to moderate contact and lay symmetrically with and parallel to the axis of room or corridor. Distribute variations in shade or pattern of production run. Obtain uniform effect. Abrupt variations will not be permitted. Where tiles have a pattern or grain, refer to Consultant before installing tiles.

Note: Contractor to pay particular attention to ‘setting-out’ of the tiles in order to provide perimeter tile of not more than one half (1/2) tile in width and not less than one third (1/3) tile in width.

.3 Roll after laying with a polished, clean, roller weighing at least 100 lbs in 2 directions perpendicular to each other.

Note: Contractor is to pay additional attention to tile at perimeter room/space and/or at component junctions, i.e., door frames etc., to ensure complete and proper rolling. Perimeter tiles exhibiting improper or inadequate adhesion and/or variations in levels between tiles shall be removed and replaced immediately.

.4 Accurately scribe the tile around the walls, columns, door frames, floor outlets and any other projections through the floor

3.4 INSTALLATION: BASE

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

.2 Clean substrate and prime with one coat of adhesive.

.3 Apply adhesive to back of base.

.4 Set base against wall and floor surfaces tightly by using 3 kg hand roller.

.5 Install straight and level to variation of 1:1000.

.6 Scribe and fit to door frames and other obstructions. Use premoulded end pieces at flush door frames.

.7 Cope internal corners. Use premoulded corner units for right angle external corners. Use formed straight base material for external corners of other angles.

3.5 REPAIR

.1 Refer to section 1.4.3 for extra stock materials. Repair material must come from the same original dye lot as the Manufactured Product initially installed.

.2 Repairs are to be performed by Surfacing Contractor’s qualified installers/technicians only.

3.6 CLEANING

.1 Always wait at least a minimum of 72 hours after the resilient flooring has been completely installed before performing initial maintenance. Perform initial cleaning to remove any factory contamination.

3.7 PROTECTION

.1 As needed, protect resilient flooring with 1/8” Masonite during and after the installation, prior to its acceptance by the Owner.

END OF SECTION

1 General

1.1 SUMMARY

.1 Section includes surface preparation and the application of paint systems on the following interior and exterior substrates:

.1 Concrete;

.2 Concrete masonry units (CMU)

.3 Steel and iron;

.4 Galvanized metal;

.5 Hollow metal doors and frames;

.6 Gypsum board;

.7 Cotton or canvas insulation covering.

.2 Refer also to Intumescent Paint requirements as outlined in Specification 07 81 23.

1.2 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.

.3 The Society for Protective Coatings (SSPC):

.1 Coating Materials Guidelines

.2 Surface Preparation Guidelines

.3 Application, Inspection and Quality Control Guidelines

1.3 DEFINITIONS

.1 Gloss Levels: Standard coating terms defined by MPI Manual apply to products of this Section as follows:

.1 MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D523.

.2 MPI Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D523.

.3 MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D523.

.4 MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D523.

.5 MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D523.

.6 MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D523.

.7 MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D523.

.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 Consultant at a later date.

.2 Trim and Doors: Semi-gloss (G5).

.3 Ceilings: Flat (G1).

1.4 SUBMITTALS

.1 Provide required information in accordance with Division 01.

.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 Consultant 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 Consultant:

.1 Certification: Submit certification reports for paint products indicating that they meet or exceed low VOC and coloured base requirements listed in this Section.

1.5 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 Division 01, including specific warning of any maintenance practice or materials that may damage or disfigure the finished Work.

.2 Maintenance Materials: Deliver maintenance materials to Owner in quantities indicated and in accordance with Division 01, 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.

1.6 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.

1.7 MOCKUPS

.1 Mockups: Apply mockups of each paint system indicated and each colour and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

.1 Consultant will select one surface to represent surfaces and conditions for application of each paint system.

.1 Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).

.2 Other Items: Consultant will designate items or areas required.

.2 Final approval of colour selections will be based on mockups.

.1 If preliminary colour selections are not approved, apply additional mockups of additional colours selected by Consultant at no added cost to Owner.

.3 Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Consultant specifically approves such deviations in writing.

.4 Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

.1 Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 7 deg C (45 deg F).

.1 Maintain containers in clean condition, free of foreign materials and residue.

.2 Remove rags and waste from storage areas daily.

1.9 FIELD CONDITIONS

.1 Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 10 and 35 deg C (50 and 95 deg F).

.2 Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 3 deg C (5 deg F) above the dew point; or to damp or wet surfaces.

1.10 WARRANTY

.1 Provide upon completion of the work, a Warranty Certificate, in the name of the Owner, stating that the work of this section was performed in accordance with these specifications and the MPI manual (latest edition), and is warranted against defects in material or installation, for a period of two (2) years from Date of Substantial Performance.

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 Dulux Paints

.2 Sherwin-Williams LLC

.3 Benjamin Moore and Co. Limited

.4 ICI Paints (Canada) Inc.

2.2 PAINT, GENERAL

.1 MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists".

.2 Material Compatibility:

.1 Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.

.2 For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.

.3 VOC Content: For field applications, paints and coatings shall comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:

.1 Flat Paints and Coatings: 50 g/L.

.2 Nonflat Paints and Coatings: 50 g/L.

.3 Dry-Fog Coatings: 150 g/L.

.4 Primers, Sealers, and Undercoaters: 100 g/L.

.5 Rust-Preventive Coatings: 100 g/L.

.6 Zinc-Rich Industrial Maintenance Primers: 100 g/L.

.7 Pretreatment Wash Primers: 420 g/L.

.8 Shellacs, Clear: 730 g/L.

.9 Shellacs, Pigmented: 550 g/L.

.4 Paint Colour and Manufacturer (PT): As selected by the Consultant from the manufacturer’s standard product line. Carry five (5) colours and three (3) accent colours in Bid Price.

2.3 PREPARATORY COATS

.1 CMU Block Filler:

.1 Benjamin Moore; Coronado Super Kote 5000 Latex Block Filler (958-11).

.2 PPG; Speedhide Interior/Exterior Masonry Latex Block Filler (6-7).

.3 SW; PrepRite Block Filler Interior/Exterior Latex (B25W25).

3 Execution

3.1 EXAMINATION

.1 Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

.2 Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

.1 Concrete: 12 percent.

.2 Fiber-Cement Board: 12 percent.

.3 Masonry (Clay and Concrete Masonry Units): 12 percent.

.4 Wood: 15 percent.

.5 Portland Cement Plaster: 12 percent.

.6 Gypsum Board: 12 percent.

.3 Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

.4 Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.

.5 Proceed with coating application only after unsatisfactory conditions have been corrected.

.1 Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

.1 Comply with manufacturer's written instructions and recommendations in "MPI Painting Specification Manual" applicable to substrates and paint systems indicated.

.2 Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

.1 After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

.3 Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

.1 Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

.4 Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

.1 Use abrasive blast-cleaning methods if recommended by paint manufacturer.

.5 CMU / Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.

.6 Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer, but not less than the following:

.1 SSPC-SP 3.

.7 Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

.8 Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

.9 Gypsum Wallboard: Repair all surfaces in gypsum wallboard with wallboard joint finishing compound or spackling compound, filled out flush and sanded smooth. Clean all surfaces and taped joints of dust, dirt and other contaminants and be sure they are thoroughly dry before applying paint.

.10 Cotton or Canvas Insulation Covering Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

.11 Mix and prepare paint materials according to manufacturer's written instructions.

.1 Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.

.2 Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.

.3 Use only thinners approved by paint manufacturer and only within recommended limits.

3.3 APPLICATION

.1 Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."

.1 Use applicators and techniques suited for paint and substrate indicated.

.2 Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.

.3 Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.

.4 Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

.5 Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

.2 Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match colour of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

.3 Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

.1 The number of coats and film thickness required are the same regardless of application method. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.

.1 Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.

.2 Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

.3 If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure that edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.

.2 Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, and does not deform or feel sticky under moderate thumb pressure, and until application of another coat of paint does not cause undercoat to lift or lose adhesion.

.4 Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.

.1 Brushes: Use brushes best suited for type of material applied. Use brush of appropriate size for surface or item being painted.

.2 Rollers: Use rollers of carpet, velvet-back, or high-pile sheep's wool as recommended by manufacturer for material and texture required.

.3 Spray Equipment: Use airless spray equipment with orifice size as recommended by manufacturer for material and texture required.

.5 Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and colour breaks.

.6 Apply block fillers to CMU at a rate to ensure complete coverage with pores filled.

.7 Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:

.1 Paint the following work where exposed in equipment rooms and where exposed in occupied spaces:

.1 Equipment, including panelboards.

.2 Uninsulated metal piping.

.3 Uninsulated plastic piping.

.4 Pipe hangers and supports.

.5 Metal conduit.

.6 Plastic conduit.

.7 Tanks that do not have factory-applied final finishes.

.8 Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.

.8 Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

.1 Colour: Flat (gloss level 1), nonspecular, black.

3.4 FIELD QUALITY CONTROL

.1 Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.

.1 Contractor shall touch up and restore painted surfaces damaged by testing.

.2 If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

.1 At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

.2 After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

.3 Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Consultant, and leave in an undamaged condition.

.4 At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 EXTERIOR PAINTING SCHEDULE

.1 Structural Steel:

.1 Intumescent Fireproofing as per Specification 07 81 23

.2 Galvanized Metal (doors, frames, railings, misc. steel, pipes, overhead decking, ducts, gutters, flashing, etcetera):

.1 Latex System - MPI EXT 5.3A.

.1 Semi-gloss (MPI Gloss Level 5).

.2 Wash Primer/2-Component Aliphatic Polyurethane Finish (High Contact Areas) - MPI EXT 5.3D:

.1 Semi-gloss (MPI Gloss Level 5).

3.7 INTERIOR PAINTING SCHEDULE

.1 Concrete Substrates:

.1 Latex System - MPI INT 3.1A:

.1 Primer: Alkali resistant, water based.

.2 Intermediate Coat: Latex, interior, matching topcoat.

.3 Topcoat: Latex, interior (gloss as selected by the Consultant).

.2 CMU Substrates:

.1 Latex System - MPI INT 4.2A:

.1 Primer: CMU block filler.

.2 Intermediate Coat: Latex, interior, matching topcoat.

.3 Topcoat: Latex, interior (gloss as selected by the Consultant).

.3 Structural Steel Substrates:

.1 Water-Based Dry Fall Finish - MPI INT 5.1C

.2 High-Performance Architectural Latex System - MPI INT 5.1R:

.1 Primer: Acrylic.

.2 Intermediate Coat: Latex, interior, high performance architectural; matching topcoat.

.3 Topcoat: Latex, interior, high performance architectural (gloss as selected by the Consultant).

.3 Coordinate with existing structural steel elements scheduled to receive applied fireproofing and/or intumescent fireproofing.

.4 Steel (Factory-Primed) Substrates:

.1 High-Performance Architectural Latex System:

.1 Primer: Acrylic (applied over factory primer).

.2 Intermediate Coat: Latex, interior, high performance architectural; matching topcoat.

.3 Topcoat: Latex, interior, high performance architectural (gloss as selected by the Consultant).

.5 Galvanized-Metal Substrates:

.1 High-Performance Architectural Latex System - MPI INT 5.3M:

.1 Prime Coat: Primer, galvanized, water based.

.2 Intermediate Coat: Latex, interior, high performance architectural, matching topcoat.

.3 Topcoat: Latex, interior, high performance architectural, semi-gloss (MPI Gloss Level 5).

.6 Hollow Metal Doors and Frames.

.1 High-Performance Architectural Latex System - MPI INT 5.3M:

.1 Prime Coat: Primer, galvanized, water based.

.2 Intermediate Coat: Latex, interior, high performance architectural, matching topcoat.

.3 Topcoat: Latex, interior, high performance architectural, semi-gloss (MPI Gloss Level 5).

.7 Gypsum Board Substrates:

.1 Latex System - MPI INT 9.2A:

.1 Primer: Sealer, latex, interior.

.2 Intermediate Coat: Latex, interior, matching topcoat.

.3 Topcoat: Latex, interior (gloss as selected by the Consultant).

.8 Cotton or Canvas Insulation-Covering Substrates: Including pipe and duct coverings.

.1 Latex System - MPI INT 10.1A:

.1 Prime Coat: Primer sealer, latex, interior.

.2 Topcoat: Latex, interior, flat (MPI Gloss Level 1).

END OF SECTION

1 General

1.1 SUMMARY

.1 Furnish labour, materials and other services to complete the fabrication and installation of the following:

.1 Washroom and Custodial Room accessories and 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.

1.2 REFERENCE STANDARDS

.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

1.3 SUBMITTALS

.1 Provide required information in accordance with Division 01.

.2 Shop Drawings:

.1 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.

1.4 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.

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 Division 01.

.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 ASI Watrous - Global Partitions

.2 Bobrick

.3 Frost

.4 Koala Kare

.5 Dyson

.6 Or approved equivalent.

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 and Custodial 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 for wood blocking for attachment of washroom accessories.

.1 Installed grab bars shall be capable of supporting a downward pull of 500 lbs. per lineal foot.

.2 Install blocking, plywood sheathing, and adjust stud spacing or gauge, in locations identified on the Drawings, scheduled to receive a future adult change table (NIC).

.1 Once installed, adult change tables shall be capable of supporting a weight of 400 pounds (1.78 kN).

.2 Provide Engineered Shop Drawings indicating blocking support, fire-retardant plywood sheathing and steel stud design, including large scale detail of members and materials, connection and interfacing with work of other Sections, jointing details, and anchorage devices. Provide dimension, gauges, thicknesses, description of materials, metal finishing, as well as other pertinent data and information.

.3 Shop Drawings are required to identify the load rating of the wall assembly scheduled to accept the adult change table, and shall be stamped by an Engineer located in the Province of the Work.

.8 Keys: Provide universal keys for internal access to accessories for servicing and re-supplying. Provide minimum of six (6) keys to Owner's representative.

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.

.2 Notify Consultant 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 Consultant prior to proceeding with the affected work.

.3 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.

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 Consultant, remove all protective coatings, and coverings. Clean and polish exposed surfaces.

3.5 WASHROOM AND CUSTODIAL ACCESSORY SCHEDULE

No.	Description / Model
W1a	Grab Bar: 1.214mm (0.048") thickness; 765mm (30") long x 32mm (1-1/4") Ø, straight, stainless steel, slip resistant grip, concealed mounting, cap secured with vandal resistant set screws: ASI 3801-30P Bobrick B-6806.99x30 Or Approved Equivalent
W1b	Grab Bar: Side "L"-shape grab bar, 760mm (30") long x 760mm (30") high x 32mm (1-1/4") dia., stainless steel, slip resistant grip, concealed mounting, cap secured with vandal resistant set screws: ASI Type 04 Or Approved Equivalent
W2	Mirror (Flat): Framed, 762mm (30") high x 460mm (18") wide, fixed installation, mounted 1000mm (40") to bottom of frame: Bobrick B-165x1830 Or Approved Equivalent
W3	Wall-Mounted Soap Dispenser: Heavy-duty all-purpose valve, wall-mounted stainless steel soap dispenser, 850 ml capacity with visible viewing window: Bobrick B-2012 Or Approved Equivalent
W4	Toilet Tissue Dispenser: Double roll, surface mounted, tissue dispenser with concealed mounting, stainless steel construction, bright polished finish with theft resistant spindles: ASI Roval 20030 Or Approved Equivalent
W5	Sanitary Napkin Disposal: Surface mounted, satin finished stainless steel, concealed fastening, self closing disposal opening with leak-proof, 2.3L capacity plastic receptacle: Bobrick B-35139 Or Approved Equivalent
W6	Hand Dryer: Refer to Mechanical
W7	Coat Hooks: Satin finished stainless steel, square profiled robe hook with concealed mounting, provide 2 for each washroom, located as directed by Consultant: Bobrick B-76717 ASI 7340-S Or Approved Equivalent

W8	Custodial Shelf with Mop and Broom Holders and Hooks: 34”L x 13”H, three anti-slip mop holders, four hooks, satin-finish stainless steel Bobrick B-239 x 34 Or Approved Equivalent
W9a	Counterop-Mounted Circular Waste Chute: rolled flange and exposed surfaced bright polished stainless steel, outside diameter 175mm, inside diameter 140mm, chute depth 130mm Bobrick B-529 Or Approved Equivalent
W9b	Floor-Standing Waste Receptacle with Open Top: 553mm high, 13 gal capacity Bobrick B-2260 Or Approved Equivalent
W10	Recessed Waste Receptacle with Disposal Door: all welded construction, flush lock, door is secured to cabinet with full-length stainless steel piano hinge, waste bin construction of heavy gauge stainless steel with 11.3L capacity Bobrick B-35633 Or Approved Equivalent

END OF SECTION

1 General

1.1 WORK INCLUDED

.1 Supply and install the following vertical transportation equipment:

.1 A single Class C1 freight elevator.

1.2 MAINTENANCE: 12 MONTHS (ALTERNATIVE PRICE #1)

.1 Provide maintenance of the equipment in accordance for a period of 12 months after Substantial Performance.

.2 Work included: Maintain, repair, or replace for the elevators machines, motors, drives, wire ropes, hoist ropes/belts, governors, pumps, travelling cables, brake components, wiring, controller parts, relays, door equipment, intercommunication system, and other elevator components.

.3 Monthly Labour

.1 For each geared traction elevator provide minimum labor of 3 hours per month for regular maintenance.

.2 Perform regular maintenance at least once a month.

.4 24 hour call-back service

.1 Provide twenty-four hour a day, seven day a week call-back service.

.2 Include overtime callbacks.

.3 Respond to regular call-backs within two hours from the time a call is placed until a maintenance person arrives at the site.

.4 Respond to emergency call-backs within 30 minutes (45 minutes outside of regular working hours) from the time a call is placed until a maintenance person arrives at the site.

.5 Provide twenty-four hour a day, seven day a week staffed telephone answering service.

.5 Elevator maintenance log book

.1 Provide a log book for elevator maintenance.

.2 Show information such as date, time, name of maintenance person, regular maintenance, callback, and work performed in the log book.

.3 The log book is the property of the Owner.

.6 Equipment performance

.1 Maintain the equipment and its performance in substantially new condition.

.2 Ensure that the equipment meets the original installation or modernization specified performance standards.

.1 Maintain the operating times compatible with reliable, consistent operation without excessive wear.

.7 Monthly checks and duties

.1 For each elevator perform the following tasks every month:

.1 Check the ride quality, levelling, and general operation;

.2 Check the door operation and door protective devices;

.3 Check the emergency stop switch and alarm;

.4 Check the telephone or intercom;

.5 Check the door open and close buttons, position indicators, and floor push buttons;

.6 Check the car door equipment (rollers, contacts, eccentrics, etc.);

.7 Check the hall door interlocks;

.8 Clean and lubricate the car door tracks;

.9 Clean pits, car tops, and machine room floor;

.10 Check the machine and motor;

.8 Quarterly checks and duties

.1 For each elevator perform the following tasks every three months:

.1 Clean the controller and inspect each relay and controller component;

.2 Check the roller guides;

.3 Check the cab emergency lighting;

.4 Vacuum the motor;

.5 Check and lubricate the governor and tension sheave;

.6 Check the buffers and the buffer oil;

.7 Clean pits, car tops, and machine room floor.

.9 Semi-annual checks and duties

.1 For each elevator perform the following tasks every six months:

.1 Check the operation of hall doors, closers, gibs, and other hall door equipment;

.2 Check the operation of the limit switches;

.3 Check the emergency service operation (if provided);

.4 Check the emergency power operation or battery lowering;

.5 Check the security system operation (if provided);

.6 Check the door dwell times for consistency;

.7 Check the power unit;

.10 Yearly checks and duties

.1 For each elevator perform the following tasks every twelve months:

.1 Check all safety devices;

.2 Clean the guide rails and hoistways;

.3 Check the hall buttons;

.4 Open up, clean, and check the car station;

.5 Check the travelling cables for wear and broken wires;

.6 Check the motor contactors and overloads;

.7 Check the governor and hoist ropes/belts for wear and tension;

.8 Check rope/belt stretch;

.9 Clean and check the safety;

.10 Perform a safety test and document this in the elevator log book;

.11 Disassemble, clean, and lubricate the brake;

.12 Check the operation of the emergency brake (if provided). In particular check wear on the linings and apply the device;

.13 Check the load weighing;

.14 Check the buffer oil levels and test the buffers;

.15 .Measure the performance times and perform a re-adjustment if required;

1.3 CODES, BY-LAWS, AND REGULATIONS

.1 Provide equipment and perform work in accordance with all local, provincial and federal codes, by-laws, and regulations.

.2 Provide equipment and perform work in accordance with the latest edition of the B44 Safety Code for Elevators and any other code which may govern the installation.

.3 At the time of bid submission and during the contract provide written notification of any proposed changes in codes, by-laws, or regulations which may affect the work.

1.4 PERMITS AND CERTIFICATES OF INSPECTION

.1 Arrange and pay for all necessary permits, certificates, approvals, variances, and inspections.

.2 Prior to Substantial Performance, arrange and pay for a safety inspection of the equipment by the regulatory authority.

1.5 WARRANTY

.1 Warrant the work performed, materials, performance, and workmanship for a period of one year from the date of Substantial Performance.

.2 Correct defects which develop within the above mentioned time period.

1.6 SHOP DRAWINGS AND SAMPLES

.1 Supply for approval shop drawings and samples of exposed finishes.

.2 Supply at a minimum drawings showing the general arrangement layout, machine room layout, fixtures, entrances, and cab finishes.

1.7 WIRING DIAGRAMS AND MANUALS

.1 Prior to substantial performance, supply to the Owner, three sets of manuals describing in detail the operation of the equipment and special features.

.1 Detail the operation for special features such as independent service, emergency power operation, special emergency service, intercommunication, and security operation.

.2 Supply, as part of the manual, as-built drawings.

.2 In conjunction with the above, supply three copies and one AutoCAD disk of the as-built wiring and schematic diagrams.

.3 Prior to substantial performance, supply to the Owner, a manual detailing proper maintenance procedures for the equipment.

1.8 TRAINING

.1 At completion of the job, provide a training session for the Owner consisting of a review of the documentation and operation of the equipment and features.

1.9 OPERATING CONDITIONS

.1 Provide equipment that will operate normally when the machine room and hoistway temperature is between 5 and 35 degrees Celsius (40 and 95 degrees Fahrenheit).

.2 Provide equipment that will operate normally when the power supply is within 10 percent of its rated voltage.

1.10 INSPECTION AND ACCEPTANCE

.1 Provide a meter and test weights (full load) along with an adjuster and helper to assist the engineer with a final acceptance inspection.

1.11 NON-PROPRIETARY EQUIPMENT

.1 If proprietary tools and/or information is required to maintain, adjust, or diagnose the equipment provide this to the Owner.

.2 Arrange the equipment such that there are no time, date, trip, or other counters that would shut down the equipment or change its operation.

1.12 TEST DATA FORM

.1 Prior to final acceptance of the elevators, submit a test data form certifying that the elevators are complete and ready for inspection.

.2 This form is to show the operating times, door times, dwell times, and ride quality (lateral and vertical acceleration rates).

.3 Submit with the form accelerometer recordings showing the lateral and vertical acceleration rates.

.4 Arrange that this form is signed by the adjustor responsible for the work.

1.13 ELEVATOR CLEAN-DOWN

.1 In addition to the hoistway and machine room equipment clean-down performed at TSSA inspection, perform an additional clean-down once building construction is complete.

2 Products

2.1 DESCRIPTION

.1 Provide Class C1 Freight Elevator as follows:

.1 In-Ground Electro-Hydraulic freight elevator.

.2 Rated Load: 20,000lbs (9,072kg)

.3 Rated Speed: .75 m/s (148fpm) plus or minus 5.0 percent

.4 Car Inside Dimensions: 3050mm wide x 7315mm deep

.5 Overall cab height of 3050mm

.6 Hoistway Size: Refer to Architectural Drawings

.7 Operation: Single Automatic Push Button

.8 Car Controls: Illuminated Type with faceplate in Stainless Steel #4 finish.

.9 Hall Call Stations: Illuminated type. Stainless steel #4 Cover Plates.

.10 Entrance Type: Automatic Bi-Parting front entrance at each level with a width of 3050mm and height of 2440mm.

.11 Entrance Frame: Formed or structural steel entrance frame to be provided and sized to adequately support the loading onto the entrance door sills. Entrance frame to accommodate building wall thickness and to be provided on both sides and top. Bottom to include checker plate and reinforcing steel to support loading.

.12 Travel: Refer to Architectural Drawings.

.13 Stops: Refer to Architectural Drawings.

.14 Openings: Refer to Architectural Drawings.

.15 Power Supply: 208 VAC, 3 phase, 60 Hertz

.16 Lighting Supply: 120 Volts, 60 Hertz, 15 Amp

.17 Elevator(s) must comply with the CSA B44 Elevator Code version currently in effect, including Supplements).

2.2 CAR CAB SPECIFICATIONS

.1 Shell Enclosure:

.1 Car Top: Minimum 14 ga. (2.0 mm) steel, grey enamel finish

.2 Shell Walls: 14 ga. (2.0 mm) steel, grey enamel finish

.3 Car gate: Vertical slide up wire mesh 1829 mm high

.4 Operation: Automatic

.2 Cab Features:

.1 Finished Flooring: Steel checker plate

.2 Bumper Rail: Solid hardwood

.3 Hoistway Doors and Frames: Finish to be prime coat

.4 Lighting: LED strip lighting type recessed into ceiling

.5 Emergency Exit: Top exit in car top in accordance with CSA B44 Elevator Code

.6 Overall Height: 2438 mm (8' 0") clear

.7 Car Operating Station: Top row of buttons located in compliance with CSA B44 Elevator Code Appendix E for accessibility

.3 Other Control Features:

.1 Emergency Run-Stop key switch

.2 Door open button, door close button

.3 Independent Service key switch

.4 Phone Button to activate conversation

.5 Access Key Switch

.6 Light Key Switch

.7 Emergency Light Test Switch

.4 Emergency Car Lighting: The emergency power unit must illuminate the elevator car and provide current to the alarm bell in the event of normal power failure. The equipment must comply with the requirements of the current CSA B44 Elevator Code.

.5 Entrances: Must be manufactured in accordance with procedures established by fire testing authorities and must be labelled for a minimum of 1 hour.

.6 Car Floor Indicator: One (1) to be installed in each car as part of the car station.

.7 Hall Floor Indicator: One (1) for each elevator to be installed at each landing.

.8 Certificate Frame. Mounted on: Elevator cab wall

2.3 CYLINDER AND PLUNGER (JACK UNIT)

.1 The jack must be designed and constructed in accordance with the applicable requirements of the CSA B44 Elevator Code. It must be of sufficient size to lift the gross load the height specified, and must be factory tested to insure adequate strength and freedom from leakage.

.2 The jack unit must consist of the following parts: A plunger of heavy seamless steel tubing accurately turned and polished; a stop ring electrically welded to the plunger to prevent the plunger from leaving the cylinder; a packing seal of suitable design and quality; a drip ring around the cylinder top; a cylinder constructed of steel pipe complete with a pipe connection and air bleeder.

.3 The well for the cylinder, including casing and PVC pipe corrosion protection, must be sunk into the ground. The cavity between the PVC pipe and the cylinder may be optionally filled with a neutral compound whose density is greater than that of water. Means must be provided to check for the absence of water or the level of the compound and top up the level if required.

.4 No plunger follower may be used.

2.4 PUMPING UNIT

.1 The pumping unit must be a unit of integral design and must include an electric motor connected to a pump, a hydraulic control system, a storage tank, necessary piping connections, and a controller, all compactly designed as a single self-contained unit. The motor and pump assembly must be mounted on a rubber isolated inner base.

2.5 PUMP

.1 The pump must be a positive displacement screw type to give smooth operation and must be designed and manufactured for elevator service.

2.6 MOTOR

.1 The motor must be of the alternating current, polyphase squirrel cage induction type and must be of a design adapted to electro-hydraulic requirements.

2.7 HYDRAULIC CONTROL SYSTEM

.1 The hydraulic control system must be of compact design suitable for operation under the required pressures. The control valve must be a manifold with up, down, and check valve sections. A control section including solenoid valves will direct the main valve and control up and down starting, transition from full speed to levelling speed, up and down stops, pressure relief and manual lowering. Down speed and up and down levelling will be controlled at the main valve sections. All of these functions must be fully adjustable for maximum smoothness and to meet contract conditions. All control systems must be pre-adjusted at the factory.

.2 The manual lowering feature must permit lowering the elevator at slow speed in the event of power failure or for adjusting purposes.

2.8 LEVELLING DEVICE

.1 The elevator must be provided with an automatic levelling device which brings the car to a stop within 6 mm (1/4") of the landing level regardless of load or direction of travel. Landing level will be maintained within the levelling zone irrespective of the hoistway doors being open or closed.

2.9 STORAGE TANK

.1 The storage tank must be constructed of steel, and must be provided with a cover, minimum oil levelling measurement and a filter screen mounted over the suction inlet. Tank design must incorporate a reserve capacity of no less than 45 litres (10 gallons). An initial supply of oil sufficient for proper operation must be provided.

2.10 PIPING

.1 Pipe of adequate size and thickness must be installed between the pumping unit and the cylinder head. A shut off valve must be provided for maintenance and adjusting purposes.

2.11 CONTROLLER

.1 A microprocessor controller must be provided, including necessary starting switches of adequate size together with all relays, switches and hardware required to accomplish the operation specified. Overload protection must be provided to protect the motor against overloading.

2.12 CAR STALL PROTECTIVE CIRCUIT

.1 A protective circuit must be provided which will stop the motor and the pump and return the car to its lowest landing in the event the car does not reach its designed landing with a predetermined time interval. This circuit will permit a normal exit from the car but prevent further operation of the elevator until the issue has been corrected.

2.13 WIRING

.1 All wiring and electrical interconnections must comply with the governing codes. Insulated wiring must have flame retardant and moisture proof outer covering, and must be run in conduit, tubing or electrical wire-ways. Travelling cables must be flexible and suitably suspended to relieve strain on individual conductors.

2.14 HOISTWAY OPERATING DEVICES

.1 Normal terminal stopping devices must be provided. When an emergency terminal stopping device is also required, it must be furnished and the controller switches and circuitry arranged in accordance with the requirements of the CSA B44 Elevator Code.

2.15 PIT SWITCH

.1 An emergency stop switch must be located in the pit.

2.16 PLATFORM

.1 The car platform must have a fabricated frame of formed and structural steel shapes, rigidly welded. Flooring is recommended to be steel checker plate. The underside of the platform must be fireproofed. The platform must be manufactured by a CWB certified shop

2.17 CAR FRAME

.1 A suitable car frame fabricated from formed or structural steel members must be provided with adequate bracing to support the platform and car enclosure and designed for the class of loading. Cast iron shoe or slipper guides must be mounted on top and bottom of the car frame to engage the guide rails. The crosshead must be of sufficient strength to lift the fully loaded car when slung in the centre.

2.18 GUIDES

.1 Steel elevator guide rails must be furnished to guide the car, erected plumb and securely fastened to the building structure.

.2 Sliding Guides: Cast iron guides must be mounted on top and bottom of the car for car speeds up to 1.0 m/s.

2.19 TELEPHONE

.1 An ADA-approved AUTODIAL telephone must be furnished and installed as part of the car station. A separate phone line to the elevator controller must be provided and located in the elevator machine room under another section of the specifications.

3 Execution

3.1 OPERATING PERFORMANCE

.1 Levelling - Arrange that the car stops within 6 mm (1/4") of the floor level.

.2 Acceleration - Arrange that the average acceleration is at least 0.9 m/s/s (3.0 f/s/s) and that the acceleration peaks are less than 1.2 m/s/s (3.9 f/s/s).

3.2 FREFIGHTERS' EMERGENCY OPERATION

.1 Firefighters' Emergency Operation: Provide all requirements for FEO Phase I and Phase II in each elevator.

END OF SECTION

ACCORD PLASTIC
CONCORD
ONTARIO

PROJECT NUMBER 2023-1010
ELECTRICAL SPECIFICATION
MARCH 2024

Prepared By
SHARMA & PARTNERS INC.
Curlew Drive, Suite 108
Toronto

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SECTION 26 05 00
BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 GENERAL

1.1 REFERENCE

.1 Comply with General Conditions of the Contract and Division 1.

1.2 INTENT

.1 This Section applies to all Sections of Electrical Contractor.

.2 The mention herein and/or indication on the drawing of any article, material, operation or method requires that it shall be provided and shall be of the quality and subject to the qualifications noted. Perform each operation prescribed according to the conditions stated, providing therefore all necessary labour, equipment and incidentals.

1.3 SUBMITTALS

.1 Comply with Division 1 General Requirements and specific additional requirements of Sections in Electrical Contractor.

1.4 WORK UNDER OTHER DIVISIONS

.1 Painting of exposed conduits, ducts and unfinished electrical equipment – under General trades.

.2 Concrete work – under Division 26.

.3 Excavation and backfilling inside and outside the building – under Div 2/Electrical Contractor.

.4 Cutting and patching will be by General Trades.

1.5 CONTRACTOR'S WORKSHOP

.1 Provide temporary buildings for field office, workshop, tools and material storage as may be required for own use and be responsible for any loss or damage thereto. Temporary buildings shall be of a type approved by the Consultant and located as directed by him. Temporary buildings shall be removed after completion of work as directed by Consultant.

1.6 TEMPORARY LIGHT, POWER AND WATER

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.1 Temporary light, power and water will be provided under Division 1. Provide all necessary extension cords, lamps, hoses, etc. for own use.

1.7 INSPECTION OF SITE AND EXISTING CONDITIONS

.1 Existing manufacturing facility in the construction area will be operational during the construction of the new upper floor.

.2 .Before submitting tender for this work, examine the site, local services and local conditions, Electrical Drawings, Mechanical Drawings, Structural Drawings, and Architectural Drawings to ascertain that the work can be satisfactorily carried out as shown on these Drawings and as herein specified. Before commencing work, examine the work of the other trades and report at once any defect or interference affecting the work of this Division or the guarantee of same. No extra will subsequently be allowed to cover any such error, omission and/or oversight for not having made a thorough inspection of the grounds, existing conditions, drawings, and specifications.

1.8 DEFINITIONS

.1 "Provide" or "furnish" shall mean "supply and install". "Install" shall mean "mount and wire". "Wire" shall mean "supply and install all required wire and raceways and make all connections".

.2 Unless clearly indicated otherwise, words such as "approved", "allowed", "permitted", "satisfactory" and "as instructed" shall refer to such approval, allowance, etc. by the Consultant.

1.9 STANDARD OF MATERIALS AND EQUIPMENT

.1 Tender price shall be based only on equipment specifically mentioned by name in the specifications that is on ‘Base Bid’ equipment or on ‘Named Alternate’ equipment.

.2 In the event that the tender price is based on any of the ‘Named Alternate’ equipment, mark in the ‘Named Alternate’ manufacturers in the appropriate space in the Tender Form. If no choice is indicated in the Tender Form, ‘Base Bid’ equipment shall be supplied.

.3 ‘Bidder’s Proposed Alternates’ are invited and are to be marked in the appropriate space in the tender together with the reduction in the Base Bid tender price amount for each of the ‘Bidder’s Proposed Alternates’. These ‘Bidder’s Proposed Alternates’ will be considered at the time of the award of the Contract and those accepted will be included in the Contract.

.4 For the purposes of these specifications and tender documents, the following definitions shall apply:

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.5 'Base Bid' – equipment or manufacturer shall be that named first in the specifications for any material or equipment; or equipment or manufacturer specifically described as 'Base Bid' equipment in the Specifications.

.6 'Base Bid' – equipment or manufacturer shall be that named first in the specifications for any material or equipment; or equipment or manufacturer specifically described as 'Base Bid' equipment in the Specifications.

.7 'Bidder's Proposed Alternate' – shall be equipment or manufacturer considered by the Bidder to be equal to 'Base Bid' or 'Named Alternate' equipment. Basic tender price shall not be based on, or include 'Bidder's Proposed Alternate' equipment.

.8 Reductions in tender price due to the 'Bidder's Proposed Alternates' may be considered in selecting the Bidder for award of the Contract.

.9 Be responsible for and cover all costs and labour in cases where a 'Named Alternate' or Bidder's Proposed Alternate' requires additional labour, material, piping, connections, or involves any other costs to any trade. General Contractor or the Owner, over the costs involved with the 'Base Bid' equipment or material. Such additional costs and work shall be included in the Tender Price. Availability of space, proximity to other equipment and arrangement of connections shall be considered.

.10 Assume full responsibility for, and cover all costs involved in modifying the alternate or substitution as required in the opinion of the Consultant to meet the specification. Should the Consultant decide, after the necessary modifications to the 'Named Alternate' or 'Bidder's Proposed Alternate' are considered, that the originally specified equipment must be used, cover all costs of such reversal to original equipment, except for any stated difference in tender price, regardless of whether or not a preliminary approval for the 'Named Alternate' or 'Bidder's Proposed Alternate' was given earlier.

.11 Assume full responsibility for any failure of the alternate to meet the requirements of the specification. The acceptance of an alternate by the Consultant does not remove or change such responsibility.

.12 Materials not specified herein as to manufacture, quality, etc., shall be supplied of high commercial standard of quality, new and of uniform pattern. Used materials or equipment will not be accepted.

.13 In case materials or equipment specified are unavailable, clearly state in the Tender the alternative material and/or equipment and price used in compiling the Tender.

1.10 DRAWINGS

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.1 The drawings are to be considered as diagrammatic only and do not show all the structural and construction details. Any information involving measurements of the building shall be taken from the interior design, architectural and structural drawings and at the building site. Make without additional charge any necessary changes or additions to the equipment locations, type and conduit/cable runs to accommodate structural conditions.

.2 The drawings and specifications shall be considered an integral part of the Contract Documents. Neither the drawings nor the specifications shall be used alone. Provide and install all work as required for a complete and functioning installation. Misinterpretation of any requirements of either drawings or specifications shall not change the requirements or intent of the specifications for proper completion of the work to the full approval of the Consultant.

.3 The drawings indicate the general location and route to be followed by the cables, ducts, conduits, etc., which are to be installed under this contract.

.4 Where the required conduit work, cables, etc. is not shown on the plans or only shown diagrammatically, these shall be installed as tight as possible to structural members, concrete, ceilings and walls to interfere as little as possible with the free use of the space through which they pass.

.5 The location of conduit, ducts, outlets and other equipment may be altered by the Consultant without charge to the Owner, provided the change is made before installation and does not necessitate additional material, and the new location is within 3M (10') of the original location.

.6 Be responsible for the detailed layout of work with respect to the building structure and to other piping, ducts, conduit, etc. If required in certain sections, produce field drawings to show relative positions of various services and/or equipment and have these approved before work proceeds.

.7 Consult with the Consultant and/or Interior Designer and obtain detailed drawings and instructions for the exact location of equipment, and before the installation of fixtures and equipment which may interfere with the interior treatment of the building.

.8 The drawings and specifications are intended to supplement each other so that any details shown on the drawings and not mentioned in the specifications, or vice versa, shall be executed in the same manner as if contained in the specifications and shown on the drawings.

.9 Should any discrepancy appear between these specifications and the drawings, or between one part of the specifications and another, between one drawing and another or between one location on the drawings and another, to cause doubt as to the true meaning and intent of the drawings and specifications, a ruling shall

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be obtained from the Consultant before submitting the tender. If this is not done, it will be assumed that the more expensive alternative has been included in the contract.

.10 Any error or inconsistency in the drawings or specifications noted after award of contract must be reported to the Consultant before commencing work on the item involved.

.11 The omission or incorrect mention of work, materials, etc. that are indispensable to the completed work, is not to be interpreted as relieving of the necessity of providing such work, materials, etc. at no expense to the Owner.

1.11 CODES AND REGULATIONS

.1 The whole of the work specified herein and on the Drawings shall comply strictly with the requirements of all authorities having jurisdiction. The Electrical Safety Code, the Ontario Building Code, Ontario Fire Marshal, National Building Code and regulations and by-laws of other jurisdictional authorities form an integral part of this specification, and are the minimum requirements. Where the drawings or specifications call for conduits, equipment, devices, wiring sizes or methods exceeding the minimum requirements of such codes, the drawings and specifications shall be followed. In case of doubt as to the interpretation of the codes, the local Electrical Inspector, Building Inspector, Fire Inspector, etc. shall be consulted and his decision shall be final.

.2 Before starting any work, submit the required number of copies of the Drawings and Specifications to all authorities and utilities and obtain their approval. The Consultant shall be notified immediately of any changes requested before installation. Any work installed before approval is obtained from the above authorities and the Inspection Authority shall be corrected without charge. Submit any additional drawings which may be required by the Inspection Authority.

1.12 CERTIFICATES AND FEES

.1 Give all necessary notices, obtain and pay for all necessary permits, and inspections required for the work herein specified. Pay all fees for examination of drawings and specifications. This shall apply to Electrical inspection Government, Municipal and Public Utilities and all other such bodies.

.2 On completion of the work, obtain final unconditional certificates of approval by all utilities and authorities having jurisdiction. All final certificates of approval shall be delivered to the Consultant before final payment is made.

.3 Arrange and pay for all tests of the work.

.4 Furnish certificate that the work installed conforms with the laws and regulations of all authorities having jurisdiction and generally complies with the drawings and specification as revised by addenda, change orders and written field instructions.

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1.13 CERTIFICATION OF TESTS

.1 Upon completion of the project, present to the Consultant a copy of all reports and a signed statement to the effect that all tests have been carefully carried out as required by the specifications and the manufacturer's recommendations and that the equipment and installations have been inspected by all jurisdictional authorities.

1.14 SHOP DRAWINGS

.1 Submit for review one Electronic copy of a sepia and one white print or Submit for review at least 8 sets of white prints of detail drawings showing panels, switchboards, transformers, transfer switches, generators, contactors, electric heaters, alarm systems, sound systems, intercom systems, special outlets, control systems, control panels, and any other major equipment before ordering and immediately after the award of the contract. Indicate all pertinent data such as options, voltage, type of fuse clip etc.

.2 Submit eight copies of typed sheets, catalogue sheets, or illustrations, etc., giving suppliers and catalogue numbers for such items as switches, lighting fixtures and any other standard catalogue items. Indicate all pertinent data such as fixture letter types, ballast voltage, options, special finish or mounting etc.

.3 These will be reviewed by the Consultant and returned. No allowance will be made later if equipment is condemned on the site because of failure to observe this instruction.

.4 The Consultant reserves the right to reject any material or apparatus which, in his opinion, does not conform with the requirements of the Specifications.

.5 Notify Consultant in writing if shop drawings differ from Consultant's design drawings in any respect. Certify shop drawings to indicate that they have been checked and agree with Consultant's drawings and specifications. Assume all responsibility for errors made on shop drawings or for changes made from Consultant's drawings and specifications, unless such changes were set out in written notification to Consultant.

.6 Review is for the sole purpose of ascertaining conformance with the general design concept. This review shall not indicate approval of quantities, dimensions, the detail design inherent in the shop drawings, responsibility for which shall remain with the Division submitting same, and such review shall not relieve the Division of responsibility for errors or omissions in the shop drawings or of responsibility for meeting all requirements of the Contract Documents. Be responsible for dimensions to be confirmed and correlated at the job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for coordination of the work of all other

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Divisions.

1.15 RECORD DRAWINGS

.1 Mark on a set of white prints as the job progresses, changes made through any approved change order as well as the location of feeders, conduit runs, junction boxes, and all changes in circuiting location of equipment, runs of conduits, wiring, etc. from that originally shown, so that on the completion of the job the record drawings will show the exact conditions as actually installed.

.2 Also mark on final actual room names and numbers.

.3 Location of concealed and buried ducts, conduits and cables shall be dimensioned from fixed reference points. Also mark location of all access doors. Record drawings shall be kept at the site and shall be brought up to date as the work progresses. Submit completed record drawings and electronic/ CAD Drawings and a DISK before final certificate of job acceptance is issued.

.4 Make any corrections required by the Consultant and submit the corrected drawings and a copy of as-built drawings on AutoCad format on the computer disks to the Consultant.

1.16 SAMPLES OF MATERIALS

.1 Samples shall be submitted to the Consultant for his approval before ordering such items as name plates, tags, thermostats, etc., and other repetitive materials where finish or detail can be better examined by sample. All materials used for the work shall be fully equal to the samples as approved.

1.17 MATERIALS AND EQUIPMENT APPROVALS

.1 All equipment, materials, controls, wiring and wiring devices, etc., supplied shall conform to the CSA, and Safety Authority requirements for the purposes for which they are to be used, and shall bear a CSA approval label.

.2 Special equipment which does not have a standard CSA label shall be inspected by the Special Inspection Department and the Approval Certificate shall be submitted to the General Contractor and Consultant as soon as possible.

1.18 TEMPORARY AND TRIAL USAGE

.1 It is understood and agreed that the temporary or trial usage by the Owner of any electrical device, machinery, apparatus, equipment or any other work or material supplied under this Section before final completion and written acceptance by the Consultant, is not to be construed as evidence of the acceptance of same by the Owner and it is further understood and agreed that the Owner shall have the privilege of such temporary and trial usage as soon as the Contractor shall claim

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that the said work is complete and in accordance with the drawings and specifications, and for such reasonable length of time as the Consultant shall deem to be sufficient for making a complete and thorough test of same and that no claim for damage will be made by the Contractor for the injury to, or breaking of any parts of such work which may be so used whether caused by weakness or inaccuracy of structural parts or by defective material or workmanship of any kind whatsoever.

.2 Should the equipment be abused, improperly used or maintained by the Owner, advise the Consultant immediately. Verbal advice shall be followed up in writing, otherwise subsequent claims for damage will not be considered.

1.19 TEMPORARY HEATING

.1 All temporary heating required while the building is under construction will be provided under Division 1.

.2 The permanent electric baseboards, unit heaters, etc., may be used for temporary heating, providing this equipment is installed in its permanent location and providing that the building is completely closed in and clean. Approval must be obtained from the Consultant for use of such equipment.

1.20 DATA BOOK

.1 Bind within a hard-covered, loose-leaf binders, a complete set of manufacturer's operating and maintenance instructions showing all major electrical equipment and systems. Include shop drawings and detail drawings. Instructions shall be complete for installation, operation and maintenance. Spare part suppliers, lists and addresses shall be included. Provide electronic copy of the AS Builts and O&M Manuals.

.2 Make any additions and/or corrections required by the Consultant and submit two correct copies to the Consultant.

.3 Instructions shall be reviewed with the operating personnel to ensure a thorough understanding of the equipment and its operation.

1.21 CLEAN UP

.1 All material shall be stored neatly and out of the way. Clean up daily all refuse caused by work.

.2 On completion of the work, remove from the premises all tools, debris, surplus and waste materials resulting from operations under this Section. Clean all fixtures and equipment and leave all items in perfect order ready for operation.

1.22 GUARANTEE

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.1 Before final payment is made, guarantee all materials and workmanship supplied in the performance of this contract, for a period of one year from date of final acceptance by the Consultant and, when called upon, make good without further charge any such defects as may appear within this period. Before final payment is made, test the operation of all equipment installed and demonstrate to the Consultant or his representative that all equipment is operating as intended. The period of this guarantee shall in no way supplant any other guarantee or warranties of longer period, but shall be binding on all other work not otherwise covered.

1.23 DOCUMENTS REQUIRED

.1 The following documents shall be submitted to the Consultant on completion of the project as described above:

.i Electrical Inspection (ESA) Certificate

.ii Fire Department Certificate

.iii As-Built Drawings and Disks

.iv Data book

.v Guarantee

.vi Service Equipment Co-ordination Certificates

.vii Ground and Groundfault Protection Test Certificates

.viii Other Certificates Specified

1.24 CLAIMS FOR EXTRAS

.1 All claims for extras shall be supported by written authorization and shall be submitted with itemized material and labour costs breakdowns. The format of the breakdown shall follow that of the change document (i.e. that of the notice of change, site instruction, change directive, etc.). Materials shall be priced at cost including any discounts. Labour units shall be based on CECA and NECA labour unit tables suitable for the type of work involved. Quotations shall be submitted in a form that each item listed in the change can be clearly identified.

PART 2 PRODUCTS

2.1 CONDUITS

.1 Rigid steel conduits shall be thick-walled, electrogalvanized with threaded

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couplings, locknuts and bushings. Bushings shall have nylon insulation to protect conductors.

.2 Electro metallic tubing EMT shall be thin-walled, electroplated with water tight joints. Connectors shall have nylon insulation to protect conductors.

.3 Rigid PVC conduits shall be “Schedule 40” Scepter, Cobra, Canron or equal.

.4 Flexible PVC conduit shall be Scepter “Cor-Line” Type ENT with tooless snap-in connectors, couplings and EMT adapters.

.5 Aluminium conduit shall be thick-walled suitable for exterior surface installation.

2.2 CONDUCTORS

.1 Generally, unless otherwise shown on the drawing or herein specified or required by Electrical Code, conductors run in conduits, ducts or other raceways shall be 600 Volt grade minimum for 208 Volt systems and 1000 Volt grade for 600 Volt systems, RW 90 x-link as manufactured by Canada Wire and Cable Industrial Wire, CGE or equal. T90 and THHN shall not be used unless approved by the Consultant. Conductor shall be Aluminium NUAL or approved equal only.

.2 Conductor sizing shown is based on Copper conductors. Contractor shall size and install required current and voltage rated Nual conductors and corresponding conduits sized in accordance with the Electrical Code to suit the number and type of conductors.

.3 Where Corflex is indicated on the drawings, Teck or ACWU-90 may be used and shall be considered as equal.

.4 Where aluminium sheathed, Teck, Corflex or mineral insulated cables are specified, they shall have Nual aluminium conductors as shown on the drawings, complete with a bare copper ground wire. Termination of cables shall be as per manufacturer's recommendations and local Inspector's satisfaction.

.5 Underground wiring, unless otherwise indicated, shown as direct buried, shall be type RWU 90 – x link installed in rigid PVC conduit or equal with mechanical protection as required by the Electrical Code.

.6 Conductors serving distillate or gasoline product equipment shall be TW90 complete with nylon sheath.

2.3 ACCESS DOORS

.1 Access doors, unless otherwise specified or shown, shall be at least 12 gauge steel, finished prime coat only, with concealed hinges, anchor straps, plaster lock, without screws. Access doors in ceilings, where acoustic tile is applied to

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plaster or gypsum board, shall be dish type designed to receive tile inserts.

.2 Access doors shall be as manufactured by:

.i	Zurn Industries Canada Ltd.	-	Inspectors
.ii	Wade International Limited	-	LeHage
.iii	A.G. Baird Limited	-	ABCO

2.4 INSERTS AND HANGERS

.1 Inserts, hangers and supports shall be Canstrut, Unistrut or equal.

2.5 PLASTIC FILM

.1 Plastic film to mark buried telephone, secondary and primary service ducts, cables and conduits shall be bright yellow, 6" (150mm) wide as manufactured by A.B. Chance Co., 3M or equal. Film shall contain continuous printed warnings and messages identifying buried service.

2.6 GROUND RODS AND CONNECTORS

.1 Ground connectors of the mechanical type shall be Burndy Hyground using specially designed dies which emboss the die index number into the Hyground connection.

.2 Ground rods shall be "Copper Weld" or equal.

.3 Welded connectors shall use the thermit process as manufactured by Cadweld or equal.

.4 Solderless grounding connectors shall be Burndy or Thomas and Betts.

2.7 FLEXIBLE CONDUIT AND FITTINGS

.1 Flexible conduit fittings shall be PVC jacketed and shall be T&B, Greenfield or equal.

.2 Connector shall be Tite Bite type with nylon insulated throats as manufactured by Thomas & Betts Series 3110 or equal.

.3 Flexible conduit fittings shall be liquid tight, PVC jacketed and shall be T&B, Greenfield or equal.

.4 Flexible conduit and fittings for wet areas shall be sealtite.

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2.8 FIRE RATED SEALS

.1 Dow Corning Silicone RTV Foam as distributed by Pilgrim Products, Tremco or 3M or equal.

PART 3 EXECUTION

3.1 PROTECTION AND CARE OF WORK AND EQUIPMENT

.1 Protect finished and unfinished own work and work of other contractors from damage due to own operations. Cover floors and other parts of the building with tarpaulins and protective wood sheets as necessary. Repair all damages to floor surfaces or other parts of the building resulting from the carrying out of this work.

.2 All material damaged by weather, rough usage or through negligence shall be removed and replaced with new material.

.3 During freezing weather, protect all material in such a manner that no harm can be done to the installation already made and to materials and equipment on the job.

.4 Store all material and equipment neatly and out of the way.

.5 Securely plug or cap all open ends of pipes, ducts, conduits and equipment to prevent blockage or damage during construction.

3.2 CO-ORDINATION OF WORK

.1 Assume full responsibility for layout of own work so as not to conflict with other trades and also for damage caused to other's work by improper location or carrying out of own work.

.2 Arrange work in co-operation with other trades in such a manner as not to interfere with other work in progress. Co-ordinate layout of work with other trades so that all resulting pipework, wiring, conduits, etc., is installed to the best advantage.

.3 Assume full responsibility for the timely installation of wiring, conduits, ducts, equipment and sleeves in co-ordination with the work of other trades as required.

.4 Where any equipment supplied under this Division must be built in with the work of other Divisions such as Masonry, Plastering or Concrete, supply the equipment to be built in, provide templates, anchors, sleeves, bolts and measurements to allow the installation of these in the proper sequence.

.5 Confer and co-operate with all other trades in order to eliminate any unnecessary delay to any work being done under this Contract.

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.6 Submit composite interference drawings of crowded locations where there may be conflict with the work of other trades. Indicate exact locations and elevations of pipes, ducts, conduits, etc., obtained from field measurement.

3.3 WORKMANSHIP

.1 Only first class workmanship will be accepted utilizing the best accepted standard practices, safety, accessibility, durability, etc. and neatness of detail. Conduits shall be installed true to line and level. All conduits, ducts and cables shall be aligned parallel to and at right angles to the building walls. Equipment shall be accurately set, plumbed and levelled. Hanger rods shall be aligned vertically. The entire work shall present a neat and clean workmanlike appearance on completion.

.2 Where possible, ducts, conduit and wiring shall be concealed in ceiling spaces, furred-in spaces, pipe spaces, walls, trenches, etc., except they may be run exposed in boiler, service and equipment rooms, or where specifically indicated. Where ducts, conduits and other equipment are exposed, they shall be installed as close as possible to building structure, ceiling and walls. Provide all offsets for this purpose at own expense, whether or not shown on drawings. Use minimal amount of space for concealed or exposed installations.

.3 Any conduit, duct or other work which is not, in the opinion of the Consultant, installed as it should be, shall be taken out and replaced without cost to the Owner.

.4 Equipment shall be installed in such a manner that it will be easy to maintain and/or replace.

3.4 METHOD OF WIRING

.1 Unless otherwise shown or hereinafter specified, rigid galvanized steel conduit shall be used in all locations required by Electrical Code and for:

.i All exposed wiring subject to mechanical damage.

.ii Wiring in poured concrete slabs and walls not in contact with earth.

.iii Wiring in damp locations, except where non-metallic duct is specified or shown.

.iv Rigid PVC or type ENT flexible PVC conduit shall be used in poured concrete slabs and walls.

.2 All conduits, couplings, connectors and boxes in poured concrete slabs and walls in contact with earth shall be non-metallic.

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.3 Unless otherwise specified and subject to Electrical Code and any local authority having jurisdiction, electrical metallic tubing (EMT) may be used for: surface work, in furred walls, ceiling spaces and in masonry walls. EMT shall not be used where it may be exposed to rain.

.4 Unless otherwise specified and subject to the Electrical Code and any local authority having jurisdiction, armoured flexible cable AC-90 (BX) may be used for final connection to lighting, receptacle and motors. Cables shall be concealed in dry accessible ceiling spaces and hollow partitions. Maximum length shall be 4.5m (15 ft.). Home runs of BX cables are not acceptable.

.5 Flexible conduit shall be used for final short connections between outlet and electrical equipment such as recessed fixtures, motors, transformers, motorized equipment or fixed appliances.

.6 All low voltage and multi conductor cables shall be installed in conduit.

.7 If number of conductor in any one conduit exceeds 6 line conductors, conductor size shall be increased to allow for derating as required by Code.

.8 Separate neutrals shall be provided for dimmed circuits and circuits connected to ground fault protected circuit breakers, circuits with isolated ground receptacles, circuits in computer rooms or LAN closets and circuits feeding system furniture and other work station outlets that will have computer equipment attached.

.9 Conduits in parking structures and concrete driveways shall be installed only with permission of the Consultant.

.10 Corflex, MICC, BX and other such cables shall be used only where fire rated systems are required for life safety systems in general and/ or their use is specifically indicated on the Drawings.

.11 Unless otherwise indicated, branch wiring installed underground outside the building shall be RWU90 installed in rigid PVC conduit complete with an insulated ground wire.

.12 Rigid PVC conduit shall be used for direct burial underground. Ducts shall be sloped at least 1 in 400 and shall be buried at not less than 915mm (36”) below finished grade, unless otherwise indicated.

.13 Supply and install a 150mm (6”) wide plastic film 300mm (12”) below finished surface or grade to mark the location of buried telephone service, primary and secondary service ducts, cables and conduits.

.14 Unless otherwise prohibited by the local Building Department, conduits for circuits in non-hazardous areas fed from isolation transformers shall be rigid PVC

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conduit with separate grounding conductors. Conduit shall be installed in accordance with Electrical Code and support for conduits shall be as listed in rule 12-1212. PVC conduit shall not enter, terminate in or run through hazardous areas.

.15 Surface mounted conduit exposed to rain and weather shall be aluminium.

3.5 CONDUIT INSTALLATION

.1 All conduits shall be completely installed with bushings in place before conductors are pulled into the conduits.

.2 Conduits installed on surface shall be run in neat lines parallel to walls and ceiling.

.3 Conduits shall be sized as per Electrical Code and adjusted for ground conductor as required. Where conduit sizes are shown on the Drawings, these are minimum and in no case shall be reduced without the approval of the Consultant.

.4 Conduit shall enter properly and shall be secured to all fittings, outlet boxes, etc., my means of locknuts and bushings.

.5 Locknuts and bushings shall be screwed up tightly to ensure a perfect mechanical and electrical bond.

.6 Where conduit joints occur in concrete, couplings shall be concrete tight and painted with asphalt paint.

.7 Where conduits cross building expansion joints, provide conduit expansion joints with telescoping sleeve and insulated bushings. Straight runs of conduit 100 feet or longer shall have expansion joints and pull boxes. Location of expansion joints shall be taken from Architectural and Structural Drawings.

.8 Running threads shall not be used. Where required, Erickson couplings shall be used.

.9 All cut conduit ends shall be reamed to remove burrs and sharp edges.

.10 Conduit shall be laid out so as to avoid interference with other work and so that it can drain with no pockets in which water can collect. Conduits shall be at least 2" (50mm) clear of all mechanical pipes, flues, etc.

.11 All rigid steel conduit and E.M.T. shall be supported with one-hole pipe clips where smaller than 1.5” and two-hole straps for larger sizes or by hangers, with supports at intervals specified in Electrical Code.

.12 Field bends and offsets shall be uniform and symmetrical without flattening of conduit. Minimum bending radius shall be 10 times conduit diameter. Where two

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or more exposed conduits are running parallel and close to each other, all bends shall be concentric.

.13 Buried conduits or cables run outdoors shall be 915mm (36”) below finished grade, unless otherwise specified.

.14 Conduits below floors on grade shall be installed 300mm (12”) below the under side of the slab and shall be rigid PVC.

.15 Conduits in concrete slabs shall be installed between the top and bottom reinforcing steel and tied securely in place to the reinforcing steel.

.16 Where conduits are installed in concrete slabs, obtain Structural Engineer's approval on maximum size of conduit that may be used therein.

.17 Conduits in concrete or masonry shall be securely held in place during pouring and construction. Seal conduit during pouring with interlocking plastic "Space Caps". Maintain conduit interior clean. Prevent conduit damage and to maintain the proper spacings with the use of interlocking plastic spacers.

.18 Conduits which are required to be installed, but left empty shall be tested for clear bore and shall be left with pull string and shall be sealed at both ends to prevent entrance of dirt and moisture.

.19 All conduits in mechanical equipment rooms, electrical room, fan rooms, boiler rooms and in such other areas, shall be run exposed with outlets installed after mechanical or other equipment is installed. Outlet locations in these areas are approximate only, and are shown only to indicate the quantity of outlets required. Outlets shall be located to clear pipes, ducts or mechanical equipment. Location of lighting outlets shall be consistent with good distribution of light to the satisfaction of the Consultant.

.20 Where rigid conduit enters cabinets, panels, outlet boxes, junction boxes, pull boxes, auxiliary gutters or other such enclosures, the conductors shall be protected by a nylon insulated metal bushing.

.21 Where electrical metallic tubing is installed, the couplings and connectors shall be steel set screw type. The connectors shall have nylon insulated throat.

.22 Where a flexible raceway is exposed to continuous or intermittent moisture, the conduit shall be the liquid tight flexible type CSA type ‘4A’. It shall be installed in such a manner that liquids tend to run off the surface and not drain toward the fittings. Sufficient slack shall be provided to reduce the effects of vibration. Where the fittings are brought into an enclosure with a knock-out, a gasket assembly, consisting of an “O” ring and retainer, shall be installed on the outside of the enclosure.

.23 The final raceway connection to motors, transformers, and other equipment

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subject to vibration shall be flexible metallic conduit at least 12 conduit diameters long.

.24 Where a conduit pierces a fire rated wall or floor, seal the opening with suitable fire retardant sealant.

.25 All conduits and outlet boxes shall be supported from building surfaces and shall not be supported from other conduits, ducts or pipes. Where existing hangers have space for additional conduits, these may only be used with proper fastening devices and adequate clearances maintained.

.26 Electrical conductors shall be installed in service spaces that do not contain other combustible material or shall be protected against exposure to fire to ensure continued operation for a period of one hour.

3.6 INSTALLATION OF CONDUCTORS AND CABLES

.1 All conductors unless otherwise specified, shall be copper/aluminium alloy minimum #12 AWG except that control wiring shall be minimum #14 AWG. Wiring from emergency battery system shall be minimum #10 AWG and sized to limit the voltage drop to the furthest light to less than 5%.

.2 Conductors for 15 amp 120/208V lighting branch circuit home runs up to 18m (60') shall be minimum #12 AWG and for home runs over 18m (60') but not to exceed 27.5m (90') shall be minimum #10 AWG and maximum length of branch circuit feeder from panel to further receptacle shall not exceed 90 feet. For 15 amp 347/600V branch circuit home runs up to 50m (165'), conductors shall be minimum #12 AWG, and for home runs over 50m (165') shall be minimum #10 AWG. In no case shall the wire be smaller than shown on Drawings.

.3 Conductors for circuits greater than 15 amps, and for which size is not shown on the Drawings, shall be sized for current-carrying capacity of breaker or fuse protecting them, and to limit the voltage drop at the outlet to 2% as shown in Table D3 of the Electrical Code.

.4 Single conductor aluminium sheathed, Teck and Corflex cables shall be spaced a minimum one diameter apart and installed in such a manner that they will qualify for their free air current rating and cables 250 MCM and larger shall be installed to have no sheath current.

.5 Cables shall be installed on building surfaces, cable trays, and trapeze hangers. Cables shall not rest on mechanical pipes, ducts, conduits or ceiling (unless fished in existing inaccessible spaces) nor shall they be supported from pipes, ducts or conduits.

.6 Cables shall be properly clipped and protected against mechanical injury. Clips shall be single conductor non-ferrous type.

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.7 Cables shall be installed on building surfaces, cable trays, and trapeze hangers. Cables shall not rest on mechanical pipes, ducts, conduits or ceiling (unless fished in existing inaccessible spaces without Consultant's approval), nor shall they be supported from pipes, ducts or conduits.

.8 All Nual conductor cables shall be terminated with high compression connectors or lugs. Connectors shall be Alcan "Coppertails". Where lugs are required, these shall be Burndy 'Hylugs' or Thomas & Betts colour-keyed compression lugs. Connectors and lugs shall be installed with appropriate tools and in the manner recommended by the connector or lug manufacturer. Burndy Hylugs may be indent type for conductor up to 250 MCM, but shall be circumferential crimp type for larger sizes.

.9 Control wiring shall be of type and size required for that particular system and voltage. Unless multi conductor cable is specified, minimum #14 AWG conductor shall be used.

.10 Method of installation shall conform to the Electrical Code.

.11 Wire connections shall be made with pressure type solderless connectors. Wire connection shall be twisted prior to splicing and shall be insulated with vinyl insulating caps and locking rings.

.12 Provide pigtails for all electrical fixtures and devices to ensure that neither the neutral nor the power supply lines are "opened" when a fixture or a device is removed from the circuit.

.13 For multiple (parallel conductor) runs, test for equal load sharing. Provide test reports of actual installation in writing to Consultant.

.14 Measure the insulation value of all lighting and power circuit feeders and sub-feeders. If resistance between conductor and ground is less than that recommended by the Electrical Code, such circuits are to be considered defective and must be replaced.

3.7 GROUNDING/BONDING

.1 All grounding of services, equipment, light standards, feeders, transformers, generators, conduits, etc., shall be done in accordance with the Electrical Code and any requirements of the local supply authorities.

.2 The following requirements are supplementary and additional to the above requirements.

.3 Grounding and bonding conductors run inside buildings beyond the electrical rooms or closets and transformer room/vault shall be run in EMT conduit of

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sufficient diameter.

.4 Provide a green insulated bonding conductor in all non-metallic conduits. Size of bonding conductor shall be as shown on the Drawings. If size is not shown, follow Electrical Code. Bonding conductors shall be installed inside conduit or tubing containing the phase conductors.

.5 Conduits installed in concrete or in masonry exterior walls below grade shall have an insulated bonding conductor. The conduits shall not be relied upon for ground continuity.

.6 All branch circuit, EMT conduits 35mm (1.25”) and larger shall have a green insulated bonding conductor run parallel to the line conductors in the tubing.

.7 All feeder and sub-feeder conduits for panels, transformers, shall have a green bonding conductor run parallel to the line conductor in the conduit. If size is not shown, follow Electrical Code.

.8 Grounding and bonding connections shall be made with approved solderless ground connectors, or by welding, using thermit process.

.9 All ground connections underground and in places which will become inaccessible after installation, shall be made only by welding using the thermit process.

.10 Where ground continuity through conduits is not maintained, a green insulated bonding wire shall be installed inside the conduits.

.11 Where isolated ground receptacles are specified, provide a separate bonding and separate neutral conductor from panel for each duplex or quad receptacle.

.12 Bond all waste lines to the building ground or cold water line as per Electrical Code Article 10.406. If waste line is non-metallic, bond each metallic trap.

.13 Provide a continuous ground conductor in all cable trays, raceways and wireways, bonding to same at least once every 3M (10’).

.14 The main service and building ground system shall consist of a minimum of 4 ground rods at least 10’ apart driven to the required depth for reading permanent moisture. The ground rods may be installed outside the building or inside the building electrical room (if applicable) to the satisfaction and approval of the local power supply authority and the electrical inspection authority. Where the main electrical room floor is located on ground, provide 4 ground rods, one in each corner of the electrical room. These ground rods, if acceptable to the electrical inspection authority, may be used for the main service ground.

.15 In each transformer room vault, provide 4 ground rods, one in each corner of the

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transformer room vault. (This is in addition to the ground rods required for the main service grounding described above).

.16 Ground rods installed outside building shall have inspection cans, with top of cover flush with grade.

.17 Ground rods installed inside buildings shall protrude 100mm above finished floor.

.18 Ground rods shall be copper clad steel of minimum size 20mm diameter x 3m long and shall be interconnected with minimum #3/0 bare ground conductor. In areas where there is insufficient earth or the site is primarily rock, provide 600 x 600 x 12mm copper ground plates buried in a sandy clay bed complete with source of piped-in water for proper earthing.

.19 In vaults provide for Power Supply Utility transformers, provide grounding as per Utility requirements but said installation shall not be less than those described herein. Leave 20 ft. of ground conductor in vault for connection by Utility.

.20 Below grade (buried) connections and ground rod connections shall be made with pure wrought copper compression devices, factory filled with inhibiting compound or by using the thermit process and shall meet IEEE 837 “Standard for Qualifying Permanent Connections used in Sub-Station Grounding”.

.21 Supply and install a (50mm x 6mm) (#3/0) (or code minimum) ground bus loop on walls attached at 1.5m intervals on 13mm standoffs in Transformer Vault Room, Main Electrical Room at a height of 300mm above the floor. The ground shall be continuous around the room and shall be continued above or below all such openings as doors and vents. Connect the ground loop to the ground rods with #3/0 minimum ground conductors. Connect to the ground loop all transformer neutrals, switchboard neutral and all metal equipment enclosures as well as all other metal parts such as mechanical pipes, ducts, waste lines, door frames, railings, grilles, fences, etc.

.22 Alternatively, if acceptable to the local inspection authority, ground the building steel to the main system ground and provide shunts around expansion joints, so that the steel may be used as the ground bus.

.23 Ground connections (other than station grounds) shall be made using the thermit process or with pure wrought copper compression devices, factory filled with inhibiting compound or with appropriate all bronze or copper mechanical devices and shall meet current IEEE 80 Standard and CSA C22.2 No. 41 grounding and bonding standard.

.24 Mechanical connector hardware shall be bronze or stainless steel.

.25 The electrical main system ground shall be connected to the metallic water main if available on the street side of the water meter by means of #3/0 conductor run

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in conduit. Connections to the water mains shall be made in an approved manner. Provide ground wire shunts around water meters.

.26 Provide a building ground system consisting of a continuous ground bus along the appropriate walls and connect to the main distribution system ground. This is for grounding of individual unit services and/or transformers. Bus shall be bare copper, #3/0 installed above level of suspended ceiling. Confirm height of ceilings with Consultant.

.27 All single conductor armoured cables shall have a bare copper ground wire running parallel to the conductors from power source to the load.

.28 Continuous rows of fluorescent fixtures and fixture wiring channels where such are used shall have a green ground wire of same size as phase conductors. The fixture or channel body shall not be relied upon to provide ground continuity.

.29 All bus duct runs shall have a bare soft drawn copper ground conductor in conformance with Table 16 of the Electrical Safety Code, attached to the top of the bus duct for grounding purposes. This conductor shall be clipped to the bus duct at 1500mm (5') intervals throughout the duct. All bus duct plug in fused disconnect switches and their conduits shall be connected to the bus duct ground conductor.

.30 In rooms with conductive floors and all Operating and Delivery Rooms, provide grounding conductors for all fixed electrical equipment such as operating lights, ceiling lights, X-ray view boxes, dimmers, etc. Make permanent grounding connections to the frames of all such items in an approved manner. Ground conductors shall be connected to a ground bar in the panel feeding these items.

.31 For additional grounding of outlets and equipment connected to Isolated Power System panels, see appropriate section of the specifications.

.32 Swimming pool and fountain equipment, conduits and all metal parts within the water or within 3000mm from the water line shall be grounded in accordance with all applicable Codes and local regulations. This shall apply to equipment, pipes, metal parts and reinforcing steel supplied and installed under this and any other Division of the Contract. All grounding shall be in accordance with the Electrical Safety Code and shall be supplied and installed by this Division.

.33 Grounding for circuits in resident areas and all other areas classified as basic care areas, shall meet the requirements of Section 24 of Electrical Safety Code.

3.8 SUPPORTS, HANGERS AND SLEEVES

.1 Unless specifically noted otherwise, provide all foundations, supports, stands, platforms, etc. necessary for the proper installation of the work of this Section.

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.2 They shall be steel, etc. as shown, specified or required and as approved by the Consultant. All equipment such as panels, transformers, boxes, switches, etc. shall be supported independently of the conduit.

.3 All concrete foundations and curbs for all equipment, unless otherwise shown or noted, shall be provided by this Division. Hire the trade involved and pay all expenses.

.4 Where concrete bases are specified for floor mounted equipment, they shall be constructed of 3000 psi (20 mPa) concrete using plywood forms. Supply and install dowels for all concrete bases unless noted otherwise. Concrete bases or curbs shall be not less than 100mm thick all around and not less than 100mm larger than base of equipment complete and with chamfered edges and smooth finish.

.5 Supply all necessary templates, anchor bolts, inserts and location drawings for equipment supplied and supervise the work of installation of same.

.6 Hanger rods must be vertical without bends or offsets. Where other structural supports do not exist, provide angle or channel iron supports, properly sized, to support the load from the structural framework.

.7 Percussion type fastenings of any kind will not be permitted.

.8 All wall mounted electrical panels, switches or other electrical equipment shall be complete with suitable mounting brackets. Provide required angle or channel iron supports to bear the equipment weight.

.9 Supply and set all necessary sleeves and be responsible for the exact location. Sleeves shall be plastic where allowed by building code. In mechanical rooms and in other areas where water may accumulate on the floor, sleeves shall be of steel pipe and shall extend 100mm (4”) AFF. Sleeves for communication risers to be metal and extend 100mm (4”) AFF.

.10 Install oversized sleeves for conduits passing through floor slab, caulk around joint. Apply cold cure fire resistant mastic between sleeve and conduit to maintain full fire rating. Gap between sleeve and conduit shall not exceed 38mm (1.5”).

.11 Openings in floors for bus ducts and groups of conduits shall have a 150mm (6”) curb around the opening and voids between conduits and ducts shall be sealed to prevent sound transmission and to provide full fire rating of floor.

.12 Where sleeves pass through fire walls or fire separations, voids shall be filled to restore full fire rating of wall so penetrated and to prevent sound transmission.

.13 Inserts for hangers, etc. shall be firmly secured to the forms before the concrete is poured. Supply these inserts and be responsible for their correct location.

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.14 Hangers, equipment, etc. may not be supported from any precast concrete slab construction without the Consultant's approval. Where conduits, equipment, etc. are to be installed below pre-cast concrete slab construction, or under the steel roof deck, support all this equipment from the building structural steel beams, trusses or joists, using beam clamps.

.15 Where structural supports do not exist, or are spaced too far apart to be suitable for proper support of equipment, conduits and cables, supply and install angle or channel steel members between beams of the structural framework as required for proper supporting of same. Obtain Structural Engineer's prior approval.

.16 Where openings are required in precast floor or roof construction, pay the appropriate trade for cutting of any such openings. Be responsible for accurately laying out the location and size of openings necessary and obtain prior approval for all such openings from the Consultant.

3.9 CONCRETE WORK

.1 All concrete work shall be the responsibility of the Electrical Contractor, and shall conform with the appropriate articles in the architectural divisions of the specifications. Retain General Trades Specialists to perform the work.

3.10 INSTALLATION OF ACCESS DOORS

.1 Provide access doors to all junction boxes, bus duct and other electrical equipment, where built-in or concealed behind furring, walls or ceiling. Access doors shall be minimum size (300mm x 450mm) (12" x 18") and 500mm x 450mm (24" x 18") where it is necessary for persons to enter, and shall be adequately sized to properly service and maintain the equipment they served.

.2 Be responsible for their correct location. Frame and cover shall have a prime coat finish. Where necessary to have a number of access doors installed in the same area of a ceiling or wall, submit to the Consultant for his approval the location of these access doors.

.3 Employ specialists for the installation of access doors.

.4 Size and locate access doors in applied tile or in glazed or unglazed structural tile to suit tile patterns. Refer to Architectural Room Finish Schedule and details on Architectural Drawings in this regard.

.5 Submit list of proposed access door locations and obtain approval before commencing access door installation.

.6 Access doors in removable acoustic tile ceilings are not required.

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.7 Provide two sets of record drawings showing the location of all access doors and identify their function and/or service above them.

3.11 WIRING OF ITEMS SUPPLIED BY OWNERS

.1 Completely wire and connect all items listed as supplied by Owner; Refer also to the architectural and other system design drawings. These items will be installed in place by other Divisions but this Division shall do all electrical work required for installation of these items, including control wiring unless otherwise indicated.

.2 Some Owner's equipment is shown on the Drawings as "relocated". Disconnect said equipment in its present location and make ready for relocation by other Division. Electrical equipment such as starters, disconnect switches, controls, etc., not mounted on the equipment but which is required for operation of the equipment shall be disconnected, moved and reconnected by this Division. Completely wire and reconnect the equipment in its new location. Cut back, disconnect and remove obsolete wiring to its source and make safe the previous supply lines which became obsolete through the disconnection.

3.12 WIRING TO ELEVATORS

.1 Supply and install fused disconnect switches, one for power, one for control and one for cab lights for each elevator machine room and not more than 900mm (3’) from the door on the lock side. If the elevator motor switches are not within sight and within 9m (30’) of the motor, provide an additional disconnect switch at each motor. Provide wiring from the disconnect switches to the elevator controllers. Elevator layout is shown for pricing only. Final roughing-in and equipment location shall be done in accordance with final elevator installation drawings.

.2 In high rise non-sprinklered building: Provide a smoke detector wired into the fire alarm system on the elevator recall level and alternate floor. Smoke detector shall have auxiliary dry contacts which shall be wired into the elevator controller by this Division.

.3 In high rise building: Provide a smoke detector complete with relay base in elevator penthouse. All smoke detectors shall be wired into the fire alarm system and to the elevator controllers. In addition to the above, provide a smoke alarm complete with 120 volt power supply and wire alarm contacts into elevator controller. Do not connect to fire alarm panel. Provide one smoke alarm for each elevator machine room.

.4 In high rise building: Power supply conductor to "Fire-Fighters" elevators shall be two-hour rated MICC as required by the Provincial and National Building Codes from the power supply source to the elevator machine room. This shall also apply to all elevators in buildings classed as "High Rise Building" as defined in the Provincial and National Building Codes.

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.5 In each elevator pit, provide a light, with wire guard, light switch and GFI/WP duplex receptacle on a separate circuit. In each elevator machine room, provide a GFI receptacle on a separate circuit and 21mmC to telephone backboard for telephone.

.6 For elevator connected to emergency power distribution system, provide 4 #14 control wires from elevator controller to transfer switch of generator supplying the elevator motor. (These wires are for elevator control during emergency generator operation). Connect to dry contacts in transfer switch to signal in advance of re-transfer to normal power.

.7 Provide 6 #14 control wires from elevator controller to fire alarm control panel, connecting to auxiliary contacts for recall signal.

3.13 WIRING FOR OUTLETS IN FURNITURE

.1 Where receptacles or other outlets are shown mounted in furniture, the furniture manufacturer shall provide openings to receive the outlet boxes or cut-outs for these receptacles. This Division shall supply the outlet box, receptacle and cover plates and install these in the furniture, and do all necessary wiring for these receptacles or outlets. Wiring between outlets in furniture may be armoured cable (BX) type [Spec writer: check if the furniture is pre-wired].

.2 Where furniture is located adjacent to the wall, wiring from the supply source shall be run into suitably sized junction boxes recessed in the wall adjacent to the furniture. Boxes shall be provided with extension frames with suitable knock-outs and blank covers. Wiring from boxes to receptacles shall be flexible, interlocked armour cable whips, and shall be run concealed, where possible.

.3 Where furniture is located remote from walls, wiring from outlet to the supply source shall be run into flush mounted floor boxes in an accessible location, below the furniture. Wire to the furniture with armoured cable. Floor boxes shall be Nepco 800 series.

3.14 MOUNTING HEIGHT AND OUTLET LOCATION

.1 The location of outlets and equipment is subject to change without extra cost to the Owner, providing information is given prior to installation. No extra amount will be paid for outlets or equipment relocated requiring extra labour and materials up to 3000mm (10’) from the original location, nor will credits be anticipated where relocations up to 3000mm (10’) reduces the materials and labour.

.2 Unless dimensioned, symbols on the drawings show approximate locations only. Care shall be used to locate each fixture at the centre of spaces or rooms and to align continuous rows of fluorescent fixtures.

.3 Location of outlets in public areas or generally in any corridor, lobby, or in any

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areas having decorative wall finishes such as glazed tile, mosaic tile, marble, wood panelling, prefabricated panels, etc., shall be confirmed with the Consultant prior to installation.

.4 Where outlets are located within 150mm (6") of a mechanical device such as a thermostat, co-ordinate with the Mechanical Trade to ensure that the items are located to the approval of the Architect.

.5 Outlets shall not be mounted halfway through a ceramic or glazed tile dado line. If necessary, the mounting height specified shall be adjusted and the outlet located above the dado line.

.6 Outlet boxes intended for wall receptacles, switches, telephone outlets, etc., located in exposed concrete block, brick walls or ceramic tile walls shall be saw-cut into the top or bottom edge of the nearest course of block, brick or tile at a height nearest the specified elevation, and the height shall be uniform throughout the project. Opening shall be of minimum size required to take the outlet box and such that the device cover plate will conceal the cut.

.7 Where a number of outlets are located side by side, their centre lines shall be aligned horizontally. Where outlets occur one above the other, their centre lines shall be aligned vertically. In each case, the distance between cover plates shall be 25mm (1").

.8 Final roughing-in locations of all floor outlets shall be obtained from the Architectural furniture and equipment layout drawings.

.9 Receptacles in counters or furniture shall be mounted as detailed on Architectural Drawings.

.10 Outlets in kitchen shall be mounted at various heights and in locations shown on kitchen roughing-in drawings. Locations shown on electrical drawings are for pricing only.

.11 Obtain mounting heights from the Consultant for all outlets that do not have mounting height indicated.

.12 All measurements listed, unless otherwise noted, refer to centre line of device from finished floor.

.13 Mounting height above floor shall be as follows:

.i Top of panel board 2000mm (6’-6”).

.ii Lighting switches shall be located on the knob/latch side of the door unless otherwise indicated or applicable, and shall be mounted at 1200mm (47”) AFF. Light switches in service rooms shall be mounted at

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1500mm (60”) AFF.

.iii Recessed motor starters shall be mounted at same height as light switches in that area.

.iv Receptacles, telephone and T.V. antenna outlets 300mm (12”). Handicapped wheelchair access building 450mm (18”).

.v For Barrier free installation heights, refer to AODA or relevant standards.

.vi Receptacles above counters, 1350mm in general, on face of counter for handicapped. However, coordinate this with actual counter or backsplash height; obtain details from architectural drawings.

.vii Fire alarm manual pull stations 1200mm (47”) AFF.

.viii End of line resistor for signal and alarm circuits shall be mounted at 1950mm (77”) AFF.

.ix Alarm signals 2700mm (8’-10”), and 300mm (12") below ceiling in areas where ceiling height is lower than 2700mm (8'-10").

.x Clocks unless otherwise detailed 2700mm (8’-10”) and 300mm (12”) below ceiling in areas where ceiling height is lower than 2700mm (8’-10”).

.xi Speakers unless otherwise detailed 270mm (8’-10”) and 300mm (12”) below ceiling in areas where ceiling height is lower than 2700mm (8’-10").

.xii Sound system switches 1200mm (47") AFF and at 1200mm (47") AFF.

.xiii Thermostats shall be mounted 1500mm (60”) maximum, for handicapped access building 1200mm (47") AFF.

.xiv Telephone intercom handsets 1200mm (47") AFF.

.xv Receptacles in the Mechanical Rooms and other unfinished areas at same height with switches.

.xvi Bottom of lighting fixtures over mirrors 50mm (2”) above mirror. Check Architectural drawings for detail.

3.15 CIRCUITING OF OUTLETS

.1 Each outlet shown on the drawing shall be connected to the lighting panel indicated. Outlets with same branch circuit number shall be connected to the same branch circuit breaker. Outlets without circuit number designation shall be connected to a spare circuit breaker in the nearest lighting panel, normal or

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emergency in accordance with the nature of the service required. Circuit numbers shall correspond to breaker number in panel.

.2 Circuit numbers also show grouping of outlets connected to any given circuit. Circuit numbers may be changed only where required to balance loads in a panel.

.3 Common neutral shall not be used for lighting circuits on different phases.

.4 Separate neutrals shall be provided for dimmed circuits and circuits connected to ground fault protected circuit breakers, circuits with isolated ground receptacles, circuits in computer rooms or LAN closets, and circuits feeding systems furniture and other workstation outlets that will have computer equipment attached.

3.16 WIRING FOR MECHANICAL TRADES

.1 Unless otherwise specified, this Division shall supply and install all power wiring required for the mechanical trades. Examine the mechanical drawings and specifications in order to determine the exact extent of the work to be done.

.2 Unless otherwise specified for a particular application, each section of the Mechanical Contractor shall supply all required motors, starters, pilot lights, control devices, such as speed controllers, flow float and pressure switches, aquastats, ductstats, control panels, thermostats, etc., all as hereinafter specified under the various divisions. Each section of the Mechanical Contractor shall clearly identify each starter and control device with the equipment it is to control and together starters and control devices to this Division for installation.

.3 Low voltage supply source for control devices and interlocks shall be obtained through control transformers with 120V secondary voltage and suitable VA capacity mounted within the starter enclosure and supplied with the starters. All required interlock devices such as relays and double voltage relays shall be supplied by the section supplying equipment to be so interlocked.

.4 Supply and install a disconnecting means for isolation purposes at each motor. The disconnecting means shall consist of a disconnect switch of suitable rating designed to break all ungrounded conductors of the motor under full load. The disconnecting means shall be located within 9m (30’) and within sight of the motor and the machinery driven by the motor.

.5 Automatic Temperature Control manufacturer shall do all wiring required in connection with automatic temperature controls and electro pneumatic interlock wiring.

3.17 ELECTRICAL WIRING FOR MECHANICAL DIVISION

.1 The Mechanical Contractor will supply electrical motors, starters, controls, relays,

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thermostats, float switches, pressure switches, flow switches, pilot lights, remote control stations, safety devices, aquastats, control transformers, disconnects for control circuits, and interlocks.

.2 The Mechanical Contractor will mount the above equipment, except for line voltage wall thermostats and line voltage starters, which shall be mounted by the Electrical Contractor.

.3 The Electrical Contractor shall supply and mount isolation switches where required for safe servicing of motors, as well as at electrical panels of all factory assembled package equipment, e.g. rooftop units, condensing units, air-conditioning units.

.4 The isolation switch shall be located within sight of and not more than 9000MM (30') from the motor and the machinery driven by the motor.

.5 Unless otherwise indicated, the Electrical Contractor shall provide all power wiring as defined herein.

.6 The Mechanical Contractor will provide all control and interlock wiring including connection to equipment and to source of supply.

.7 Power wiring is defined as all single or three-phase wiring carrying the full line current of the mechanical equipment, including all wiring of line voltage controls and isolation disconnects connected in line between the source and the mechanical equipment and including connection to the equipment.

.8 Control and interlock wiring is defined as all mechanical equipment wiring other than power wiring outlined above.

.9 The Mechanical Contractor will provide detailed wiring diagrams for each motor.

.10 The Electrical Contractor will provide power outlets for damper motor power and control from nearest lighting panel. The Mechanical Contractor will wire from the outlet to the damper motor.

.11 Ascertain exact location of starters, motors and line voltage controls from Mechanical Drawings. If no starter location is indicated on the Electrical Drawings, obtain it from the Mechanical Drawings or from the Consultant prior to closing of Tenders. This shall also apply to motors indicated on single line distribution diagrams but not shown on the floor plans.

3.18 PAINTING

.1 Unless otherwise specified, all surface mounted equipment such as panels, switchboards, transformers, etc. shall have factory prefinished exterior surfaces. All prefinished equipment surfaces shall be cleaned and any scratches shall be touched up with original paint on completion of project.

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.2 All equipment intended for recessing, such as flush panels and recessed electric heaters and equipment specified with finish suitable for painting shall have factory applied prime coat of paint. Final painting of prime painted equipment will be done under Painting Section of this specification.

.3 If in the Consultant's opinion, touching up is not sufficient to provide a satisfactory appearance, the equipment shall be replaced and/or repainted to the Consultant's approval.

3.19 CUTTING AND PATCHING

.1 All cutting and patching of existing building walls, ceilings and floors required for the execution and installation of the work specified will be done by the General Trades. Mark carefully all areas to be cut prior to commencement of work. Coordinate the work with all other trades. Keep required cutting to a minimum.

.2 Should any cutting and repairing of either unfinished or finished work be required due to failure of this trade to advise of or install equipment or sleeves on time, cutting and patching shall be carried out by the trade affected and the Electrical Contractor shall pay all costs of such work.

.3 Be responsible for all cutting, patching and painting of and around patched area for Electrical work being installed in existing building where no architectural work requiring cutting and patching is being done.

3.20 IDENTIFICATION OF EQUIPMENT

.1 All power, lighting, signal and telephone panels, disconnect switches, starters, contactors and time switches shall be identified with black plastic laminated (Lamacoid) nameplates with white engraving, secured to the equipment with screws, to indicate function, voltage and designation appearing on drawings.

.2 Cover plates for recessed manual fractional HP motor starters shall have engraved designation, or lamacoid nameplate to the satisfaction of the Consultant, to differentiate them from light switches, e.g. "FAN".

.3 All fusible units and/or breakers in power panels and switchboards shall be identified with black plastic laminated (Lamacoid) nameplates with white engraving secured with screws to indicate load served.

.4 Surface mounted equipment shall have the nameplates mounted on exterior face of door or cover. Flush mounted equipment shall have the nameplates mounted at the top of the inside face of the door or cover.

.5 Each panelboard shall have a typewritten legend to indicate area or equipment controlled by each branch circuit.

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.6 All feeders in pullboxes shall be tagged with load. Tags shall be T & B "E-Z Code" markers or equal.

.7 Terminal strips in control panels shall be indexed and wires shall be colour coded.

.8 Raceways of various systems shall be identified by colour bars, dots or rings on the exterior of the raceway at 9m (30’) intervals and at termination points. The identification may be coloured adhesive tape or paint and shall be located 150mm (6") from the duct or conduit coupling. Sheathed cables shall be marked at 15m (50’) intervals and at termination points.

.9 Junction boxes shall be similarly identified but on the inside of the box.

.10 Bus ducts shall be identified with stencilled paint or lamacoid plates at 15m (50’) intervals.

.11 The identification shall be by voltage and system type as follows:

.i 750 volts and higher - yellow plus voltage designation

.ii 600V & 347/600 volt – orange

.iii 120/208 volt - blue (light)

.iv 600V & 347/600 volt - Emergency - orange and white

.v 120/208 volt - Emergency - blue and white

.vi Fire alarm system – red

.vii Communications systems – black

.viii Security system - brown

.12 All conductors shall be colour coded. All conductors No. 8 AWG and smaller shall have the colour impregnated into the insulation at the time of manufacture. In the case of conductors size No. 6 gauge and larger they may be colour coded with adhesive colour coding tape, but only black insulated conductors shall be employed in this case except for neutrals which shall be white whenever possible. Where colour coding tape is utilised, it must be applied for a minimum of 1" 25mm at all terminations and junction boxes. Painting of conductors will not be accepted under any conditions. The colour coding shall also apply to all bussing in panels and bus ducts, in which the phasing shall be 'A','B','C', from left to right when facing the panel or vertical bus duct.

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.13 Conductor colour coding shall be as follows:

.i Phase 'A' – Red

.ii Phase 'B' - Black (Yellow)

.iii Phase 'C' – Blue

.iv Neutral – White

.v Ground – Green

.vi Control – Orange

.vii Isolated Power Circuits - Orange and Brown

.viii Fire Alarm: use multi conductor FAS cable. Follow manufacturer's recommendations.

.14 All equipment, including electrical motors, shall have a proper nameplate affixed thereto, showing the size, name of equipment, service, serial number, and all information usually provided which shall include voltage, frequency, phase, and horsepower of motors and the name and address of the manufacturer. All stamped, etched or engraved lettering on plates shall be perfectly legible to the satisfaction of the Architect Consultant. Nameplates shall not be painted over, and where apparatus is to be insulated, nameplates shall be firmly attached with rigid insulation back-up, of equal thickness of that of jacket.

3.21 TESTING

.1 Make any tests required by the Architect Consultant during the progress of the work or at its completion. Provide all necessary labour and equipment for such tests. Such tests shall be carried out for the purposes of determining if the work as actually installed meets specified requirements.

.2 Tests must last for duration specified, defects and faults developed shall be corrected and the test repeated to the satisfaction of the Owner, Architect Consultant and the local authorities.

3.22 INSTRUCTIONS OF OWNER'S PERSONNEL

.1 When the installation is completed and ready for acceptance, demonstrate to, and instruct, owners staff or representative in the operation of each piece of equipment and system. Provide required labour and equipment for the demonstrations and instructions.

3.23 SEQUENCE OF WORK

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.1 The work may have to be carried out in certain stages. Refer to Architect Consultant Specifications for further details.

3.24 SPACE FOR FUTURE EQUIPMENT

.1 Where it is indicated that equipment is to be installed in future, leave such space clear and install the conduits, outlets, equipment and other work in such a way that future equipment installations and connections can be made. Consult with the representative of the Architect Consultant whenever necessary for the purpose.

3.25 FIRE STOPS

.1 Fire stops shall seal off all fire rated walls and ceilings. Fire stops shall be CSA and UL listed and shall be designed for application required to meet the various fire rated separations. Fire stop shall be Hilti, Tremstop manufactured by Tremco, 3M or equal.

3.26 DATA, VOICE, SECURITY SYSTEMS:

.1 In general, Electrical contractor shall install all conduits from each floor DATA/ Security Closets to each suit space, all access controlled doors and security devices as shown on all floors based on service providers requirements and run empty conduits of sizes noted in typical wiring diagram details for the systems to the designated IT/ Security Room in the basement garage level. All wiring/ cabling etc. shall be by IT/ Tel/Security contractors except for door contacts and cabling from door contacts to IT Room and as noted for monitoring devices. Coordinate exact locations and requirements of conduits etc. with service providers prior to installation. Please note that the door entry VING Card system is battery powered with no power requirement at the suite and individual room entry door locks. All other doors (Lobby, stairs, vestibules, roof, misc.) shall be provided with power, card readers, alarms and contact devices.

.2 Refer to riser diagrams for DATA, IT, Security, TV etc. on the drawings indicating size, numbers and type of conduits required to suit the IT/ TEL/ security/ TV System requirements.

.3 Provide vertical carrying conduits, numbers shown in the riser diagram.

.4 Provide a Cable Tray from the IT/ Security Closet to all suits in the corridor for IT, TEL, Security and TV cables (Cabling by others) and a 2 inch conduit from the corridor cable tray to the suite Comm Panel for the service providers to install their cables and connect to suit devices.

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.5 Provide all door contacts and cabling from door contacts to IT Room located Security Gateway/ Rack. Coordinate with Security System Supplier (Vingcard) on site for exact location, conduit size and cabling requirements.

.6 TV shall be COAX cables, DATA/ VOICE CAT 6.

END OF SECTION

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SECTION 26 05 20
RACEWAYS, ELECTRICAL DEVICES AND CONTROLS

PART 1 GENERAL

1.1 REFERENCE

.1 Basic Electrical Materials and Methods forms an integral part of this Section.

1.2 INTENT

.1 Provide all material, equipment and labour required for a complete and adequate installation of electrical materials as shown on the drawings and as described herein.

1.3 SHOP DRAWINGS

.1 Refer to Division 1 General Requirements and Basic Electrical Materials and Methods Section for details regarding shop drawing submission.

.2 Submit Shop Drawings for the following:

.i Cover plates.

.ii Light switches.

.iii Receptacles.

.iv Time switches.

.v Photo-Electric controls.

PART 2 PRODUCTS

2.1 CONDULETS, FITTINGS AND OUTLET BOXES

.1 Underground junction boxes: Crouse Hinds Type EGJ-422 or EGJ-421 complete with Ozite compound or equal.

.2 Explosion-proof: EYS sealing condulets shall be Crouse Hinds or equal complete with Chico-A compound and Chico K fiber.

.3 Condulets, outlet boxes and fittings shall be as manufactured by Crouse-Hinds of Canada Limited, Hubbell, Thomas and Betts Limited, Killark of Canada Limited and Elliott-Efcor of Canada Limited.

2.2 COVER PLATES

.1 Cover plates for receptacles, switches, pilot lights, communications outlets, T.V. outlets,millwork, columns and amenities areas and other devices requiring cover plates for flush mounted boxes shall be:

.i stainless steel with Type 301 brushed finish.

.ii brush marks shall be parallel with long direction of a single gang plate.

.iii plate shall be protected by adhesive plastic film which shall be removed after painting.

.iv nylon or urea of colour to match wiring devices.

.v Receptacles on white painted gypsum shall be WHITE RECEPTACLES with white cover plates.

.2 Weatherproof cover plates shall be diecast corrosion resistant or PVC type suitable for mounting on F.S. type boxes. All weatherproof cover plates shall have rubber or neoprene gaskets between cover and box.

.3 Plates for surface mounted boxes shall be galvanized formed steel type to match the box.

.4 Flush mounted receptacles connected to emergency supply shall have their plates engraved with 1/8" (3.2mm) high letters "EMERGENCY". Letters shall be filled with red paint. Similarly receptacles connected to "constant voltage" and "regulated voltage" shall have their plates engraved correspondingly.

.5 Cover plates for weatherproof or surface receptacle devices connected to emergency supply shall have a red lamacoid nameplate engraved "EMERGENCY" attached by screws to the plate.

.6 Cover plates for other flush mounted equipment shall be supplied of quality and performance specified by the manufacturer of the equipment.

.7 Cover plates shall not carry manufacturer's name.

.8 Coverplates of quality specified shall be manufactured by Bryant, Leviton, Smith & Stone, Harvey Hubbell, P & S.

.9 Cover plates for receptacles other than 15 amps and 120 volt shall have the amperage and voltage engraved into the plate and filled with black paint.

.10 Cover plate for communication outlets shall match those specified in Cover Plate article in this Section.

.11 Wall telephone outlets shall have single gang covers as specified for switches

and receptacles in this specification.

.12 Plates shall be equipped with jacks as specified in communication wiring sections.

.13 Plates shall have 3/4" (19mm) bushed hole.

.14 Plate at main telephone switchboard shall have a 1 5/8" (40mm) bushed hole to conduit a black soft rubber grommet and the telephone cable. Grommet shall be Conduflor Cat. #800-1.

2.3 LIGHT SWITCHES

.1 Unless otherwise indicated, light switches shall be Pass & Seymour, quiet type, side & back wired, white colour as follows:

.i Residential Grade (in suites only).

- Toggle type		15A
Single Pole	120V	660-XCN
Single pole (Handle lighted when OFF)	120V	660-XSLG
3-Way	120V	663-XCN
4-Way	120V	664-XCN

- Decora type		15A
Single Pole	120V	TM870-X
Single pole (Handle lighted when OFF)	120V	TM870-XSL
3-Way	120V	TM873-X
4-Way	120V	TM874-X

.ii Specification Grade –

Toggle type		15A	20A
Single Pole	120V	PS15AC1-X	PS20AC1-X
Single pole (Handle lighted when OFF)	120V	PS15AC1-XSL	PS20AC1-XSL
3-Way	120V	PS15AC3-X	PS20AC3-X
4-Way	120V	PS15AC4-X	PS20AC4-X
Single Pole	347V	PS371510-X	PS372010-X
3-Way	347V	PS371530-X	PS372030-X
4-Way	347V	PS371540-X	PS372040-X

Decora type	15A	20A

Single Pole	120V	2601-X	2621-X
Single pole (Handle lighted when OFF)	120V		2625-X
3-Way	120V	2603-X	2623-X
4-Way	120V	2604-X	2624-X
Single Pole	347V	2601347-X	2621347-X
3-Way	347V	2603347-X	2623347-X
4-Way	347V		2624347-X

.2 Switches of equal quality as manufactured by Bryant, Arrow Hart, Leviton and Hubbell shall be considered as acceptable as specified alternates.

.3 Dimmers shall be Lutron preset ON/OFF, linear slide, thin profile, white as follows:

.i Incandescent Dimmer: NT series.

.ii Magnetic Low Voltage Incandescent Lighting Dimmer: NTLV series.

.iii Electronic Low Voltage Incandescent Lighting Dimmer: NTELV series.

2.4 RECEPTACLES

.1 Receptacles shall be, unless otherwise indicated, U ground type, white, screw terminal type. Receptacles connected to emergency power supply shall be red.

.2 Receptacles on white painted gypsum surfaces shall be white receptacles with white cover plates.

.i Equal products to some Catalogue numbers listed are for Pass & Seymour as listed below:

Conventional Type:

.a Residential Grade (in suites only)

15A 125V duplex (5-15R)	3232-XCN
15/20A, 125V duplex (5-20RA)	CR20-X
15A, 125V duplex, GFCI	1591-XCN
30A, 250V Dryer	R3864
50A, 250V Stove	R3894

.b Hard use Specification Grade

15A 125V duplex (5-15R)	5252-XCN
15/20A, 125V duplex (5-20RA)	5352-XCN
15A, 125V duplex, GFCI	1591-XCN
15A, 125V duplex Isolated Ground (Orange)	IG6200-CN

.c Extra Hard use Specification Grade

15A 125V duplex (5-15R)	5262-XCN
15/20A, 125V duplex (5-20RA)	5362-XCN
15A, 125V duplex, GFCI	1591-XCN
15A, 125V duplex Isolated Ground (Orange)	IG6200-CN

.d Hospital grade type receptacles (shall be installed in all areas as defined in section 24 of the electrical code).

15A 125V duplex (5-15R)	8200-XCN
15A/20A 125V duplex (5-15RA)	8300-XCN
15A 125V duplex GFCI	1591-HGX
15A 125V duplex IG (Orange)	IG8200
15A 125V duplex IG (Red)	IG8200-RED

.e Hospital Grade receptacles shall be tested as per CSA Z32.99 Standards and test results submitted to the Consultant. Test shall be performed by independent test contractor or agency.

Decora Type:

.a Residential Grade (in suites only)

15A 125V duplex (5-15R)	885-XCN
15/20A, 125V duplex (5-20RA)	26342-XCN
15A, 125V duplex GFCI	1591-XCN

.b Hard use Specification Grade

15A 125V duplex (5-15R)	26252-X
15/20A, 125V duplex (5-20RA)	26352-X
15A, 125V duplex, GFCI	1591-XCN
15A, 125V duplex Isolated Ground (Orange)	IG26262-X

.c Extra Hard use Specification Grade

15A 125V duplex (5-15R)	26252-X
15/20A, 125V duplex (5-20RA)	26352-X
15A, 125V duplex, GFCI	1591-X
15A, 125V duplex Isolated Ground (Orange)	IG26262-X

.3 Clock hanger outlets shall be used for all view boxes shown. 15A 125V c/w stainless steel plate, S3733-SS

.4 Receptacles and telephone outlets located in horizontal planes of furniture shall

consist of poke through recessed or floor boxes or where indicated pedestal type fittings with receptacles and telephone devices of type specified mounted in the vertical face of the fitting.

.5 Devices of equal quality and type as manufactured by Bryant, Arrow Hart, Leviton and Hubbell shall be considered as specified alternates.

2.5 FLUSH FLOOR OUTLETS

.1 Flush floor receptacles shall be Wire Mold Evolution or equal in Hubbell and shall consist of:

.i cast iron watertight fully adjustable box

deep round top	B 2536
shallow round top	B 2537
deep single gang	B 2436
shallow single gang	B 2437
deep two gang	B 4233
deep three gang	B 4333

.ii formed steel concrete tight fully adjustable box

deep round top	B 2527
shallow round top	B 2529
deep single gang	B 2427
shallow single gang	B 2429

.iii cast iron watertight semi-adjustable

shallow round top	B 2524
shallow single gang	B 2414
shallow two gang	B 4214
shallow three gang	B 4314

.iv with brass coverplates

round, duplex flip	S 3925
round, duplex screw	S 3725
round, combination	S 2525
round, single (30 Amp)	S 3525
rectangular, duplex flip	S 3825
rectangular, duplex screw	S 3625
rectangular, combination	S 2425
rectangular, single (30 Amp)	S 3425

and with receptacle(s) as indicated on the drawing and listed hereinbefore.

.2 Flush floor telephone outlets shall consist of Nepco Series 800 flush floor box with 800-C-3/4" floor plate and 800A 3/4" brass plug and bell cap.

.3 Devices of equal quality and type as manufactured by P&S, Arrow Hart, Leviton, Hubbell shall be considered as specified alternates.

2.6 SERVICE FITTINGS

.1 Low profile receptacle service fittings with 3/4" nipple shall be as specified below. Catalogue numbers shown are Harvey Hubbell. Service fittings shall consist of:

15A, 120V duplex	SC 3091
15A, 120V duplex back to back	SC 3092

.2 Pedestal type service fitting (only where approved by Architect) shall consist of the following. Catalogue numbers shown are Hubbell.

Single gang double face housing	SA 6686
Double gang double face housing	SA 6688
Single gang blank cover plate	93I21
Single gang duplex cover plate	93I01
Single gang single receptacle. cover plate	93091
Two gang blank cover plate	93122
Two gang two duplex	93102
Heavy duty 30A 250V single, complete	SA 6631
Heavy duty 50A 250V single, complete	SA 6651

.3 Devices of equal quality and type as manufactured by P & S, Arrow Hart, Leviton, Nepco and Bryant shall be considered as specified alternates.

.4 Surface floor telephone outlets shall be Nepco Series 800, 55mm deep with 1" conduit adapter and aluminum die cast service fitting with 1" bushing.

2.7 PILOT LIGHTS

Neon type, red plastic jewel for switch plate opening shall be Bryant 48071-R.

.1 LED type, red plastic jewel for switch plate opening.

.2 Incandescent type, single red jewel for use in single vertical opening plate with 6 watt 120V candelabra lamp shall be Bryant 427 c/w 3850 bull eye plastic jewel and coverplate.

.3 Devices of equal quality and type as manufactured by P & S, Arrow Hart, Leviton, and Hubbell shall be considered as specified alternates.

2.8 DISCONNECT SWITCHES

.1 Disconnect switches shall have ample gutter space for top or bottom wiring and shall have fully visible blades when in the "off" position with cover open. Disconnect switches shall have a quick-make, quick-break mechanism and shall be horsepower rated.

.2 Disconnect switches shall have a mechanism by which their covers are interlocked with the handle to prevent opening when in the "on" position, but which can be defeated by means of a screwdriver or similar tool. Disconnect

switches shall have pad locking provisions.

.3 Disconnect switches shall be equipped with suitable fuse clips to take fuses specified.

.4 Fuse clips shall have appropriate rejection feature where HRC fuses are specified.

.5 Flush mounted unfused disconnect switches shall have flush mounting trim and door and front operated rotary type handle.

.6 Disconnect switches shall be Square D, Westinghouse or Siemens.

2.9 FUSES

.1 Fuses shall be CSA certified Class J for ratings 1 to 600 amperes or Class L for ratings 601 to 6000 amperes. Ratings as shown.

.2 Fuses for motor circuits rated 1 to 600 amperes shall be CSA certified Class J Time Delay. Fuses for transformer circuits shall be CSA certified Class RK5 Time Delay.

.3 For overcurrent protection of motor circuits, Time Delay fuses shall be rated up to 175% of motor full-load current unless otherwise noted on the drawings. Ferraz-Shawmut Type AJT or equivalent by Bussman.

2.10 PHOTO ELECTRIC CONTROLS

.1 Photo-electric controls shall be weatherproof temperature compensated and shock and vibration resistant. The electric cell shall be screened against ultraviolet rays.

.2 "On" action shall be adjustable from 10 to 50 Lux. "Off" action shall be adjustable from 30 to 150 Lux Switch shall have up to 2 minutes delay to prevent false switching due to temporary flashes of light.

.3 Should any part of the photo-electric control fail to operate, the switch shall be in the "on" (fail-safe) position.

.4 Photo-electric control shall be suitable for mounting on a flush mounted cast outlet box cover plate.

.5 Photo-electric control shall be Tork Cat. #2101 series or equal by Intermatic or Paragone.

2.11 TIME SWITCHES

.1 Time switch shall be electronic type, 7-day format, 365 day advance holiday scheduling, astronomic dial. Unit shall have LCD display, manual override. Time

switch shall have number of NO/NC maintained or momentary contacts as shown on the drawings and shall be suitable for mechanically held contactor or electrically held contactor or low voltage latching relay.

.i One SPDT, maintained contact: Tork # DZS100A

.ii Two SPDT, maintained contact: Tork # DZS200A

.iii Two SPDT, momentary contact (pulse ON, pulse Off) Tork #DZM200A

.2 Provide contactors as required to suit the application.

.3 Enclosure shall be Nema 1 surface mounting type.

.4 Flush mounted time switches shall have hinged door and lock.

.5 Time switch shall be Tork or equivalent by Intermatic or Paragon.

2.12 CONTACTORS

.1 Contactors shall be electro-magnetically operated, electrically held as indicated on the drawings. The contactors sizes 0 to 5 shall be of the vertical action design, employing double break silver alloy contacts. Contacts controlling lighting load shall be rated to take 100% tungsten filament load and 100% continuous non-inductive heating load without enclosure. Enclosure shall be Nema type 1 and of sufficient size as not to de-rate the device to less than 90% of the continuous open nominal current rating. Each contactor shall be capable of carrying continually without overheating the load specified on the drawing. If necessary, the next higher rated contactor shall be supplied.

.2 Contactors shall be provided with shading coils imbedded in the magnet frame to reduce the a/c hum to a minimum.

.3 Contactors shall have 24 volt or 120 volt control coils and control circuit fuse holder and fuse. Contactors controlling 208, 347 or 600 volt loads shall have integral control circuit transformer.

.4 Mechanically held contactors controlled by maintained contact pilot devices shall have coil clearing contacts.

.5 Electrically operated contactors shall have an "on-off-auto" selector switch in the cover except that heating load contactors shall have "auto-off" selector switches.

.6 Mechanically held contactors shall have momentary contact on-off push buttons in cover.

.7 Lighting contactors shall be Square D Class 8903. Other contactors shall be Square D Class 8502. Equivalent contactors by Arrow-Hart, Ascolectric or Westinghouse are considered as approved equal.

.8 Remote pushbuttons shall be flush mounted in brushed stainless steel cover plate.

.9 Cover plate shall match cover plates specified elsewhere in the specifications. Square D Class 9001 type BB-9 or equal.

2.13 OUTLET BOXES

.1 Outlet boxes shall be electro-galvanized and made of code gauge steel. Boxes shall be of size and type suitable for the particular location and application.

.2 Unless otherwise specified, receptacles and switch boxes shall be sectional where recessed and formed steel, solid type boxes where surface mounted.

.3 4" (100mm) square boxes with single gang plaster ring or extension ring shall be used for single devices where necessary to accommodate wiring and conduit entries.

.4 Outlet boxes for ceiling and wall mounted lighting fixtures shall be 4" (100mm) octagon. Outlet boxes for recessed fixtures shall be 4" (10mm) octagon or 4" (100mm) square of depth as required by code. Where special outlets are required for wall mounted fixtures, these shall be used.

.5 Where more than one switch is shown on plan, a multigang box shall be used.

.6 Outlet boxes for grouped outlets such as TV and receptacles, communications and receptacles shall be solid gang type with barriers to separate the various systems. Outlet boxes shall be Hubbell-Temco type GSB with GBC covers and LVP partition.

.7 Outlet boxes for the various systems shall be as specified in their respective Sections of this Specification, and as required by manufacturer of the system.

.8 Wiring devices located on prefabricated partitions shall be mounted in boxes supplied by the partition manufacturer and as described elsewhere in these specifications.

.9 Outlet boxes for 347 volt light switches shall be Hubbell-Temco MBD-HV (deep) or MBS-HV (shallow), single or multi- gang as required.

2.14 PULLBOXES, SPLITTERS, ETC.

.1 Boxes and splitters shall be as manufactured by Bel Products, Stelpro or Square D.

PART 3 EXECUTION

3.1 AUTOMATIC CONTROL OF EXTERIOR LIGHTS

.1 Contactors, photo-electric controls and time switches shall be used to control the exterior lights and signs. Refer to appropriate Standard Sheet.

.2 If the photocell is not indicated on the Drawings, obtain the location from the Consultant.

.3 The photo-electric cell shall be wired so as to control a magnetic contactor and shall cause the magnetic contactor to close at dusk and open at dawn for all-night items such as security lights. For each group of other items, a time switch shall shut off the appropriate contactor at the designated hours. Obtain designated hours from the owner. Each contactor shall have an "On-Off-Auto" switch to permit manual operation of the individual contactor.

.4 Where exterior lights are fed from a number of panels, a number of contactors shall be provided to accomplish the above stated operation.

.5 Control circuit of contactor shall be taken through a control transformer from line side of contactor through a control circuit fuse mounted within the contactor enclosure.

.6 Contactors shall have lamacoid nameplates indicating that control circuit is supplied from a different source if applicable.

3.2 INSTALLATION OF PULL BOXES, SPLITTERS, ETC.

.1 Wherever necessary for proper installation of anchoring of cables, whether shown on the drawings or not, pull boxes, junction boxes or cable anchor boxes shall be installed.

.2 Pull boxes, junction boxes, cable anchor boxes, splitter boxes, splitter troughs, etc., shall be suitable for the application and location in which they are used. Where joints are made inside any of the above boxes these shall be equipped with terminal blocks with separate screw terminals for each wire.

.3 Flush mounted pull boxes, etc., shall have screw-on covers and a 3/4" overlap on all sides and shall be prime coated for painting. Location of all flush mounted pull boxes in finished areas must be approved by the Consultant prior to installation.

.4 Splitter boxes shall have hinged covers equipped with sealing hasps.

.5 Boxes shall be located so as to be accessible after the building is completed. Supply access panels where required to make boxes accessible.

.6 Each wire in pull boxes and junction boxes shall have wire ends colour coded and/or marked with E-Z Code Marker tape.

3.3 OUTLET BOXES

.1 Outlet boxes recessed in exposed concrete block or masonry walls shall be saw-cut into the corner and lower edge of the block at the appropriate course of block or file closest to the specified mounting height. Uniform mounting heights shall be maintained throughout the project. Opening shall be of minimum size required to fit the outlet box, and sufficiently small that the outlet box cover plate will conceal the cut. Outlet boxes on exterior wall shall be provided with vapour barrier.

.2 Outlet boxes for exterior or weatherproof receptacles and switches shall be cast F.S. type with gaskets and shall be recessed, where possible, in the wall or structure.

.3 Free standing weatherproof duplex receptacles (in planter boxes) outlet shall be supported on 2" x 1" x 3' (50mmx25mmx914mm) channel and driven 30" (762mm) into the soil.

.4 Outlets in plaster walls shall consist of 4" (100mm) square box with raised plaster cover. For ganged outlets use solid gang type boxes with raised plaster cover.

.5 Offset outlet boxes, shown back to back in partitions, horizontally to minimize noise transmission between adjacent areas.

.6 Outlet boxes for devices mounted side by side or one above the other shall be separated by a minimum of 1" (25mm).

.7 Outlet boxes for outlets located in poured concrete ceilings shall consist of 4" (100mm) octagonal concrete rings and covers. Outlet boxes shall be of sufficient depth to avoid the need of conduit offsets. Conduits shall enter box between the top and bottom reinforcing rods.

.8 Outlet boxes for connection of equipment located against walls or partitions shall be 4" (100mm) square and 2 ½" (63.5mm) deep, complete with metal cover. Connection from box to equipment shall be made with extension box and flexible liquid tight conduit and angle connector.

.9 Outlet boxes used for high and low voltage devices which are indicated to be ganged shall use multigang boxes with securely fastened metal dividers.

.10 Ceiling outlet boxes supporting suspended incandescent chandelier type lighting fixtures shall be provided with fixture studs.

.11 Wall mounted exterior fixtures, unless otherwise shown shall have their outlet boxes flush mounted in the wall.

.12 Outlet boxes shall be supported independent of the conduit.

3.4 CONDULETS, FITTINGS AND OUTLET BOXES

.1 Where conduits are exposed, cast aluminum outlet boxes and condulets with suitable covers and gaskets shall be used. Conduit fittings shall be of a type suitable for their particular use. P.V.C. type outlet boxes may be used where P.V.C. conduit is used and permitted by code.

.2 Condulets and outlet boxes shall have threaded hubs of size and number required for the application. Condulet covers shall be located in such a manner that the removal and access of the covers shall be clear of any obstructions.

.3 Where necessary for proper pulling or anchoring of cables, junction boxes or cable anchor boxes shall be installed. All shall be installed in such a manner that they will be accessible after building is completed and they shall be set to come within finished surfaces of the building.

3.5 FUSES

.1 Unless otherwise specified, low voltage fuses shall be Class J, Class L or Class R, CSA certified in accordance with Standard C22.2 No. 248.8, No 248.10 and No 248.12 respectively.

.2 Fuses shall be so selected as to provide a fully coordinated system for both overload and short circuit fault conditions.

.3 Application of all fuses shall comply with the Canadian Electrical Code - Part I and local inspection authority regulations.

.4 Each fusible device provided with fuses in compliance with the above requirements shall be provided with a suitable warning label on the inside cover specifying that CSA classified fuses only shall be used on that device.

.5 Fuses for special devices shall be as specified in corresponding article.

.6 Provide one complete set of spare fuses identified and tagged for each type and rating of fuses installed.

.7 Provide a fuse cabinet large enough to accommodate all spare fuses supplied. Mount cabinet in Electrical Room.

.8 Fuses are coordinated with circuit breaker interrupting capacity and breaker size; do not change size without written approval. Dual element fuses are selected on "Ferraz-Shawmut" fuses characteristics. If other fuses are considered prior to making required revisions to fuses and fusible devices, obtain written approval from the Engineer for the proposed change.

3.6 RACEWAYS FOR COMMUNICATION SYSTEMS

.1 Supply and install an empty raceway system complete with conduits, pullboxes, panels, outlet boxes, and coverplates, suitable for the installation of communication cables and equipment, by the Telephone Company and Communication system supplier» . The complete conduit installation shall meet all Telephone Company requirements «Communication system supplier» and CSA T530 for Telecom Pathways.

.2 Unless otherwise shown, each communication outlet shall have a 3/4" conduit run to the communication backboard, panel or zone conduit location as applicable.

.3 Raceways shall be rigid, galvanized steel conduit where exposed to mechanical injury. In all other locations, EMT may be used.

.4 PVC duct shall be used for underground service entrance. Conduits shall be installed as specified under "Conduit Location and Installation" in this specification.

.5 All conduits shall be fished with pull line. All blockages shall be cleared, and all outlet and pull boxes cleaned out at the completion of the installation.

.6 Unless otherwise shown, wall telephone outlets shall be recessed flush with the wall finish.

.7 Where communication outlets are shown ganged with other outlets a multigang solid type box shall be used as specified above with appropriate barriers.

.8 The terminal cabinets, sized and located as shown on the drawings shall be of standard galvanized steel code gauge, complete with trim, door and combination lock and latch. Cabinets shall be for surface or flush mounting as shown on the drawings and shall have recessed trim as described for lighting panels. The cabinets shall be equipped with 3/4" (19mm) plywood backboard, painted, and securely fastened with flat head bolts to the back of the cabinet.

.9 The door opening shall be practically full size of the cabinet front. Conduit shall terminate in cabinets with ample clearance in front of mounting board.

.10 At all telecom equipment locations supply a 3/4" (19mm), sizes as indicated, plywood backboard, painted and securely fastened with flat head bolts to the wall. Paint shall be fire rated.

.11 Provide 120 volt receptacles on separate circuits in each telecom closet, located at 2m intervals.

.12 Unless otherwise shown, steel pull boxes shall be installed every 30m or less of straight conduit run; every 25m or less of straight conduit run and one 90 deg. bend or equivalent; every two 90 deg. bends or equivalent.

.13 Minimum of space requirements in pull boxes having one conduit each in opposite ends of the box shall be at least 8 times the diameter of the largest conduit.

.14 All communication conduits shall be grounded to building ground.

.15 Service entrance conduits shall be of type and size indicated on the drawings and shall be supplied and installed by this Division.

.16 A trench at least 1m deep shall be provided to the property line for telephone service entry. Coordinate with Telephone Company.

.17 Provide a #3 green ground wire from a 50mmx600mmx6mm copper busbar mounted in the main telecom room to the main service ground. Provide a #6 green ground wire from each 50x300x6mmm copper busbar in each telecom closet to the main telecom busbar. Grounding shall be in accordance with CSA-T527.

.18 Zone conduits shall terminate in ceiling space indicated and terminated with a bushing. Conduits shall be firmly fastened to building structure (not to ceiling supports).

3.7 EMPTY CONDUITS FOR SPECIAL SYSTEMS

.1 Supply and install a complete system of empty conduits, boxes and panels for the enclosure of wiring for systems specified.

.2 All conduits shall be as specified in "Basic Electrical Methods". Conduits shall be cleared and cleaned and all outlets and pullboxes cleaned out at the completion of the installation. All conduits shall be left with a pull line installed from outlet to outlet and fastened at each box.

.3 Conduit bends shall have a bending radii or not less than ten times the conduit diameter. Conduit shall be reamed out and all ends identified.

.4 All conduits shall be grounded to building ground.

.5 Additional steel pullboxes shall be installed where necessary, so that throughout the entire system, there shall be not more than two 90 degree or equivalent bends in each run so that wire or cables may be pulled in or withdrawn with reasonable ease.

.6 Provide as per the various building service providers (Bell, Rogers, Security Systems etc.). Refer to Single line riser diagrams on the drawings for sies, types and quantities.

END OF SECTION

ARTICLE NAME **PAGE**

SECTION 26 05 40
LOW VOLTAGE REMOTE CONTROL SYSTEM

PART 1 GENERAL

1.1 REFERENCE

.1 Specification Sections Basic Electrical Materials and Methods, Raceways, Electrical Devices and Controls and Service and Distribution shall form part of this specification section as though written out in full herein.

1.2 INTENT

.1 Provide a Low Voltage Remote Control System for lighting and other loads as indicated on the drawings.

.2 Low voltage panels shall be supplied, factory-assembled and factory tested by a single manufacturer.

.3 The specification is based on Canadian General Electric Company Limited Remote Control Wiring Systems components and pre-assembled low Voltage Panels (PAL Panels).

1.3 CODES

.1 All components as well as each PAL Panel assembly shall carry CSA approval and conform to CEC Code 22.0 for Class Two Energy Limiting Systems.

.2 All external control wiring between PAL Panels, local switches, area masters, etc. shall be installed in accordance with CGE recommendations and in conformance to CEC Code 22.1 for Class II systems.

1.4 SHOP DRAWINGS

.1 Manufacturer of low voltage panels shall provide an approval drawing for each and every low voltage panel prior to manufacture. Manufacturer shall keep original drawings on record at factory and supply (Specify No.) copies for approval and (Specify No.) copies for record.

.2 Manufacturer of low voltage panels shall affix to each panel prior to shipping:

.i One copy of the approved drawing for that panel (affixed on inside panel cover).

.ii Aluminum nameplate bearing a unique identification number for future reference to drawings on record in factory.

1.5 WARRANTY

.1 Overall system installation shall function according to drawings, schedules and specifications and shall be warranted by the electrical contractor for a period of one year from date of acceptance.

.2 Manufacturer of low voltage panels shall guarantee each and every low voltage panel to operate according to its approved drawings for a period of one year from date of acceptance.

PART 2 PRODUCTS

2.1 PANELS

.1 Panels shall be constructed of 14 Ga. CRS and painted Grey ASA.61.

.2 All panels shall have knockouts line up for joining two or more panels horizontally or vertically by using conduit nipples.

.3 Each panel shall be complete with stepped barrier separating HV and LV compartments. High voltage compartment shall have only one system voltage unless proper steel barrier provided.

2.2 LOW VOLTAGE COMPONENTS - RELAYS

.1 Relays used in PAL panels shall be CGE heavy duty specification grade Cat. No. RR-8.

.2 Relays shall be of three-wire, two coil type, operating at 24 volts AC and mechanically latching. Relays shall be free of control diodes, circuit eliminator contacts or resistors.

.3 The low voltage side shall plug into a 13mm knock out and be complete with colour coded pigtail leads.

.4 The main contacts shall be double break capable of switching 20 amps at 347 volts or less.

.5 The high voltage side shall be dead front complete with recessed brass screw terminals. Pigtail type leads on HV side are not acceptable. No wire nuts shall be used in panels.

.6 Where isolated feedback contacts are required RR-9 relays shall be used.

.7 It shall be possible to connect two or more relays to the same switch even if independent operation of each relay is required.

2.3 RECEPTACLES

.1 Receptacles shall be, unless otherwise indicated, U ground type, «white», screw

terminal type. Receptacles connected to emergency power supply shall be red.

.i Catalogue numbers listed are for Pass & Seymour as listed below:

Conventional Type:

.a Hard use Specification Grade

15A 125V duplex (5-15R)	5252-XCN
15/20A, 125V duplex (5-20RA)	5352-XCN
15A, 125V duplex, GFCI	1591-XCN
15A, 125V duplex Isolated Ground (Orange)	IG6200-CN

Decora Type:

.a Hard use Specification Grade

15A 125V duplex (5-15R)	26252-X
15/20A, 125V duplex (5-20RA)	26352-X
15A, 125V duplex, GFCI	1591-XCN
15A, 125V duplex Isolated Ground (Orange)	IG26262-X

.b Extra Hard use Specification Grade

15A 125V duplex (5-15R)	26252-X
15/20A, 125V duplex (5-20RA)	26352-X
15A, 125V duplex, GFCI	1591-X
15A, 125V duplex Isolated Ground (Orange)	IG26262-X

.2 Receptacles and telephone outlets located in horizontal planes of furniture shall consist of pedestal type fittings with receptacles and telephone devices of type specified mounted in the vertical face of the fitting.

.3 Devices of equal quality and type as manufactured by Bryant, Arrow Hart, Leviton and Hubbell shall be considered as specified alternates.

2.4 SERVICE FITTINGS

.1 Low profile receptacle service fittings with 3/4" nipple shall be as specified below. Catalogue numbers shown are Harvey Hubbell. Service fittings shall consist of:

15A, 120V duplex	SC 3091
15A, 120V duplex back to back	SC 3092

.2 Pedestal type service fitting shall consist of the following. Catalogue numbers shown are Hubbell.

Single gang double face housing	SA 6686
Double gang double face housing	SA 6688
Single gang blank cover plate	93I21
Single gang duplex cover plate	93I01
Single gang single receptacle. cover plate	93091
Two gang blank cover plate	93122
Two gang two duplex	93102
Heavy duty 30A 250V single, complete	SA 6631
Heavy duty 50A 250V single, complete	SA 6651

.3 Devices of equal quality and type as manufactured by P & S, Arrow Hart, Leviton, Nepco and Bryant shall be considered as specified alternates.

.4 Surface floor telephone outlets shall be Nepco Series 800, 55mm deep with 1" conduit adapter and aluminium die cast service fitting with 1" bushing.

2.5 PILOT LIGHTS

Neon type, red plastic jewel for switch plate opening shall be Bryant 48071-R.

.1 Incandescent type, single red jewel for use in single vertical opening plate with 6 watt 120V candelabra lamp shall be Bryant 427 c/w 3850 bull eye plastic jewel and coverplate.

.2 Devices of equal quality and type as manufactured by P & S, Arrow Hart, Leviton, and Hubbell shall be considered as specified alternates.

2.6 DISCONNECT SWITCHES

.1 Disconnect switches shall have ample gutter space for top or bottom wiring and shall have fully visible blades when in the "off" position with cover open. Disconnect switches shall have a quick-make, quick-break mechanism and shall be horsepower rated.

.2 Disconnect switches shall have a mechanism by which their covers are interlocked with the handle to prevent opening when in the "on" position, but which can be defeated by means of a screwdriver or similar tool. Disconnect switches shall have pad locking provisions.

.3 Disconnect switches shall be equipped with suitable fuse clips to take fuses specified.

.4 Fuse clips shall have appropriate rejection feature where HRC fuses are specified.

.5 Flush mounted unfused disconnect switches shall have flush mounting trim and door and front operated rotary type handle.

.6 Disconnect switches shall be Square D, Westinghouse or Siemens.

2.7 FUSES

.1 Fuses shall be CSA certified Class J for ratings 1 to 600 amperes or Class L for ratings 601 to 6000 amperes. Ratings as shown.

.2 Fuses for motor circuits rated 1 to 600 amperes shall be CSA certified Class J Time Delay. Fuses for transformer circuits shall be CSA certified Class RK5 Time Delay.

.3 For overcurrent protection of motor circuits, Time Delay fuses shall be rated up to 175% of motor full-load current unless otherwise noted on the drawings.

.4 Ferraz Shawmut Type AJT or equivalent by Bussman.

2.8 CONTACTORS

.1 Contactors shall be electro-magnetically operated, electrically held as indicated on the drawings. The contactors sizes 0 to 5 shall be of the vertical action design, employing double break silver alloy contacts. Contacts controlling lighting load shall be rated to take 100% tungsten filament load and 100% continuous non-inductive heating load without enclosure. Enclosure shall be Nema type 1 and of sufficient size as not to de-rate the device to less than 90% of the continuous open nominal current rating. Each contactor shall be capable of carrying continually without overheating the load specified on the drawing. If necessary, the next higher rated contactor shall be supplied.

.2 Contactors shall be provided with shading coils imbedded in the magnet frame to reduce the a/c hum to a minimum.

.3 Contactors shall have 24 volt or 120 volt control coils and control circuit fuse holder and fuse. Contactors controlling 208, 347 or 600 volt loads shall have integral control circuit transformer.

.4 Mechanically held contactors controlled by maintained contact pilot devices shall have coil clearing contacts.

.5 Electrically operated contactors shall have an "on-off-auto" selector switch in the cover except that heating load contactors shall have "auto-off" selector switches.

.6 Mechanically held contactors shall have momentary contact on-off push buttons in cover.

.7 Lighting contactors shall be Square D Class 8903. Other contactors shall be Square D Class 8502. Equivalent contactors by Arrow-Hart, Ascolectric or Westinghouse are considered as approved equal.

.8 Remote pushbuttons shall be flush mounted in brushed stainless steel cover plate.

.9 Cover plate shall match cover plates specified elsewhere in the specifications. Square D Class 9001 type BB-9 or equal.

2.9 OUTLET BOXES

.1 Outlet boxes shall be electro-galvanized and made of code gauge steel. Boxes shall be of size and type suitable for the particular location and application.

.2 Unless otherwise specified, receptacles and switch boxes shall be sectional where recessed and formed steel, solid type boxes where surface mounted.

.3 4" (100mm) square boxes with single gang plaster ring or extension ring shall be used for single devices where necessary to accommodate wiring and conduit entries.

.4 Outlet boxes for ceiling and wall mounted lighting fixtures shall be 4" (100mm) octagon. Outlet boxes for recessed fixtures shall be 4" (10mm) octagon or 4" (100mm) square of depth as required by code. Where special outlets are required for wall mounted fixtures, these shall be used.

.5 Where more than one switch is shown on plan, a multigang box shall be used.

.6 Outlet boxes for grouped outlets such as TV and receptacles, communications and receptacles shall be solid gang type with barriers to separate the various systems. Outlet boxes shall be Hubbell-Temco type GSB with GBC covers and LVP partition.

.7 Outlet boxes for the various systems shall be as specified in their respective Sections of this Specification, and as required by manufacturer of the system.

.8 Wiring devices located on prefabricated partitions shall be mounted in boxes supplied by the partition manufacturer and as described elsewhere in these specifications.

.9 Outlet boxes for 347 volt light switches shall be Hubbell-Temco MBD-HV 9deep) or MBS-HV (shallow), single or multi- gang as required.

2.10 PULLBOXES, SPLITTERS, ETC.

.1 Boxes and splitters shall be as manufactured by Bel Products, Stelpro or Square D.

PART 3 EXECUTION

3.1 INSTALLATION OF PULL BOXES, SPLITTERS, ETC.

.1 Wherever necessary for proper installation of anchoring of cables, whether shown on the drawings or not, pull boxes, junction boxes or cable anchor boxes shall be installed.

.2 Pull boxes, junction boxes, cable anchor boxes, splitter boxes, splitter troughs, etc., shall be suitable for the application and location in which they are used. Where joints are made inside any of the above boxes these shall be equipped with terminal blocks with separate screw terminals for each wire.

.3 Flush mounted pull boxes, etc., shall have screw-on covers and a 3/4" overlap on all sides and shall be prime coated for painting. Location of all flush mounted pull boxes in finished areas must be approved by the Consultant prior to installation.

.4 Splitter boxes shall have hinged covers equipped with sealing hasps.

.5 Boxes shall be located so as to be accessible after the building is completed. Supply access panels where required to make boxes accessible.

.6 Each wire in pull boxes and junction boxes shall have wire ends colour coded and/or marked with E-Z Code Marker tape.

3.2 OUTLET BOXES

.1 Outlet boxes recessed in exposed concrete block or masonry walls shall be saw-cut into the corner and lower edge of the block at the appropriate course of block or file closest to the specified mounting height. Uniform mounting heights shall be maintained throughout the project. Opening shall be of minimum size required to fit the outlet box, and sufficiently small that the outlet box cover plate will conceal the cut. Outlet boxes on exterior wall shall be provided with vapour barrier.

.2 Outlet boxes for exterior or weatherproof receptacles and switches shall be cast F.S. type with gaskets and shall be recessed, where possible, in the wall or structure.

.3 Free standing weatherproof duplex receptacles (in planter boxes) outlet shall be supported on 2" x 1" x 3' (50mmx25mmx914mm) channel and driven 30" (762mm) into the soil.

.4 Outlets in plaster walls shall consist of 4" (100mm) square box with raised plaster cover. For ganged outlets use solid gang type boxes with raised plaster cover.

.5 Offset outlet boxes, shown back to back in partitions, horizontally to minimize noise transmission between adjacent areas.

.6 Outlet boxes for devices mounted side by side or one above the other shall be separated by a minimum of 1" (25mm).

.7 Outlet boxes for outlets located in poured concrete ceilings shall consist of 4" (100mm) octagonal concrete rings and covers. Outlet boxes shall be of sufficient depth to avoid the need of conduit offsets. Conduits shall enter box between the top and bottom reinforcing rods.

.8 Outlet boxes for connection of equipment located against walls or partitions shall be 4" (100mm) square and 2 ½" (63.5mm) deep, complete with metal cover. Connection from box to equipment shall be made with extension box and flexible liquid tight conduit and angle connector.

.9 Outlet boxes used for high and low voltage devices which are indicated to be ganged shall use multigang boxes with securely fastened metal dividers.

.10 Ceiling outlet boxes supporting suspended incandescent chandelier type lighting fixtures shall be provided with fixture studs.

.11 Wall mounted exterior fixtures, unless otherwise shown shall have their outlet boxes flush mounted in the wall.

.12 Outlet boxes shall be supported independent of the conduit.

3.3 CONDULETS, FITTINGS AND OUTLET BOXES

.1 Where conduits are exposed, cast aluminum outlet boxes and condulets with suitable covers and gaskets shall be used. Conduit fittings shall be of a type suitable for their particular use. P.V.C. type outlet boxes may be used where P.V.C. conduit is used and permitted by code.

.2 Condulets and outlet boxes shall have threaded hubs of size and number required for the application. Condulet covers shall be located in such a manner that the removal and access of the covers shall be clear of any obstructions.

.3 Where necessary for proper pulling or anchoring of cables, junction boxes or cable anchor boxes shall be installed. All shall be installed in such a manner that they will be accessible after building is completed and they shall be set to come within finished surfaces of the building.

.4 Sealing condulets shall be provided in all locations required by Code. In explosion proof areas suitable explosion proof condulets shall be installed for surface or flush mounting devices as specified.

3.4 FUSES

.1 Unless otherwise specified, low voltage fuses shall be Class J, Class L or Class R, CSA certified in accordance with Standard C22.2 No. 248.8, No 248.10 and No 248.12 respectively.

.2 Fuses shall be so selected as to provide a fully coordinated system for both overload and short circuit fault conditions.

.3 Application of all fuses shall comply with the Canadian Electrical Code - Part I

and local inspection authority regulations.

.4 Each fusible device provided with fuses in compliance with the above requirements shall be provided with a suitable warning label on the inside cover specifying that CSA classified fuses only shall be used on that device.

.5 Fuses for special devices shall be as specified in corresponding article.

.6 Provide one complete set of spare fuses identified and tagged for each type and rating of fuses installed.

.7 Provide a fuse cabinet large enough to accommodate all spare fuses supplied. Mount cabinet in Electrical Room.

.8 Fuses are coordinated with circuit breaker interrupting capacity and breaker size; do not change size without written approval. Dual element fuses are selected on "Ferraz-Shawmut" fuses characteristics. If other fuses are considered prior to making required revisions to fuses and fusible devices, obtain written approval from the Engineer for the proposed change.

3.5 RACEWAYS FOR COMMUNICATION SYSTEMS

.1 Supply and install an empty raceway system complete with conduits, pullboxes, panels, outlet boxes, and coverplates, suitable for the installation of communication cables and equipment, by the Security , Telephone Company and Communication system supplier . The complete conduit installation shall meet all requirements of system supplier and CSA T530 for Telecom Pathways.

.2 Unless otherwise shown, each communication outlet shall have a 3/4" conduit run to the communication backboard, panel or zone conduit location as applicable.

.3 Raceways shall be rigid, galvanized steel conduit where exposed to mechanical injury. In all other locations, EMT may be used.

.4 PVC duct shall be used for underground service entrance. Conduits shall be installed as specified under "Conduit Location and Installation" in this specification.

.5 All conduits shall be fished with pull line. All blockages shall be cleared, and all outlet and pull boxes cleaned out at the completion of the installation.

.6 Unless otherwise shown, wall telephone outlets shall be recessed flush with the wall finish.

.7 Where communication outlets are shown ganged with other outlets a multigang solid type box shall be used as specified above with appropriate barriers.

.8 The terminal cabinets, sized and located as shown on the drawings shall be of

standard galvanized steel code gauge, complete with trim, door and combination lock and latch. Cabinets shall be for surface or flush mounting as shown on the drawings and shall have recessed trim as described for lighting panels. The cabinets shall be equipped with 3/4" (19mm) plywood backboard, painted, and securely fastened with flat head bolts to the back of the cabinet.

.9 The door opening shall be practically full size of the cabinet front. Conduit shall terminate in cabinets with ample clearance in front of mounting board.

.10 At all telecom equipment locations supply a 3/4" (19mm), sizes as indicated, plywood backboard, painted and securely fastened with flat head bolts to the wall. Paint shall be fire rated.

.11 Provide 120 volt receptacles on separate circuits in each telecom closet, located at 2m intervals.

.12 Unless otherwise shown, steel pull boxes shall be installed every 30m or less of straight conduit run; every 25m or less of straight conduit run and one 90 deg. bend or equivalent; every two 90 deg. bends or equivalent.

.13 Minimum of space requirements in pull boxes having one conduit each in opposite ends of the box shall be at least 8 times the diameter of the largest conduit.

.14 All communication conduits shall be grounded to building ground.

.15 Service entrance conduits shall be of type and size indicated on the drawings and shall be supplied and installed by this Division.

.16 A trench at least 1m deep shall be provided to the property line for telephone service entry. Coordinate with Telephone Company.

.17 Provide a #3 green ground wire from a 50mmx600mmx6mm copper busbar mounted in the main telecom room to the main service ground. Provide a #6 green ground wire from each 50x300x6mmm copper busbar in each telecom closet to the main telecom busbar. Grounding shall be in accordance with CSA-T527.

.18 Zone conduits shall terminate in ceiling space indicated and terminated with a bushing. Conduits shall be firmly fastened to building structure (not to ceiling supports).

3.6 EMPTY CONDUITS FOR SPECIAL SYSTEMS

.1 Supply and install a complete system of empty conduits, boxes and panels for the enclosure of wiring for systems specified.

.2 All conduits shall be as specified in "Basic Electrical Methods". Conduits shall be cleared and cleaned and all outlets and pullboxes cleaned out at the completion

of the installation. All conduits shall be left with a pull line installed from outlet to outlet and fastened at each box.

.3 Conduit bends shall have a bending radii or not less than ten times the conduit diameter. Conduit shall be reamed out and all ends identified.

.4 All conduits shall be grounded to building ground.

.5 Additional steel pullboxes shall be installed where necessary, so that throughout the entire system, there shall be not more than two 90 degree or equivalent bends in each run so that wire or cables may be pulled in or withdrawn with reasonable ease.

END OF SECTION

ARTICLE NAME **PAGE**

SECTION 26 24 13
SERVICE AND DISTRIBUTION

PART 1 GENERAL

1.1 REFERENCE

.1 Basic Electrical Materials and Methods forms an integral part of this Section.

1.2 INTENT

.1 Provide all material, equipment and labour required for a complete and adequate service and distribution system as shown on the drawings and as described herein.

1.3 WORK UNDER OTHER SECTIONS

.1 High Voltage Distribution.

1.4 SHOP DRAWINGS

.1 Refer to Division 1 General Requirements for details regarding shop drawing submission.

.2 Submit Shop Drawings for the following:

.i Service Entrance Board

.ii Main Switchboard

.iii Power Panels

.iv Lighting Panels

.v Suite Lighting Panels

.vi Bus duct

.vii Transformers

.viii Circuit breakers

.ix Reverse Current and Ground Fault Relays

.x Unfused Isolation Switches

PART 2 PRODUCTS

2.1 FIXED AIR CIRCUIT BREAKERS

.1 Fixed air circuit breakers shall be complete with direct acting dual-magnetic trips for each pole. Frame sizes and trip settings shall be as shown on the Drawings. Breakers shall be manually operated with stored energy closing for frame sizes up to 1600 amp, and electrically operated for frame sizes above 1600 amp. All breakers shall have an interrupting capacity rating of 100KA RMS asymmetrical or as noted on the drawings.

.2 Trip system shall be microprocessor based electronic, true RMS sensing, digitally programmed.

.i Provide the following time current adjustments to maximize system selective coordination.

.a Long Time Ampere Rating
.b Long Time Delay
.c Short Time Pickup
.d Instantaneous Pickup
.e Short Time Delay (include) I^2p and I^2t
.f Ground Fault Pickup
.g Ground Fault Delay (includes I^2t In and I^2t Out)
.h Fault trip LED indication indicating the element causing the breaker to trip

2.2 DRAW-OUT AIR CIRCUIT BREAKERS

.1 Draw-out air circuit breakers shall be 3 PST with self-aligning connectors mounted on the breaker. Draw-out mechanism shall provide specific "fully connected", "test" and "fully disconnected" positions. Breakers shall be mechanically interlocked so that the breaker must open to permit transfer of the breaker to or from the "fully connected", "test" or "fully disconnected" positions. Provision shall be incorporated to permit padlocking breakers in the open position.

.2 Breakers shall have 3 phase solid state direct acting overload relays and shall be trip free in operation. Frame sizes and trips shall be as shown on the Drawings. Breakers shall be manually operated with stored energy closing for frame sizes up to l600 amp and electrically operated for frame sizes above l600 amps. Breakers shall have an interrupting capacity rating of 100kA RMS symmetrical or as noted on the drawings.

.3 Trip system shall be microprocessor based electronic, true RMS sensing, digitally programmed.

.i Provide the following time current adjustments to maximize system selective coordination.

.a Long Time Ampere Rating
.b Long Time Delay
.c Short Time Pickup
.d Instantaneous Pickup
.e Short Time Delay (include) I^2p and I^2t
.f Ground Fault Pickup
.g Ground Fault Delay (includes I^2t In and I^2t Out)
.h Fault trip LED indication indicating the element causing the breaker to trip

2.3 FUSIBLE DRAW-OUT AIR CIRCUIT BREAKERS

.1 Draw-out fusible air circuit breakers shall be similar to the air circuit breakers specified above, but shall include current limiting HRC type fuse for each pole, connected on the line side of the breaker. The fuses shall be incorporated as an integral part of the circuit breaker, and shall be readily accessible for servicing when the breaker is completely in withdrawn position. The fuses shall be arranged for operation on short circuits in excess of the interrupting capacity of the breaker, and operation of any fuse shall automatically trip the breaker. Fuses sizes and melting characteristics shall be suitable for coordination with breaker trip setting.

2.4 FUSIBLE DISTRIBUTION UNITS

.1 Fusible distribution units shall be sized as shown, quick-make, quick-break, and horsepower rated, with rotary type operating handles. Covers shall have piano type hinges with padlocking facility. Covers shall be interlocked to permit opening only when the switch is in the "off" position. Switch handles shall have padlocking facilities to permit locking in the "off" position. Each unit shall be individually enclosed with insulated end barriers. Load terminals shall be equipped with solderless lugs.

.2 The units shall have high pressure silver alloy contacts and visible blades. Units shall be equipped with fuses as specified under "Fuses" article of this specification. Units designated as "Spare" shall be a complete fusible unit sizes as shown, but less fuses. Units designated as "Space Only" shall be space and bus provision for future installation of fusible units sized as shown.

2.5 BREAKER WITH AMPTECTOR

.1 Air circuit breaker shall be 1600 amps fixed mounting with 50 kA RMS symmetric short circuit interrupting capacity, manually operated spring closing. Breaker shall be equipped with Amptector solid state trip having 1600 amp long and 400% short delay trip settings. Ground fault current trip shall be set at 80% of long delay trips. Amptector time delay shall be set at 10 cycles.

2.6 MOULDED CASE DISTRIBUTION BREAKERS

.1 Moulded case circuit breakers shall have number of poles, frame size and trip

setting indicated and unless otherwise shown shall have a minimum interrupting capacity of 22,000 amps. RMS symmetrical for 2 pole and 3 pole breakers and 10,000 amps. RMS symmetrical for 1 pole breakers. Breakers indicated as "Spare" shall be complete with breaker of frame and with trip setting indicated. Breakers indicated as "Space" shall have all required bus work and mounting brackets installed in this time except for hardware which normally is supplied with the breaker.

2.7 FUSED MOULDED CASE BREAKERS

.1 Fused moulded case breakers shall have number of poles, frame size and trip setting indicated. Fuses shall be on the load side of the breaker and shall be readily accessible. The fuses shall be HRC limiter type with rejection feature to prevent installation of standard fuses. Breaker and fuse shall have a minimum interrupting capacity of 100,000 amps RMS asymmetrical.

.2 The fuses shall be arranged for operation on short circuits in excess of the interrupting capacity of the breaker, and operation of any fuse shall automatically trip the breaker. Fuse sizes and melting characteristics shall be suitable for coordination with breaker trip setting. Breaker shall not reset until fuse is replaced.

.3 Breakers with trip coils rated in excess of 200 amps shall be equipped with shunt trips and GFP protection, Westinghouse solid state ground fault relay Cat. #GFP 1200 standard sensor set at 1000amp or 6 x largest downstream breaker rating and 5 cycles time delay.

.4 Breakers or units indicated as spaces only shall have all required buswork installed at this time except for hardware and bus extension which normally are supplied with unit "kits". Breakers indicated as "spare" shall be complete with breaker of frame and with trip setting indicated.

2.8 TRANSFORMER

.1 The 600-120/208 Volt transformer shall have copper winding, KVA rating indicated on the drawing. Transformer shall have Class H insulation with maximum continuous coil temperature rise of 30 - 40 deg. C. High voltage taps shall be 4 - 2-l/2% full capacity, two above and 2 below normal voltage. BIL shall be 10 KV. Average sound level shall be 50 dB measured in accordance with NEMA Standards. Impedance shall be 5% plus or minus 0.5%.

.2 Neutral ground connection shall be made through isolating link. Transformer coil shall be mounted on the concrete floor type RSR vibration isolation pads and shall have braided flexible connections on primary, secondary and ground bus connections. Transformer shall have full capacity neutral and shall be bus connected to the ground bus. This transformer shall be designed and tested in accordance with CSA specification C9 and shall be equipped with a winding temperature indicating device having alarm contacts and a red pilot light. Temperature indicating device and a red pilot light shall be mounted in front panel of this cell.

.3 Transformer shall be well braced and reinforced to prevent vibrations and shall be ventilated and so arranged to allow for adequate volume of air movement to give maximum protection to the core and coil from dust. This section shall provide ready access to the transformer tap changer from the front of the enclosure and shall permit removal of the core and coil without disturbance to the main substation structure. This section shall be equal height to the Distribution section.

.4 High voltage shall be 600 volt delta; low voltage shall be l20/208volt star.

2.9 ADDITIONAL REQUIREMENTS

.1 Six copies of complete instruction books shall be provided showing details re: insulation, maintenance and operation. A one line diagram of the electrical equipment of size not less than 430mm x 550mm framed and glazed, shall be supplied and installed.

.2 Each main breaker shall be key interlocked with the handle of the load break switch to prevent opening load break switch with breakers in closed position.

.3 The main breaker cubicle shall also have two red pilot lights suitable for identifying and labelling for transformer "High Pressure" and "High Temperature" indication. These shall be wired in parallel with the transformer alarm panel in the switchboard room.

2.10 DRY TYPE TRANSFORMERS

.1 Dry type distribution transformers shall be indoor air cooled type rated three phase 60 cycle, of KVA rating shown on the drawings,600-208Y/l20 volts, l.2 KV class, and capable of withstanding a 10KV basic impulse level (BIL). They shall have standard primary taps. The transformer shall be designed with a Class B or H insulation system.

.2 The sound level in decibels shall be in accordance with NEMA TRI current standards. The transformer shall be equipped with terminal boards, tap changing links, suitable solderless connectors and shall have a ventilated code gauge steel enclosure complete with hinged removable expanded metal side panels and mounting brackets for floor or wall mounting as shown.

.3 The completed assembly shall be painted with a primer coat and a finish coat of ASA #6l grey. The transformer shall conform to CSA-C9, NEMA TRI and CEMA L2 current standards except where noted and shall be approved to CSA code part 2 specification C22.2 No. 47 where applicable.

.4 Floor mounted transformers shall have Vibro-Acoustic vibration isolators installed between case and floor.

.5 Wall mounted transformers shall have wall mounting angle iron platforms with appropriate vibration isolating hangers and/or brackets.

.6 Dry type transformers shall have metal drip pans, overhangs, louvres, etc. as

required to protect them against fire protection sprinkler water flow.

.7 Transformers shall be CSA type ANN and shall be as manufactured by Westinghouse, Pioneer, Polygon or Marcus.

.8 Transformers shall be wired with 3 ft. flexible conduit on secondary and primary side for sound isolation.

2.11 LIGHTING PANELS

.1 Lighting panels shall be breaker type and shall contain number of branch circuit breakers shown on the drawings.

.2 Panels shall be flush mounted except in electrical rooms and closets where they shall be surface mounted.

.3 Panels shall have lugs suitable for the number, type and size of conductors feeding the panel.

.4 Minimum size of mains shall be governed by size of fuse or breaker protecting the panel.

.5 Panels shall be constructed of code gauge steel with hinged door and combination latch and key lock. Locks shall be common to one key and each panel shall be equipped with two keys.

.6 Panel trim shall be fully adjustable, and shall be attached to the panel with concealed screws.

.7 Panels shall have plain door trim with no advertising or impression of any type. Surface mounting panel trim shall be finished in baked grey enamel paint. Flush mounting panel trim shall have exterior surface prime coated for painting and interior surface shall have baked grey enamel paint finish.

.8 Panel tubs for both flush and surface mounted panels shall have the interior and exterior surfaces finished in baked grey enamel.

.9 Each panel in addition to required number of breakers shall have a minimum of 20% of spare breakers.

.10 Panel bus bars shall be copper.

.11 All breakers shall be quick-make, quick-break, toggle type, with definite trip position and with line terminals bolted to the panel bus. Breakers shall be complete with thermal-magnetic trips sized as shown, and shall have ambient temperature compensation.

.12 Two pole and three pole breakers shall have common trip; tie handles will not be accepted.

.13 "Duplex, 1/2" or "Twin" breakers will not be accepted.

.14 Filler plates over unused breaker spaces shall fit tightly into the panel interior face plate.

.15 Unless otherwise noted, panels shall be for 120/208V, 3 phase, 4 wire operation. 347/600V, 3 phase, 4 wire operation. 120/240v, 1 phase, 3 wire operation as shown on the drawings.

.16 Handle locking devices shall be provided on all panel breakers feeding night lights, sign outlets, mechanical equipment, controls, intercommunication and signal circuits, exit and stair lights, time switches, signs, etc.

.17 Circuit loads shall be balanced across phases to within 5% or as closely as possible.

.18 Complete typewritten legend shall be provided on the inside of the door of each panel mounted in a metal frame and covered with transparent plastic.

.19 Lighting panels located outdoors and in sprinklered areas of the building subject to moisture and water penetration shall be enclosed in a raintight panel enclosure. Breakers for the outdoor lighting panels shall be calibrated at 40 deg.C rise and ambient temperature compensated.

.20 Circuit breakers feeding weatherproof receptacles shall be ground fault interrupter type.

.21 Circuit breakers feeding heat tracing cables shall be ground fault interrupter type.

.22 Circuit breakers feeding unswitched lighting circuits shall be "Switching Duty" type.

.23 Double and triple tub panel boards and panel boards containing auxiliary equipment shall be constructed in accordance with latest CSA requirements for Custom Built Panelboard Assemblies.

.24 Column type panels shall be complete with extended wiring trough and junction box at roof.

.25 Lighting panels and breakers shall be as manufactured by Cutler Hammer, Siemens, or Square D.

2.12 POWER PANELS

.1 Power panels shall contain circuit breakers or fusible units as shown on the drawings. Fusible units will not be accepted in lieu of breakers and vice-versa.

.2 Panels shall be surface or flush type as indicated on the drawings.

.3 Switches or breakers feeding power panels which supply mainly motor loads

shall be equipped with single phasing protection.

.4 Panel bus bars shall be copper.

.5 Panels shall have lugs suitable for type, number and size of feeders shown. Minimum size of mains shall be governed by size of breaker or fused section protecting the panel.

.6 Each panel shall have number of breakers of size and frame or fusible units indicated.

.7 Minimum interrupting capacity of breakers shall be as indicated on the drawings. Where this is not shown or specified rating shall be sufficient to interrupt and/or withstand the available fault current at that point in the electrical system.

.8 Each breaker or fusible unit shall have a lamacoid nameplate attached with contact cement or screws. Nameplate shall carry name of equipment or panel served by this breaker or unit.

.9 Breakers or units indicated as "Space only" shall have all required bus work and mounting brackets installed at this time except for hardware and bus links which normally are supplied as part of the "unit kits".

.10 Breakers or units designated as "Spare" shall be complete with breaker or fusible unit.

.11 Circuit breakers shall have ampacity and frame size shown on the drawings. Breakers shall have definite off and trip positions with provisions for padlocking. Breakers shall be bolted to the buses and 2 or 3 pole breakers shall have common trips.

.12 Fusible units shall have quick-make, quick-break, mechanism and shall be front operated. Units shall be individually enclosed with insulated end barriers. Fuse clips shall be high pressure type suitable for and complete with HRC fuses. Spare units shall be equipped with fuses of full unit size.

.13 Flush mounting panel boards shall have doors with concealed hinges and combination latch and key lock. Panel trim and door shall have no markings, and shall be fully adjustable and attached to the panel with concealed screws.

.14 Free standing panel boards and surface mounted panels unless otherwise specified shall have full length doors.

.15 Panel bus work shall be adequately braced to withstand the available short circuit capacity of system or short circuit specified.

.16 Power panels shall be manufactured by Cutler Hammer, Siemens, GE or Square D.

2.13 COMBINATION FRAME/TRIM

.1 Combination frame shall be used where two or more recessed panels are shown on the drawings side by side.

.2 Combination frame shall be of one piece construction into which the panels shall be recessed and each panel shall have a separate hinged door with separate tub.

.3 Minimum material gauge for all combination frames up to 7742 sq cm in area shall be #l2 gauge, and over 7740 sq cm shall be #l0 gauge.

.4 Combination frame for 3 or more sections and with doors longer than 1.2m shall have angle iron reinforcing between each section and top and bottom.

.5 Opening the panel door, other than a telephone panel, shall not give direct access to the wiring gutters or live terminals but only to dead front circuit breakers and fusible units. Access to the wiring gutters, live terminals, bus connections, etc., shall be obtained by removing the door or trim.

PART 3 EXECUTION

3.1 TEMPORARY ELECTRIC SERVICE AND WIRING

.1 Supply and install temporary services on the new floor area job site. Temporary services shall be located as directed by the Owner's representative on the site. Make all arrangements with the client for use of power during construction.

.2 Plant operations or service overload or affect on on-going plant operations will not be permitted.

.3 One service shall be 600 volt, 3 phase, 400 amp and shall consist of standpipe, main switch, meter and splitter. From the splitter, run a 150 amp line to the crane power connection points, and 100amp line to hoist connection point. Supply and install required disconnect switches.

.4 One service shall be 120/240 volt, single phase, 3 wire or 120/208volt, 3 phase, 4 wire, 200 amp. This service shall consist of a standpipe, main switch, meter and panel. Alternatively, contractor may provide the required power through a dry type transformer connected to the 600 V service.

.5 Standpipe support and service enclosure will be provided by the Owner. Services shall be installed at time designated by Owner.

.6 Supply and install temporary lighting and power distribution system throughout the project for use by all trades. Supply all required outlets, lamp sockets, 150W lamps, auxiliary panels, and temporary feeders as required to provide the following:

.i Temporary lighting in all corridors at 10m centres and stairways at each

landing.

.ii Temporary lighting on each floor of garage. Light outlets shall be located at 10 to 13m centres in both directions.

.7 20A 3 wire 120/240V power outlets on each floor including garage located in corridors or aisles on approximately 30m centres.

.8 Extension cords will be supplied by each trade for their own use.

.9 Throughout the construction period, replacement lamps shall be supplied by the Owners, but installed by this contractor.

.10 Relocate all temporary wiring and outlets as required and as directed by the Owner.

.11 "Used" wiring and equipment may be utilized for temporary wiring. All temporary wiring and equipment shall remain property of this contractor and shall be removed from site at the time directed by the Owner.

3.2 RE-TORQUING

.1 After installation is complete, for switchboards, service entrance boards and bus ducts, re-torque all bolted connections.

3.3 EMPTY CONDUITS AT PANELS & TERMINAL CABINET

.1 All flush mounted lighting panels shall be provided with two 1" empty conduits from the panel to the ceiling space above and, where applicable, one to the ceiling space below the panel and terminated in a suitable pull box in the nearest accessible space for future branch circuit conductors.

.2 All flush mounted telephone and power panels shall be provided with one 2" empty conduit terminated in accessible ceiling spaces as described above.

.3 All flush mounted terminal cabinets such as P.A., T.V. antenna, Fire Alarm, etc. shall be provided with one 3/4" empty conduit terminated in accessible ceiling spaces as described above.

3.4 CO-ORDINATION STUDY

.1 Provide a co-ordination study for the distribution system. Include short circuit calculations, time-current graphs showing opening curves of all appropriate breakers and fuses and inrush current and damage curves of transformers based on OESC requirements.

.2 Ground fault protection curves shall be included.

.3 Indicate clearly curves for any downstream devices which do not co-ordinate with the appropriate upstream devices. Submit proposals and provide all required

modifications of the equipment to suit. Costs shall be included and paid for by this Division

.i Coordination Study
Develop time-current coordination plots to derive coordinated settings for new protective
devices.
.iii. Protective Device Settings
Settings derived for the adjustable protective devices to be included in this study
.iii Arc Flash Incident Energy Analysis
Perform an arc flash incident energy analysis per IEEE Std 1584™-2018 and to the requirements of CSA Z462:21 on the electrical distribution system as per equipment suppliers scope of
work.
.iv An incident energy analysis is defined by CSA Z462 to be a component of an arc flash risk assessment used to predict the incident energy of an arc flash for a specified set of
conditions.
.v. Recommendations
Provide specific recommendations for improving the electrical distribution system

.4 performance and correcting any deficiencies found by the studies.

.5 Co-ordination study shall be carried out by equipment manufacturer or independent electrical power system engineering analysis and field testing group.

3.5 COMMISSIONING

.1 Commissioning costs shall be included and paid for by this Division.

.2 Commissioning shall be conducted by an independent electrical power system engineer and technical field specialists such as G.T. Wood or Ferguson Haronitis and Associates Limited.

.3 Commissioning tests shall include the following equipment, transformers, switchboards, power panels and shall generally include the following:

.i Testing of all overcurrent devices, short circuit device and all protective relays

.ii Setting of all relays in accordance with coordination an fault current analysis

.iii Phase rotation identification

.iv Checking of all terminations

.v Application of dummy loads and load testing

.vi Infrared testing of all joints

.vii Testing of protective and indicating instruments

3.6 EQUIPMENT SPRINKLER PROTECTION

.1 Electrical equipment located in area with fire protection sprinklers shall be provided with suitable protection against waterflow from sprinkler heads. This protection shall be of a type acceptable to the local Hydro Inspection Department.

END OF SECTION

ARTICLE NAME **PAGE**

SECTION 26 50 00
LIGHTING

PART 1 GENERAL

1.1 REFERENCE

.1 Basic Electrical Materials and Methods forms an integral part of this Section.

1.2 INTENT

.1 Supply and install all electrical interior and exterior lighting fixtures, luminaires, lighting standards, bases and all required accessories as indicated on the drawings by letter type or number and as hereinafter specified.

1.3 SHOP DRAWINGS

.1 Refer to Division 1 General Requirements for details regarding shop drawing submission.

.2 Submit Shop Drawings for each lighting fixture type.

1.4 WARRANTY

.1 Replace and install without extra cost to the Owner, all defective light fixtures for a period of one year.

PART 2 PRODUCTS

2.1 LIGHT FIXTURES

.1 All fixtures shall be LED dimmable with matching lumens to the fixtures noted in this section Unless otherwise indicated.

.i A line incandescent lamps:

.a 120 volt rated.
.b Inside frosted.
.c Minimum average rated life of 75000 hrs.
.d CRI of 85 or better.
.e Average rated life of 24,000 hrs.

.ii Dimmable to 10% .

2.2 LIGHTING FIXTURES

.1 The flame spread and smoke development rate of fixture lenses shall not exceed

those permitted by the Ontario Building Code.

.2 Unless otherwise specified, all fluorescent fixtures shall have baked white enamel finish.

.3 Unless otherwise indicated light poles shall have epoxy powder finish of colour designated by Consultant.

.4 All fixtures shall be hung with chains from the ceiling structure.

2.3 FLOOD LIGHTING POLES

.1 Floodlighting poles shall have grounding lug, cable entrance opening, handhole opening with cover and tamperproof screws, and anchor bolt cover. Cables in pole shall be properly anchored at top of pole.

2.4 EMERGENCY LIGHTING UNIT, REMOTE HEADS AND EXIT LIGHTS

.1 Emergency Lighting Unit Equipment

.i Transfer switch shall automatically switch load on at power failure and off on return of normal power. Battery charger shall be solid state, multi-rate, voltage/current regulated, inverse temperature compensated, short-circuit protected; shall be capable of fully recharging discharged battery in 24 hrs.

.ii Battery unit shall be complete with:

.a LED type signal lights for "ac power on" and “charger on”
.b Test switch.
.c Cord and plug connection for 120 volt ac, direct wired connection for 347 volt ac.
.d Low voltage disconnect feature.
.e 12v dc fused output circuits.
.f Mounting shelf.
.g Diagnostic board to provide self test for 1 minute every 30 days, 10 minutes for every 6 months and full discharge every 12 months.

.iii Battery shall be sealed, maintenance-free lead type, 10 years expected life, capacity as indicated on the drawings.

.iv Remote heads shall be single or twin as indicated on drawings, sealed beam, swivel-type, 12 volts, 12 watt quartz lamp, with mounting plates for wall or ceiling mounting as indicated, white finish. Lumacell MQ series.

.v Unit equipment, remote heads and auxiliaries shall be by the same manufacturer.

.vi Unit equipment shall be Lumacell RG12S series or equal by Dualite, Beghelli or Emergi-Lite.

.2 Exit lights

.i Exit lighting fixtures shall be Green Running Man Pictogram single or double face with directional arrows as indicated on drawings. Illuminator shall be an led type self contained module designed to evenly illuminate all letters, maximum consumption 2 watts, designed for at least 50,000 hours of continuous operation without replacement. Exit light shall meet or exceed CSA 860 standards, lettering shall be EXIT / bi-lingual 19mm (3/4") x 150mm (6").

.ii Where indicated exit sign shall be complete with battery and 2x12 watt emergency light heads.

.iii Exit sign shall be constructed of an extruded aluminum body and faceplate, white finish, with snap out arrows, Lumacell LER 400 series or equal by Dualite, Beghelli or Emergilite.

PART 3 EXECUTION

3.1 INSTALLATION OF LIGHTING FIXTURES

.1 Fixtures shall have C.S.A. labels and shall be complete with lamps and all necessary accessories for their hanging and mounting. Fixtures shall be installed in accordance with the manufacturer's instructions.

.2 Unless otherwise indicated support all lighting fixtures, including those mounted in suspended ceilings, directly from the building structure.

.3 Fixtures installed in inverted T bar ceilings may be supported by the ceiling provided the ceiling support system is designed to carry the weight of the fixtures, however each fixture shall be equipped with secondary security supports.

.4 Provide and install all necessary supports and hangers prior to the installation of the ceilings. All supports or hangers shall be of a non-combustible nature. Provide metal channels or similar supports as required.

.5 Recessed fixtures shall have trim designed to fit into ceiling types used. Before ordering fixtures check ceiling types used in various areas on the latest Architectural Drawings.

.6 Fixtures delivered to site shall be stored in clean, dry and protected areas until required for installation.

.7 Supply plaster frames and rings for all fixtures recessed in non-removable ceilings (i.e. plaster, drywall, wood, sheet metal, etc.). Hand these to the appropriate trade for installation. Supervise the installation to ensure correct mounting and spacing.

.8 Co-ordinate the installation of lighting fixtures with all Trades to provide spacing intended.

.9 Fixture studs or other equally secure methods of attachment shall be used throughout.

.10 Where fixtures are hung on chain hangers, the chain shall be of closed link type capable of supporting ten times the fixture weight.

.11 Unless otherwise specified suspended industrial fluorescent fixtures shall be mounted on chain at height indicated.

.12 Recessed, surface mounted, or suspended lighting fixtures of weights in excess of standard units shall be suitably supported from the structure independent of the ceiling suspension system.

.13 Suspended industrial fixtures unless otherwise noted shall have 13mm rigid conduit stem hangers with ball aligners, length of hangers shall be as required to provide fixture mounting height specified. Hangers and ball aligners shall be painted aluminum colour.

.14 Fixtures connected to ground fault interrupter circuits shall have separate neutrals (common neutrals for 2 or 3 circuits are not acceptable).

.15 Exterior wall mounted lighting fixtures shall be mounted on recessed boxes except where fixtures with integral outlet boxes are specified in which case the recessed outlet box is not required. Outlet boxes shall be firmly anchored to the wall.

.16 Fixtures shall be properly cleaned and left clean and dust free. Any fixture showing marks or scratches due to handling or tool marks shall be replaced.

.17 Where luminaires are surface mounted on inverted T-bar ceilings, they shall be supported directly from the building structure. Where this is not possible due to presence of mechanical ducts or other obstruction, supply and install galvanized steel channel, Unistrut or equal, above the ceiling, securely attached to the structure and not from the suspension system for the ceiling, and fasten the luminaires to the channel with clamping nut, bolt, flat washers and lock washer, to the satisfaction of the Consultant. Provide bolts at least every 1.2m length of fixture (i.e. 3 bolts for 2.4m fixture).

END OF SECTION

ARTICLE NAME **PAGE**

SECTION 27 41 00
VOICE / DATA / SECURITY / TV NETWORK MATERIALS AND METHODS

PART 1 - GENERAL

1.1 REFERENCE

.1 Conform to Sections of Division 1 as applicable.

.2 Conform to general Electrical Requirements, Section 26 50 00 and other sections as applicable.

.3 All conduits and cables cables shall be supplied and installed by Electrical Contractor as per service providers requirements.

.4 Work shall conform to applicable Building and Electrical Safety Codes.

1.2 SCOPE OF WORK

.1 Provide a complete EMPTY CONDUIT SYSTEM for voice, data, Security, TV cabling system as shown on drawings and as specified herein.

1.3 RELATED WORK

.1 Division 1 - General Requirements: Cutting and Patching.

.2 Division 26 - Conduits, Ladder Trays, Outlets, where indicated on drawings shall be provided under Division 16.

.3 Division 16 - Raceways, Devices and Controls.

1.4 SUBMITTALS

.1 Submit shop drawings and product data to requirements of Division 1.

.2 Indicate on shop drawings, shop fabricated enclosures and cabinets; include wiring schematic diagram, wiring diagram, outline drawing and construction diagram.

.3 Provide product information on cabinets / racks, cable, insulation displacement connectors, patch panels patch cords and outlet jacks.

1.5 AS BUILT DRAWINGS

.1 Prepare and submit "As-Built" drawings detailing exact location of all equipment indicating all wiring raceways, pull, junction and terminal boxes. The as built drawings shall be submitted in Autocad drawing format and shall include all outlet locations and labels.

PART 2 - PRODUCTS

2.1 RACEWAYS, CABLES AND FITTINGS

.1 Empty conduits as per the requirements of the service providers complete with pull strings. All cables shall be pulled in conduits only.

.2 Provide CAT6 cables from the point of use outlets to the IT / Room with 5 meter loop, complete with RJ-45 on walls and 8 feet long cord for the computer connection. Label , test, certify and terminate the cables in existing switches in IT room for connection to the IT provider.

3 Conduits and fittings, ladder tray, bridle rings, section 261000

.4 Coordinate with owner and service provider for all requirements and special requirements.

End of Section

ACCORD PLASTIC
CONCORD
ONTARIO

PROJECT NUMBER 2023-1010
MECHANICAL SPECIFICATION
MARCH 2024

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ARTICLE NAME **PAGE**

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SECTION 20 05 00
BASIC MECHANICAL MATERIALS AND METHODS

PART 1 GENERAL

1.1 REFERENCE

.1 The General Conditions, Instructions to Bidders, Division 1, any Supplements and/or Addenda thereto form an integral part of this specification and must be read in conjunction herewith.

1.2 INTENT

.1 This Section applies to all Sections of the Mechanical Contractor.

1.3 SUBMITTALS

.1 Comply with Section 013300 and specific additional requirements of Sections in the Mechanical Contractor.

1.4 RELATED WORK SPECIFIED ELSEWHERE

.1 Painting of exposed piping, ductwork and unfinished mechanical equipment - under Division 9. Painting of natural gas piping - under the Mechanical Contractor.

.2 Concrete work required for the supports and bases for mechanical equipment - under the Mechanical Contractor. The Mechanical Contractor shall provide all supports, brackets, stands and platforms required for the proper installation of its equipment and work.

.3 Backfilling for piping inside the building and under paved areas outside the building from 300mm (12") above pipe - under Division 2. Backfilling around all piping and to 300mm (12") above pipe - under the Mechanical Contractor. Excavation for all piping (inside and outside the building) and all backfilling for piping outside the building not under paved areas - under the Mechanical Contractor.

1.5 STANDARD OF MATERIALS AND EQUIPMENT

.1 Tender price shall be based only on equipment specifically mentioned by name in the specifications that is on "Base Bid" equipment or on "Named Alternate" equipment.

.2 In the event that the tender price is based on any of the "Named Alternate" equipment, mark in the "Named Alternate" manufacturers in the appropriate space in the Tender Form. If no choice is indicated in the Tender Form, "Base Bid" equipment shall be supplied.

.3 "Contractor's Proposed Alternates" are invited and are to be marked in the appropriate space in the tender together with the reduction in the Base Bid tender price amount for each of the "Contractor's Proposed Alternate". These "Contractor's Proposed Alternates" will be considered at the time of the award of the Contract and those accepted will be included in the Contract.

.4 For the purposes of these specifications and tender documents, the following definitions shall apply:

.5 "Base Bid" - equipment or manufacturer shall be that named first in the specifications for any material or equipment; or equipment or manufacturer specifically described as "Base Bid" equipment in the Specifications.

.6 "Named Alternate" - equipment or manufacturer shall be that named second, third, etc., in the specifications.

.7 Be responsible for and cover all costs and labour in cases where a "Named Alternate" requires additional labour, material, piping, connections, or involves any other costs to any trade, General Contractor or the Owner, over the costs involved with the "Base Bid" equipment or material. Such additional costs and work shall be included in the Tender Price. Availability of space, proximity to other equipment and arrangement of connections shall be considered.

.8 Assume full responsibility for, and cover all costs involved in modifying the alternate or substitution as required in the opinion of the Architect Consultant to meet the specification. Should the Architect Consultant decide, after the necessary modifications to the "Named Alternate" are considered, that the originally specified equipment must be used, cover all costs of such reversal to original equipment, except for any stated difference in tender price, regardless of whether or not a preliminary approval for the "Named Alternate" or "Contractor's Proposed Alternate" was given earlier.

.9 Assume full responsibility for any failure of the alternate to meet the requirements of the specification. The acceptance of an alternate by the Consultant does not remove or change such responsibility.

.10 Materials not specified herein as to manufacture, quality, etc., shall be supplied of high commercial standard of quality, new and of uniform pattern. Used materials or equipment will not be accepted.

.11 In case materials or equipment specified are unavailable, clearly state in the Tender the alternative material and/or equipment and price used in compiling the Tender.

1.6 DRAWINGS

.1 The drawings accompanying this specification are to be considered as diagrammatic only and do not show all the structural and construction details. Any information involving measurements of the building shall be taken from the

architectural and structural drawings and at the building site. Make without additional charge any necessary changes or additions to the runs to accommodate structural conditions.

.2 The drawings and these specifications shall be considered an integral part of the Contract Documents. Neither the drawings nor the specifications shall be used alone. Misinterpretation of any requirements of either plans or specifications shall not change the requirements or intent of the specifications for proper completion of the work to the full approval of the Consultant.

.3 The drawings indicate the general location and route to be followed by the pipes, ducts, conduits, etc., which are to be installed under this contract. Where the required conduit work, piping, ductwork, etc., is not shown on the plans or only shown diagrammatically, these shall be installed as tight as possible to structural members, concrete, ceilings and walls to interfere as little as possible with the free use of the space through which they pass.

.4 The location of pipes, ducts, outlets and other equipment may be altered by the Consultant without charge to the Owner, provided the change is made before installation and does not necessitate additional material, or in the case of electrical outlets the new location is within 3m of the original location.

.5 Be responsible for the detailed layout of work with respect to the building structure and to other piping, ducts, conduit, etc. If required in certain sections, produce field drawings to show relative positions of various services and have these approved before work is proceeded with.

.6 Consult with the Consultant and obtain detailed drawings and instructions for the exact location of equipment, and before the installation of fixtures and equipment which may interfere with the interior treatment of the building.

.7 The listing hereinafter of any article, material, operation or method requires that each item listed be provided of the quality and subject to the qualifications noted. Perform each operation prescribed according to the conditions stated, providing therefore all necessary labour, equipment and incidentals.

.8 The drawings and specifications are intended to supplement each other so that any details shown on the drawings and not mentioned in the specifications, or vice versa, shall be executed in the same manner as if contained in the specifications and shown on the drawings.

.9 Should any discrepancy appear between these specifications and the drawings to cause doubt as to the true meaning and intent of the drawings and specifications, a ruling shall be obtained from the Consultant before submitting the tender. If this is not done it will be assumed that the more expensive alternative has been included in the contract.

.10 Any error or inconsistency in the drawings or specifications noted after award of contract must be reported to the Consultant before commencing work.

.11 The omission or incorrect mention of work, materials, etc. that are indispensable to the completed work, is not to be interpreted as relieving of the necessity of providing such work, materials, etc. at no expense to the Owner.

.12 The layout of the mechanical systems in the mechanical rooms and roof mounted equipment is necessarily based upon one manufacturer's physical dimensions. In substituting equipment of different physical characteristics, submit shop drawings for approval, indicating the proposed layout and piping connections.

1.7 CODES AND REGULATIONS

.1 The whole of the work specified herein and on the Drawings shall comply strictly with the requirements of all authorities having jurisdiction. The Electrical Safety Code, the Building Code as amended to date, and any additional requirements of the Electrical Utility, Gas Utility, Ontario Water Resources Commission Regulations respecting Plumbing and codes, Fire Marshall regulations and by-laws of other jurisdictional authorities form an integral part of this specification, and are the minimum requirements. Where the drawings or specifications call for piping, equipment, devices, wiring sizes or methods exceeding the minimum requirements of such codes, the drawings and specifications shall be followed. In case of doubt as to the interpretation of the codes, the local Electrical Inspector, Plumbing Inspector, Building Inspector, Fire Inspector, etc. shall be consulted and his decision shall be final.

.2 Before starting any work, submit the required number of copies of the Drawings and Specifications to all authorities and utilities and obtain their approval. The Architect Consultant shall be notified immediately of any changes requested before installation. Any work installed before approval is obtained from the above authorities shall be corrected without charge. Prepare and submit any additional drawings which may be required by Utilities.

1.8 CERTIFICATES AND FEES

.1 Give all necessary notices, obtain and pay for all necessary permits, and inspections required for the work herein specified. Pay all fees for examination of drawings and specifications. Furnish any certificates required as evidence that the work installed conforms with the laws and regulations of all authorities having jurisdiction.

.2 This shall apply to Electrical Safety Inspection, Gas Inspection, Heating Inspection, Plumbing Inspection, Pressure Vessel, Piping and Boiler Inspection, Government, Municipal and Public Utilities and all other such bodies.

.3 On completion of the work obtain final unconditional certificates of approval by all utilities and authorities having jurisdiction. All final certificates of approval shall be delivered to the Consultant before final payment is made.

.4 Arrange and pay for all tests of the work.

1.9 CERTIFICATION OF TESTS

.1 Upon completion of the project, present to the Consultant a signed statement to the effect that all tests have been carefully carried out as required by the specifications and the manufacturer's recommendations and that the equipment and installations have been inspected by all jurisdictional authorities.

1.10 PROTECTION AND CARE OF WORK AND EQUIPMENT

.1 Protect finished and unfinished own work and work of other contractors from damage due to own operations. Cover floors and other parts of the building with tarpaulins, etc. Repair all damage to floor surfaces or other parts of the building resulting from the carrying out of this work.

.2 All material damaged by weather or through negligence shall be removed and replaced with new material.

.3 During freezing weather, protect all material in such a manner that no harm can be done to the installation already made and/or materials and equipment on the job.

.4 Store all material and equipment neatly and out of the way.

.5 Securely plug or cap all open ends of pipes, ducts, conduits and equipment to prevent obstructions during construction.

1.11 WORKSHOP

.1 Provide temporary buildings for field office, workshop, tools and material storage as may be required for own use and be responsible for any loss or damage thereto. Temporary buildings shall be of a type approved by the Architect Consultant and located as directed by him. Temporary buildings shall be removed after completion of work as directed by Architect Consultant.

1.12 TEMPORARY LIGHT, POWER AND WATER

.1 Temporary light, power and water will be provided under Division 1. Provide all necessary extension cords, lamps, hoses, etc. for own use.

1.13 LIABILITY INSURANCE

.1 Maintain such insurance as will fully protect the Owner and the Contractor from any and all claims under the Workmen's Compensation Act and all insurance as noted in the Instructions to Tenderers.

1.14 INSPECTION OF SITE AND EXISTING CONDITIONS

.1 Before submitting tender for this work, examine the site, local services and local

conditions, Electrical Drawings, Mechanical Drawings, Structural Drawings, and Architectural Drawings to ascertain that the work can be satisfactorily carried out as shown on these Drawings and as herein specified. Before commencing work examine the work of the other trades and report at once any defect or interference affecting the work of this section or the guarantee of same. No extra will subsequently be allowed to cover any such error, omission and/or oversight for not having made a thorough inspection of the grounds, existing conditions, drawings, and specifications.

.2 All work is to be carried out in existing operating plant. All coordination, services shutdowns, connections to existing will be kept to minimum with 48 hours prior approval from building owners and plant operators.

1.15 CO-ORDINATION OF WORK

.1 Assume full responsibility for layout of own work so as not to conflict with other trades and also for damage caused to other's work by improper location or carrying out of own work.

.2 Arrange work in co-operation with other trades in such a manner as not to interfere with other work being carried on and co-ordinate layout of work with other trades to get all pipework, wiring, conduits, ductwork, etc., installed to the best advantage.

.3 Assume full responsibility for the prompt installation of wiring, conduits, pipes, ducts, equipment and sleeves in advance of the work of other trades as required.

.4 Where any equipment supplied under this Section must be built in with the work of other Sections such as Masonry, Plastering or Concrete, supply the equipment to be built in, provide templates, anchors, sleeves, bolts and measurements to allow the installation of these in the proper sequence.

.5 Confer and co-operate with all other trades in order to eliminate any unnecessary delay to any work being done under this Contract.

.6 Submit composite drawings of crowded locations where there is possibility of conflict with the work of other trades. Indicate exact locations and elevations of pipes, ducts, conduits, etc., obtained from field measurement.

1.16 CUTTING AND PATCHING

.1 Refer to and be governed by specification Division 1.

.2 Be responsible for all cutting, patching and painting around patched area for Mechanical work and wiring related to mechanical scope of work being installed. Where glazed tile surfaces are being cut, replace tiles to match existing. Use rotary diamond drills for holes through slabs and walls, not pneumatic or hand hammers or other noisy equipment. Keep openings to a minimum required for pipes, ducts and equipment.

.3 Should any cutting and repairing of either unfinished or finished work be required due to failure of this trade to advise of or install equipment or sleeves on time, such cutting and patching shall be carried out by the trade affected and the Mechanical Contractor shall pay all costs of such work.

.4 Unless specified otherwise, each trade shall do all cutting required to accommodate the work of his trade and to fit his work to the work of other trades. Check architectural drawings to ascertain the extent of new architectural work. Keep openings to a minimum required for pipes, ducts and equipment. Saw cut surfaces to a depth of 25mm (1") minimum before using hammers or other percussion tools.

.5 General Contractor will make good and patch surfaces cut by the mechanical trades.

1.17 WORKMANSHIP

.1 Only first class workmanship will be accepted not only regarding the best accepted standard practices, safety, accessibility, durability, etc., but also regarding neatness of detail. Pipes shall be installed true to line and grade. All pipework, conduit, and ducts must be aligned parallel and at right angles to the building walls. Equipment must be accurately set, plumbed and leveled and hanger rods must be aligned vertically. The entire work shall present a neat and clean appearance on completion.

.2 Where possible, pipes, ducts, conduit and wiring are to be concealed in ceiling spaces, furred spaces, pipe spaces, walls, trenches, etc., except they shall be run exposed in the boiler and equipment rooms, or where specifically noted on the drawings. They shall be installed neatly and closely to the building structure so that the necessary furring, etc., is kept as small as possible. Where pipes, ducts, conduits and other equipment are exposed, they shall be installed as close as possible to building structure, ceilings and walls. Provide all offsets for this purpose at own expense, whether shown or not shown on drawings.

.3 Any conduits, pipes, ducts or other work which is not, in the opinion of the Consultant, installed as it should be, shall be taken out and replaced without cost to the Owner.

1.18 CONTRACTORS SHOP DRAWINGS

.1 Submit for review eight copies of detail drawings showing equipment and systems before ordering same and immediately after the award of the contract.

.2 Submit eight copies of typed sheets, catalogue sheets, or illustrations, giving suppliers and catalogue numbers for such items as valves, traps, expansion joints, hangers, switches, types of thermal insulation for all services and any other standard catalogue items.

.3 These will be reviewed by the Consultant and returned. No allowance will be

made later if equipment is condemned at the site because of failure to observe this instruction.

.4 The Consultant reserves the right to reject any material or apparatus which, in his opinion, does not conform with the requirements of the Specifications.

.5 Notify Consultant in writing if shop drawings differ from Architect Consultant's design drawings in any respect. Certify shop drawings that they have been checked and agree with Consultant's drawings and Specifications. Assume all responsibility for errors made on shop drawings or for changes made from Consultant's drawings and specifications, unless such changes were set out in written notification to Consultant.

.6 Review is for the sole purpose of ascertaining conformance with the general design concept. This review shall not indicate approval of the detail design inherent in the shop drawings, responsibility for which shall remain with the Section submitting same, and such review shall not relieve the Section of responsibility for errors or omissions in the shop drawings or of responsibility for meeting all requirements of the Contract Documents. Be responsible for dimensions to be confirmed and correlated at the job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of the work of all other Sections.

1.19 RECORD DRAWINGS

.1 Mark in coloured ink on a set of whiteprints, which will be provided, every change and deviation from runs of piping, ductwork, conduit and other services from where shown on drawings, so that on completion of the job the record drawings shall indicate the exact location of all services as actually installed. Record drawings shall be kept at the site and shall be kept up to date as the work progresses. Submit completed record drawings before final certificate of job acceptance is issued.

.2 Dimension locations of buried drains, pipes, duct, conduit, tanks, pads, manholes etc. to building column centres or other fixed reference points. Also mark in location of all access doors.

.3 In addition to the marked prints and PDF of AS BUILTS, provide an electronic copy of the As Builts on a CD for record and review.

.4 Acceptance of record drawings by the Consultant does not constitute a guarantee by the Consultant of their accuracy, nor does the acceptance by the Consultant remove the Contractor's responsibility for any inaccuracies that may be on the record drawings.

1.20 SAMPLES OF MATERIALS

.1 Samples shall be submitted to the Architect Consultant for his approval before ordering such items as name plates, tags, valves, thermostats, grilles, diffusers,

etc., and other repetitive materials where finish or detail can be better examined by sample. All materials used for the work shall be fully equal to the samples as approved.

1.21 MATERIALS AND EQUIPMENT APPROVALS

.1 All equipment, materials, controls, wiring and wiring devices, etc., supplied shall conform to the CSA, Hydro One or ESA, CGA & ASME requirements for the purposes for which they are to be used, and shall bear a CSA or CGA approval label.

.2 Special equipment which does not have a standard CSA or CGA label shall be inspected by the Special Inspection Department of the Hydro One and the Approval Certificate shall be submitted to the Architect Consultant as soon as possible.

1.22 TEMPORARY AND TRIAL USAGE

.1 It is understood and agreed that the temporary or trial usage by the Owner of any mechanical device, electrical device, machinery, apparatus, equipment or any other work or material supplied under this Section before final completion and written acceptance by the Consultant, is not to be construed as evidence of the acceptance of same by the Owner and it is further understood and agreed that the Owner shall have the privilege of such temporary and trial usage as soon as the Contractor shall claim that the said work is complete and in accordance with the drawings and specifications, and for such reasonable length of time as the Consultant shall deem to be sufficient for making a complete and thorough test of same and that no claim for damage will be made by the Contractor for the injury to, or breaking of any parts of such work which may be so used whether caused by weakness or inaccuracy of structural parts or by defective material or workmanship of any kind whatsoever.

.2 Should the Contractor feel that the equipment is being abused, improperly used or maintained, he shall advise the Consultant immediately. Verbal advice shall be followed up in writing, otherwise subsequent claims for damage will not be considered.

1.23 TEMPORARY HEATING

.1 All temporary heating required while the building is under construction will be provided under Division 1.

.2 The permanent pumps, convectors, unit heaters, etc., may be used for temporary heating, providing this equipment is installed in its permanent location and providing that the building is completely closed in and clean. Approval must be obtained from the Consultant for use of such equipment.

.3 Fans and air systems may not be used for temporary heat except with permission and specific instructions from the Consultant.

.4 Be responsible for the operation, care and maintenance of the permanent heating system when used for temporary heating. At the completion of the job and prior to the final acceptance all permanent heating equipment used for temporary heating shall be thoroughly cleaned and put in first class operating condition and appearance to the approval of the Consultant. All damaged equipment piping, etc., shall be replaced to the approval of the Consultant.

.5 Give all necessary instructions for proper operation of the permanent heating system used for temporary heating.

.6 In the event of construction and alterations to the existing heating system proceeding during the heating season, heating shall be maintained throughout the structure at all times. Provide all temporary piping and wiring, or temporary protective measures, required to maintain heating.

1.24 DATA BOOK

.1 Bind within hard-covered, loose-leaf binders, two complete sets of manufacturer's operating and maintenance instructions showing all major mechanical equipment and systems. Include shop drawings, detail drawings and operating curves. Instructions shall be complete for installation, operation and maintenance. Spare part suppliers, lists and addresses shall be included. Instructions shall be reviewed with the operating personnel to ensure a thorough understanding of the equipment and its operation. Include copy of the Valve Chart.

.2 Provide an Electronic copy of the O & M Manuals on a CD for record.

1.25 SPACE FOR FUTURE EQUIPMENT

.1 Where it is indicated that equipment is to be installed in future, leave adequate space for such future equipment and install the piping, conduits, ducts and other work in such a way that future equipment installations and connections can be made. Consult with the representative of the Consultant whenever necessary for the purpose.

1.26 DIRECTORIES

.1 Prepare diagrams of the major piping systems including chillers, antifreeze systems, compressors, cooling towers, boilers, pumps, air supply units, etc. Prepare diagrams of air supply and exhaust systems identifying the respective fans and locations being supplied and exhausted. Three framed copies of both the water and the air system diagrams shall be delivered to the Consultant.

1.27 CLEAN UP

.1 All material shall be stored neatly and out of the way. Clean up daily all refuse caused by work.

.2 On completion of the work remove from the premises all tools, debris, surplus and waste materials resulting from operations under this Section. Clean all fixtures and equipment and leave all items in perfect order ready for operation.

1.28 GUARANTEE

.1 Before final payment is made, guarantee all materials and workmanship supplied in the performance of this contract, for a period of one year from date of final acceptance by the Consultant and, when called upon, make good without further charge any such defects as may appear within this period. Before final payment is made, test the operation of all equipment installed and regulate all balancing and control equipment, lubricate all mechanical equipment, etc., and demonstrate to the Consultant or his representative that all equipment is operating as intended, without undue noise and vibration. The period of this guarantee shall in no way supplant any other guarantee or warranties of longer period, but shall be binding on all other work not otherwise covered.

1.29 CLAIMS FOR EXTRAS

.1 All claims for extras shall be supported by written authorization and shall be submitted with itemized material and labour costs breakdowns. The format of the breakdown shall follow that of the change document (i.e. that of the notice of change, site instruction, change directive, etc.). Materials shall be priced at cost including any discounts. Labour units shall be based on labour unit tables suitable for the type of work involved. Quotations shall be submitted in a form that each item listed in the change can be clearly identified.

PART 2 PRODUCTS

2.1 THERMOMETERS

.1 Thermometers shall be Trerice BX or BX9 Series, 200mm (8") scale with brass separable sockets. Sockets to have extension necks for pipes with insulation. For air ducts use perforated stems.

.2 Thermometers shall be Trerice, Taylor or Weksler.

2.2 PRESSURE GAUGES

.1 Pressure gauges shall be 115mm diameter Trerice No. 600. Pressure gauges shall be complete with 2.0 MPa isolating valve and shall suit fluid pressure measured. Steam gauges shall be complete with syphons. Gauges installed in pump suction and discharge pipes shall have Impulse Dampeners, Trerice No. 870 or approved equal.

.2 Pressure gauges shall be Trerice, Ashcroft, Winters, U.S. Gauge.

2.3 FILTER GAUGES

.1 Filter gauges shall be magnehelic gauges. Filter gauges shall have sufficient range for all types of filters and sufficient tubing for a proper installation.

.2 Filter gauges shall be Magnehelic or approved equal Developments.

2.4 STRAINERS

.1 Pipe strainers shall be Y-type and basket type strainers as shown and shall be selected for 100% of pump capacity.

.2 Screen perforations and working pressure shall be suitable for the systems in which they are installed.

.3 Strainers shall have monel screens and shall be reinforced when installed on pump sections.

.4 Y-type strainers shall be self-cleaning and installed with 25mm (1") hose end valve on blow-off connection.

.5 Strainers up to 50mm (2") shall be screwed and for sizes 60mm (2 1/4") and over shall be flanged.

.6 All strainers connected to steel pipe and to copper pipe 60mm (2 1/4") and larger shall have cast iron bodies. All strainers connected to copper pipe 50mm (2") and smaller shall have bronze bodies.

.7 Strainers shall be Sarco, Armstrong, Bell & Gossett, Taco or Atlas.

2.5 AIR VENTS

.1 Automatic air vents shall be Sarco Type 13 WN air trap.

2.6 PIPE SUPPORTS

.1 Use Myatt Fig. No. 124 or Grinnell Fig. No. 260 clevis hangers. For cold insulated piping hanger shall be sized for the O.D. of the insulation and shall be provided with a protection shield, Myatt Fig. No. 251 or Grinnell Fig. No. 167. For insulated hot piping the lower strap of the hanger shall be longer to place the horizontal rod outside the insulation - Myatt Fig. No. 124L or Grinnell Fig. No. 300.

.2 Where hanger rods are too short to accommodate the axial movement due to thermal expansion, use Myatt Fig. No. 258 or Grinnell Fig. No. 174 hangers for pipes up to and including 125mm (5") size and Myatt Fig. No. 261 or Grinnell Fig. No. 171 for larger pipes. Include protection shields specified previously for cold insulated pipes. Include pipe covering protection saddles Myatt Fig. No. 210-240 or Grinnell Fig. No. 160-165 for hot insulated pipes. Use similar heavy duty and extra heavy duty hangers where loads imposed exceed the capacity of the previously specified hangers, e.g. Myatt Fig. No. 125.

.3 Vertical piping shall be supported using wrought iron pipe clamps, anchored to the concrete slab, Myatt Fig. No. 182 or Grinnell Fig. No. 261. For cast iron pipe, locate hub at clamp.

.4 Provide special supports, racks, platforms, guides, stands, floor supports where such are indicated on drawings. Construct such supports in accordance with details provided.

2.7 PLATES AND ESCUTCHEONS

.1 Provide chrome or nickel plated floor plates where exposed pipes pass through the finished floors. These shall be split type of similar design to #1-BC or #10-BC shown on Page 1169 of Cat. 61 Crane Company or Grinnell Fig. 10. Where exposed pipes pass through ceilings and walls provide similar plates, but with set screws to hold them in position.

.2 Escutcheons shall be chrome or nickel plated brass with set screws and shall be provided where exposed and uninsulated piping passes through the floors, walls or partitions, e.g. fixture supplies, waste pipes. Clip type escutcheons will not be accepted.

2.8 ACCESS DOORS

.1 Doors in ceilings of lobby and presentation areas, corridors and visible areas shall be Acudor 5015, 5/8 “ drywall recess or equal Type 1-Recessed panel with drywall , hinged and screwdriver locks and finished to match the Architectural finishes, drywall, panels etc. and installed flush in most in-conspicuous manner. In other areas the access doors shall be Type 2 LeHage to suit construction, or Ormsby Kane, or Dillon, flush type with recessed hinges. Access doors in fire rated ceilings and/or walls shall match fire rating of ceilings and/or walls and shall be ULC approved. All access doors shall be equipped with screwdriver locks.

.2 Contractor shall coordinate to reroute piping, ducts and locate all devices in closed proximity for access through one access door to minimize ceiling access points. Provide a detailed drawing showing access door location for approval by architect prior to piping, ducts, valves, dampers and control devices.

.3 Access doors shall be minimum size 300mm x 300mm under vanities, concealed areas with limited devices reachable from the smaller access door and 600mm x 600mm where it is necessary for persons to enter to access multiple devices and valves etc. and shall be adequately sized to properly service and maintain the equipment they serve.

2.9 MOTORS

.1 Unless otherwise specified for a particular application, motors up to and including 350 W shall be 120 Volt, 60 cycle, single phase, 1200 or 1800 RPM.

.2 Motors larger than 350 W shall be 600 Volt, 60 cycle, three phase, 1200 or 1800 RPM. Unless specifically noted otherwise, motors with speed of 3600 RPM will not be accepted. Unless specifically noted otherwise, motors shall have open, drip proof fully guarded enclosures.

.3 Motors shall be Leland Electric, Westinghouse, Lincoln Electric, and Canadian General Electric. Motors shall be suited for application and VFD drives in mechanical equipment.

2.10 STARTERS AND CONTROLS

.1 Unless modified in other sections of these specifications or by details or control diagrams, motor starters, control and disconnect switches shall comply with the following requirements.

.2 Each motor shall be provided with a starter and all specified and required protective devices of suitable type and rating and adequate for the condition of application and in full accordance with Canadian and Ontario Electric Codes and Local requirements.

.3 Starters shall be rated for safe making and interrupting of motor currents and shall be equipped with overload relays to make or break simultaneously each ungrounded line to the motor.

.4 Magnetic starters shall be used throughout this project, except that manual starters, with relays where required, may be used for single phase motors.

.5 All manual starters shall have red or neon pilot lights.

.6 Magnetic starters shall be equipped with:

.i Red or neon pilot light.

.ii Maintained contact on-off selector switch unless otherwise specified hereinafter.

.iii Momentary contact start-stop pushbutton if starter is controlled by one or more remotely located start-stop stations.

.iv Hand-Off-Auto selector switch if starter is controlled by two wire automatic devices such as thermostats, pressure switches, float switches, etc. On all combination magnetic starters the 'test' position shall be spring return.

.v Auxiliary contacts - as required for the specified interlocks and control.

.vi Control Transformer - for remote control devices and stations of secondary voltage as required or specified.

.vii Fused Control circuit.

.viii Overload relays.

.ix Reset Button.

.7 Unless otherwise specified all magnetic starters shall be combination circuit breaker type.

.8 In all cases where magnetic starters are located in equipment manufacturer's cabinets or panels, each motor shall have a separate disconnect and a separate set of fuses. The panel shall have a main disconnect switch.

.9 Single phase 120V starters shall be equipped with one thermal overload device and three phase starters shall be equipped with three thermal overload devices. Thermal overload devices shall be manual reset type. Overload devices shall have current rating as recommended by the motor manufacturer for the particular application.

.10 Starter and control enclosures shall be suitable for mounting in the particular location in which they are to be installed. In dry and non-hazardous locations they shall be Nema Type I. Provide all required frames and supports as may be necessary for their proper installation, and as approved by the Architect Consultant.

.11 Selector switches, pilot lights, stop-lock-off, start-stop, up-stop-down, and similar controls shall be oil tight heavy duty type.

.12 Selector switches, pushbutton stations, pilot lights, manual single phase starters, etc., located in finished areas or control panels shall be suitable for flush mounting and shall have brushed stainless steel cover plates.

.13 Starters for motors of 40 HP or larger shall be combination circuit protector type, solid state, rugged modular reduced voltage type. Logic modules to be plug-in type. Standard features to include adjustable current limit 15% to 425% of MFLC, solid state overload relay with test, phase loss protection, adjustable voltage ramp. Energy saving and adjustable voltage modules, shorted SCR protection, thermally protected SCRA, easily replaceable power poles, LED diagnostics, isolated alarm contacts, up-to-speed contacts, two Form "C" NO/NC 120V auxiliary interlock contacts, 120V/60 Hz control voltage, fused control circuit transformer, shunt trip cutout contact for motor circuit protector auxiliary relays and timers, door mounted control devices, fan cooling mounted in vented EEMAC 1 enclosure forming a unit of a freestanding motor control centre.

.14 All starters shall be Square D, Klockner-Moeller (NEMA), Cutler Hammer or Allen Bradley.

2.11 FIRE STOP AND SMOKE SEAL MATERIALS

.1 Asbestos-free materials and systems capable of maintaining an effective barrier against flame, smoke and gases in compliance with requirements of ULC-S115.

.i Fire stopping and smoke seals at openings around penetrations for cable pipes, ductwork, and other items requiring sound and vibration control to have elastomeric seal.

.ii Fire stopping and smoke seals material packaging to display testing authority's Labels.

.2 Fire stop and smoke seal material ratings:

.i F rating for walls

.ii FT rating for floors

.3 Fire stop and smoke seal materials to be:

.i Standard of Acceptance:

.a Hilti
.b Johns-Manville Firetemp
.c 3M Fire Stop and Fire Barrier
.d AD Fire Protection Systems

PART 3 EXECUTION

3.1 PIPE EXPANSION AND ANCHORS

.1 Provide for expansion and contraction of pipe work. Erect all pipes so that strain and weight does not come upon cast connections or apparatus. Provide bends, loops, swing joints and expansion joints.

.2 Anchor piping at all points shall be installed at 100 feet intervals and expansion compensators with guides etc. as per mfg. recommendations as shown or as required and where necessary, using substantial structural steel angles, channels, or plates, well secured to the building structure. Strength of anchor in shear and bending is to be approximately equal to strength of pipe being anchored.

.3 Provide pipe roll or structural steel guides, two sets on each side of loop, joint or compensator, spaced at 14 pipe diameters or less and no more than 4 pipe diameters to first guide. Provide all required additional steel to span building structure for this purpose. Guides may be omitted on one side where anchor occurs within 10m.

3.2 INSTALLATION OF THERMOMETERS

.1 Supply and install straight or angle pattern type thermometers where shown on the Drawings, where required and all other locations specified herein. In general,

thermometers shall be installed in piping as follows:

.i On entering and leaving sides of water chillers and heat exchangers.

.ii On entering and leaving sides of all main chilled water coils.

.iii On leaving sides and return sides of all three-way mixing valves. This applies to both the heating and the cooling systems.

.iv Chilled water supply and return mains.

.v On entering sides of Glycol Loops and terminal pumps.

.vi Where further indicated on the Drawings.

3.3 INSTALLATION OF PRESSURE GAUGES

.1 In general, pressure gauges shall be located as follows:

.i On suction and discharge of all circulating pumps.

.ii On entering and leaving sides of all chillers and heat exchanger glycol and water piping.

.iii On entering and leaving sides of all chilled water coils.

.iv On all expansion tanks.

.v On low and high pressure sides of all pressure reducing valves.

.vi Where further indicated on the Drawings.

.vii Several special gauges shall be located as shown and further outlined in this Specification.

3.4 GAUGE GLASSES

.1 Provide gauge glasses on all tanks as required, shown and further specified.

.2 Gauge glasses shall be approved fail-safe type complete with shut-off valves and ball checks. Gauge glasses shall cover the full height of the tank.

.3 Where tank height exceeds maximum length of one glass (45cm) provide additional gauges and stagger location of gauges. Provide white enameled brass back plates behind gauge glasses.

3.5 INSTALLATION OF STRAINERS

.1 Provide strainers where shown on the Drawings and in the following locations

whether shown or not:

.i Suction sides of all pumps

.ii Ahead of all pressure reducing valves.

.2 In addition supply and install around the by-pass for circulating pump as shown an approved fine mesh strainer and 25 micron filter to handle approximately 5% of the pump capacity.

3.6 INSTALLATION OF AIR VENTS

.1 Supply and install automatic air vents at all high points or pockets in the piping to remove air from the heating and cooling systems. A 13mm (1/2") discharge from all automatic air vents or traps shall be piped to the nearest open drain to catch any trap discharge, arranging the discharge so it is readily accessible and visible. All air vents shall be installed in concealed accessible locations.

.2 Provide a shut-off valve at each air vent.

3.7 HEADERS

.1 Supply and install and completely pipe up headers for hot water heating system, chilled water system, etc., as shown on the drawings. Valves, drains, etc., shall be as shown on the Drawings and/or as required.

3.8 CONCRETE WORK

.1 All equipment supports and bases above floor required for mechanical work shall be provided as part of the work of the Mechanical Contractor.

3.9 SUPPORTS AND BASES

.1 Provide concrete foundations and bases and steel supports, stands and platforms required for the proper installation of the equipment and work of this Division. Concrete shall be 20 MPa mix and formwork shall be plywood finish.

.2 Hire the trade involved and pay all expenses.

.3 Supports and bases shall be as shown on drawings, as specified, as recommended by manufacturer, as required and as approved by the Architect Consultant. Equipment such as tanks, pumps, fans, softeners, heat exchangers, meters, boilers, compressors, transformers, switches, panels, shall be supported on concrete bases and independently from the piping and conduits and ducts so that no undue strain is placed on the equipment.

.4 Supply all necessary templates, anchor bolts, inserts and location drawings for the equipment supplied, and supervise the work of installation of the bases. Support bases above the floor shall be at least 50mm (2") larger all around than the base of the apparatus, with chamfered corners and finished to a smooth neat

surface. Unless shown otherwise on drawings, bases shall be 150mm (6") above the floor and shall be dowelled to the concrete floor with not less than four 13mm (1/2") dia. steel rods fastened to the reinforcing bars of the floor before pouring.

.5 Heating coils and cooling coils in air supply units shall be supported on bases of concrete or structural steel, supplied and installed under this Division.

.6 Wherever equipment is required to be suspended above floor level and details are not shown on the drawings, it shall be mounted on a platform bracketed from the wall. At locations where wall thickness is inadequate in the opinion of the Architect Consultant to permit such brackets, supports shall be carried to either the ceiling or the floor, or both, as required. Shop drawing details of such supports shall be submitted to the Architect Consultant for approval.

.7 Equipment stands shall be constructed of structural steel members or steel pipe and fittings which shall be braced and fastened with flanges bolted to the floor. Where saddles are indicated or required, provide welded steel or cast iron saddles, of the curvature to suit vessel being supported.

3.10 INSERTS AND FASTENINGS

.1 Supply and install all inserts and fastenings required for support of equipment and hangers provided under this Division. Use beam clamps attached onto structural steel and/or inserts set in concrete.

.2 Inserts shall be of the Midwest, Truscon manufacture and shall be firmly secured to the forms before the concrete is poured. Be responsible for correct location of inserts.

.3 Where supports are required under the roof slab and in other areas where structural bearings of sufficient strength do not exist, provide angle or channel iron supports, properly sized to support the load from the structural framework using beam clamps. Where the wall, partition, floor or roof does not permit the support of heavy equipment, carry suitable support to building structure.

.4 Percussion type fastenings of any kind will not be permitted unless prior approval in writing is obtained from the Architect Consultant.

.5 Bolts and anchors at metallic waterproofed surfaces shall be supplied under this Section but installed under the Waterproofing Section. Refer to architectural drawings for such areas.

.6 Brackets may be attached to masonry walls using expansion shields in shear, but walls must not be punched through and before drilling is started, approval must be obtained from the Architect Consultant.

3.11 SLEEVES

.1 Supply and set all necessary sleeves and be responsible for the exact location of all sleeves. Sleeves shall be of steel pipe for piping passing through masonry

walls and 1.3mm galvanized iron for piping passing through concrete walls or floors. Sleeves for bare copper piping shall be lined with copper or lead. Sleeves shall be sized to permit insulation to pass through unbroken. Seal around pipes passing through sleeves with fire resistive non-hardening mastic (concrete not acceptable) to control transmission of sound and noise, and to provide the full fire rating of the wall or floor. Unused sleeves shall be similarly sealed or filled with concrete. Use individual sleeves for each pipe.

.2 Where ducts enter through equipment room floor provide 100mm (4") wide x 100mm (4") high concrete curb to stop water. Pipe sleeves through equipment room floor shall be Schedule 40 steel pipe with machine cut ends, with top end at 100mm (4") above finished floor.

3.12 INSTALLATION OF PIPE HANGERS

.1 Supply and install pipe hangers and their supports for all piping.

.2 Piping and conduits shall be securely supported from hangers or supports, in a manner to ensure that building construction is not weakened or overstressed; that pipes are secure, vibration free, free to expand and contract, and properly graded; and that vertical adjustment of horizontal piping is possible after erection.

.3 Cast iron pipe with MJ joints shall have two hangers for each length of pipe.

.4 Pipe supports for all other piping shall be spaced at the following intervals, using round steel rod supports of the diameter indicated:

Pipe Diameter	Horizontal Spacing of Supports	Rod Diameter
Up to 20 mm	1.8 m	10 mm
25 mm to 30 mm	2.0 m	10 mm
40 mm to 50 mm	2.5 m	10 mm
60 mm	3.0 m	12 mm
75 mm to 125 mm	4.0 m	16 mm
150 mm to 200 mm	4.8 m	22 mm
250 mm and over	5.8 m	22 mm min.

Pipe Diameter	Horizontal Spacing of Supports	Rod Diameter
Up to 3/4"	6'-0"	1/4"

1" to 1 1/4"	6'-6"	1/4"
1 1/2" to 2"	8'-0"	1/4"
2 1/2" 3" to 5" 6" to 8"	9'-0" 12'-0" 16'-0"	1/2" 5/8" 7/8"
10" and over	19'-0"	7/8" min.

.5 Rod diameter for larger pipes to suit weight being supported in accordance with manufacturer's recommendations.

.6 For plumbing piping, horizontal spacing of supports shall not exceed 2.5m (8'-0") for pipes 25mm (1") and larger in accordance with the Plumbing Code.

.7 Hanger rods must be vertical, without bends, or offsets, and workmanship must be such that finished piping is true both with respect to line and grade. They must be complete with adjusting and stopping nut locks. Each hanger is to be supported independently from the structure, i.e. piping shall not be hung from other piping or equipment.

.8 No perforated or flat iron hangers shall be used.

.9 Where hangers are installed under and in direct contact with pipes, packing of approved inert material shall be crimped around the hanger to prevent electrolysis and abrasion. Copper clad hangers will not be accepted.

.10 Upper attachment of hanger rod shall allow rod to pivot without bending of the rod.

3.13 COUPLING AND BELT GUARDS

.1 Provide all belt driven equipment with belt guards with tachometer openings at both the driven and drive shafts. Belt guards shall be open mesh expanded metal type.

.2 Provide coupling guards for pumps with exposed couplings.

.3 Belt guards and coupling guards shall be fastened by bolts or wing nuts, so that they may be easily removed for servicing of equipment.

3.14 DISSIMILAR METALS

.1 Separate dissimilar metals from direct contact with each other. Install all necessary gaskets, and dielectric couplings. All metal screws, clamps, and

fastenings shall be of the same metal and finish as the material supported.

3.15 INSTALLATION OF ACCESS DOORS

.1 Provide access doors to all valves, cleanouts, electrical outlets, dampers, fire dampers, equipment, controls, plumbing devices and other apparatus requiring access where these are built in or concealed behind furring, walls or ceiling. There shall be two types of doors: Type 1 shall be suited for drywall ceilings in public and visible area and shall be recessed type approved equal to Acudor 5015 recessed and hinged at one end and a screw operated latch at the other and will receive 5/8“ thick drywall to be flush with the rest of the drywall ceiling. Type 2 shall be metal hinged and screw operated latch to be used in non-public areas and under hidden surfaces.

.2 There shall be minimum 300x300 size access door inside the vanity of each washroom to control all washroom water services. Minimum 450 x 450 access doors in all of ground floor and 9th floor drywall corridor ceiling across each suite (apartment) to suit all heating, cooling, main water (DCW, DHW, GHW/ GCHW and other services) at one location. Multiple access doors for any suite or multiple access doors in the same finished areas shall not be permitted.

.3 Access doors shall be supplied under this Division but installed by the trade providing wall or ceiling. Correct location of access doors is the responsibility of this Division. Frame and cover shall have a prime coat finish. Access doors provided in glazed tile walls shall suit the tile pattern. Refer to architectural drawings for room finish schedules.

.4 Provide a floor plan showing location of all access doors and high light where it is necessary to have a number of access doors installed in the same area of a ceiling or wall, submit to the Architect Consultant the location of these access doors for his approval.

.5 Access doors in removable lay-in T-bar acoustic tile ceilings will not be required. Mark the location of the removable ceiling tiles with approved coloured marking devices in the four corners of the tiles to indicate by their colour the nature of the item behind. Colour for different services to be later determined by the Architect Consultant. Refer to architectural drawings for the areas having such ceilings.

.6 Provide two sets of record drawings showing the location of all access panels with cross reference to their function.

3.16 ELECTRICAL WORK FOR MECHANICAL EQUIPMENT

.1 Mechanical Division shall supply electrical motors, starters, controls, relays, thermostats, float switches, pressure switches, flow switches, pilot lights, remote control stations, safety devices, aquastats, control transformers, disconnects for control circuits, and interlocks.

.2 This Division shall mount the above equipment, except for line voltage wall

thermostats and starters, which will be mounted by Electrical Division.

.3 Electrical Division will supply and mount isolation disconnect switches where required for safe servicing of motors, as well as disconnects at electrical panels of all factory assembled package equipment, e.g. rooftop units, condensing units, air conditioning units.

.4 In the case of roof mounted exhaust fans, safety isolation switches shall be factory mounted within the fan, complete with wiring from switch to motor.

.5 Division 26 will provide all power wiring as defined herein.

.6 Mechanical Division shall provide all control and interlock wiring including connection to equipment and to source of supply.

.7 Power wiring is defined as all single or three phase wiring carrying the full current of the mechanical equipment, including wiring of full equipment current carrying line voltage controls and isolation disconnects in line between the source and the mechanical equipment, and connection to the equipment.

.8 Control and interlock wiring is defined as all mechanical equipment wiring other than power wiring outlined above.

.9 This Division shall provide detailed wiring diagrams for each motor.

.10 This Division, unless specifically indicated otherwise, shall provide all damper motor power and control wiring.

.11 To obtain line voltage supply for motorized dampers, motorized valves or other controls, provide wiring to the nearest lighting or power panel, including connection to same, unless shown otherwise on the drawings.

.12 Where low voltage supply source is required, obtain line voltage supply as described previously and also provide control transformers of necessary voltage and wattage to suit the low voltage equipment and controls.

.13 This Division, unless specifically indicated otherwise, will provide all wiring for damper motor power and control from nearest lighting panel except where the drawings indicate power outlets by the Electrical Contractor. For these instances the Mechanical Contractor will wire from the outlet to the damper motor.

3.17 INSTALLATION OF STARTERS AND CONTROLS

.1 Unless otherwise specified, all controls, interlocks, start-stop stations, and control wiring shall be 120 volts or lower, except if contained entirely within starter. Such lower voltage shall be obtained from transformers of adequate rating mounted within the starter. Transformers shall be oversized where circuits carry external loads in addition to the holding coil of the starter. Where groups of motors are interlocked so as to function in a coordinated manner as in the case of an air

conditioning system, all control circuit wiring shall be in accordance with manufacturer's recommendations.

.2 Starter containing wiring powered by another starter (or source) shall have double voltage relays, mylar covered interlocks, or other such provisions permitted by applicable codes and regulations.

.3 Each motor shall have a disconnecting means. The disconnecting means shall consist of a disconnect switch of suitable rating designed to break all ungrounded conductors of the motor under full load. The disconnecting means shall be located within 10m and within sight of the motor and the machinery driven by the motor.

.4 This Division shall provide detailed control wiring schematic diagrams for each motor.

.5 Where motor control centres are shown on the drawing or where the number of starters grouped in one area warrants the use of motor control centres, these shall be as specified under 'Motor Control Centres' in this specification.

3.18 WIRING

.1 Wiring shall be in conformity with Ontario Electric Code and local regulations and motor manufacturer's recommendations and Division 26.

.2 The following are minimum requirements and are not intended to override any minimum requirements or those shown in the electrical specifications:

Power Wiring #12 Gauge
Control Wiring #14 Gauge

.3 In wet locations use wire type RW90 or TWH. In warm locations such as boiler rooms, kitchens and mechanical rooms, use wire type RW90. Wiring to or near heat producing equipment shall be fireproof type.

3.19 IDENTIFICATION OF EQUIPMENT

.1 Clearly mark all exposed ducts, pipes, pullboxes, junction boxes, etc., to indicate the nature of the service.

.2 All starters shall be identified with black plastic laminated (Lamacoid) nameplates with white engraving, secured with screws.

.3 Surface mounted equipment shall have the nameplates mounted on exterior face of door or cover. Flush mounted equipment shall have the nameplates mounted at the top of the inside face of the door or cover.

.4 Every valve on the job except on radiation, unit heaters and fixture stops shall be provided with a 30mm (1 1/8") diameter brass tag secured with split rings or

brass 'S' hooks. The number on the tags shall be factory engraved in black ink. Prepare two framed and glazed valve diagrams showing the service, location and purpose of each valve so tagged.

.5 Identify all fans, pumps, remote controls and all other equipment as to service by a black lamacoid engraved nameplate with white core, firmly affixed with screws to each unit. Submit sample plate and lettering for Architect Consultant's approval. All apparatus, including electrical motors, shall have a proper nameplate affixed thereto, showing the size, name of equipment, service, serial number, and all information usually provided which shall include voltage, cycle, phase and horsepower of motors and the name of the manufacturer and his address. All stamped, etched or engraved lettering on plates shall be perfectly legible to the satisfaction of the Architect Consultant. Nameplates shall not be painted over, and where apparatus is to be insulated, nameplates shall be firmly attached with rigid insulation back-up, of equal thickness of that of jacket.

3.20 PAINTING

.1 Unless specifically noted otherwise after all equipment is installed and piping completed, thoroughly clean off rust and oil on all exposed iron and steel work of every description, including hangers, pipe, conduits, panels, etc., installed in mechanical equipment rooms, fan room, corridors, tunnels, etc., and then paint same with one coat of chrome oxide phenolic base primer and one coat of l00% Alkyd base enamel of approved colour. This shall apply regardless of whether the material comes on the job painted or not. Unless specifically noted otherwise, equipment which is specified with factory finish will not be painted. Where galvanized items are exposed in areas mentioned above, said items shall be coated with a galvanized primer and one coat of l00% Alkyd base enamel of approved colour. Where steam and return pipe and fittings are not insulated, these hot surfaces shall have primer and type of paint as recommended by paint manufacturer.

.2 All new exposed insulation and covering shall be painted with two coats of 100% Alkyd base enamel of approved colour.

.3 After piping, etc. has been painted, paint on all pipes neatly stenciled letters about 25mm (1") high designating the pipe service and arrows showing direction of flow. The wording shall be as later directed by the Architect Consultant. The stenciling shall occur at approximately 3m intervals and where pipes pass through walls, pipe shall be stenciled on both sides of the wall. All exposed pipes and pipes in pipe spaces near access doors shall be identified in this manner.

.4 Approved colour coding with plastic bands may be used in lieu of stenciling described above.

3.21 EXCAVATION AND BACKFILLING

.1 Do all necessary excavating and backfilling required in connection with this work.

This applies to both inside and outside the building unless otherwise noted.

.2 All construction work shall be subject to the Occupational Health and Safety Act, 1978 and Regulations for Construction Projects passed by the Ontario Legislature and any amendments thereto.

.3 In addition, all excavation and backfilling shall be in accordance with General specification Division.

.4 Excavations shall be kept dry at all times by bailing, pumping or other means as may be required. Sides and bottoms shall be kept from freezing.

.5 Bottoms of excavation for pipes shall be graded as required and bedding for piping shall be provided. Where not shown or detailed on drawings, bottoms of excavations shall be shaped to fit the lower 1/3 segment of any pipes and sockets, care being taken to ensure even bearing along the barrels. No portion of pipe shall bear directly against any rock or other hard surface.

.6 Banks of excavations shall be evenly cut and/or trimmed and they shall be shored as required to prevent caving in, and the material used shall be carefully withdrawn during backfilling. Lumber left in place without approval will not be paid for by the Owners.

.7 Width of excavation shall be carefully controlled from the crown of the pipe to the invert, and shall be limited to twice the O.D. of pipe at crown and as further indicated on drawings.

.8 Do not disturb or damage any existing underground services. Make good any damage. Existing underground services are indicated approximately on the Architectural, Mechanical and Electrical Site Plans. Location of such services has been determined from available information and has not been verified in the field. Carefully check such locations, perform all necessary exploratory excavation and report any serious discrepancy before proceeding with any new work. Engage the services of local Public Utilities Commission, Hydro, Telephone and Gas Utilities to accurately determine location of any underground services.

.9 Excavating, pipe-laying, testing and backfilling shall be executed in limited length to enable all protective measures to function efficiently at all times. Not more than 100m of trench shall be open in advance of the completed buried service.

.10 Any rocks and boulders encountered shall be removed. Rocks and boulders removed from the excavation shall be broken up as required, to permit handling. Any rock encountered shall be removed by drilling and wedging as no blasting will be allowed.

.11 Where any excavating is necessary in close proximity to and below any footing level, backfilling shall be done with 10MPa concrete furnished under this section to the level of the top of highest adjacent footing.

.12 In the vicinity of manholes and catch basins backfill under pipes with 10MPa concrete, from virgin soil to springline of pipe. This shall be carried to a distance from manhole to a point where firm support of pipe by virgin soil is available. Backfill similarly with concrete at points where pipes cross other pipes or electrical services.

.13 Should the excavation by negligence or error, be carried to greater depth than shown or authorized, such extra excavation shall be replaced with well-compacted clean crushed limestone or 10MPa concrete at the expense of this Section, as required to give a bearing value equal to that provided by adjacent soil.

.14 A concrete pad, properly reinforced, or masonry piers, shall be provided by this Section under piping in earth stratum when a solid undisturbed earth bed is not obtainable, all as described in the Ontario Water Resources Commission Plumbing Code.

.15 Where piping enters or leaves the building and crosses excavation for footings, use extra heavy piping and either excavate to solid undisturbed soil and backfill with 10MPa concrete from such soil to the pipe, or support piping on a reinforced concrete pad, resting at both ends on solid undisturbed earth or a check in concrete foundation wall, all as shown on Detail Drawing D-101 attached. Cost of such pad shall be borne by this Section.

.16 Any concrete support shall be shaped to provide a minimum bearing for the lower 1/3 segment of the pipe.

.17 Trenching for drains in the building shall not be commenced until fill has consolidated and Architect Consultant's approval is obtained. Backfilling shall not be commenced until installation is inspected and approved, the testing is completed and the Architect Consultant's approval has been obtained.

.18 Backfill from bottom of trench, around pipe and to 600mm (24") above pipe shall be clean sand, compacted mechanically in 150mm (6") layers to 95% Modified Proctor Density. Take particular care to tamp thoroughly under and at sides of pipe.

.19 Exterior backfill above 600mm (24") above pipes in areas to have concrete walks or asphalt paving shall be D.H.O. granular Class B compacted in maximum 150mm (6") layers by mechanical compactors to achieve 95% Modified Proctor Density.

.20 Exterior backfill above 600mm (24") above pipes in areas to receive sod or seed shall be clean fill, free from organic material and debris, placed in maximum 300mm (12") layers and compacted to achieve 90% dry density as determined by the Standard AASHO test.

.21 Frozen earth shall not be used for backfilling, nor shall any backfilling be placed on or against frozen ground.

.22 All interior backfill of pipe trenches under building floor shall be clean sand compacted mechanically in 150mm (6") layers to 95% Modified Proctor density.

.23 If settlement occurs, it shall be made up as soon as possible, so that traffic near the work will not be inconvenienced. After a period adequate to reveal settlement has passed, fill all depressions to restore the correct grade. Be responsible for making good any subsequent settlement of fill and pay all costs involved in making good paving, curbs and all other surfaces damaged by such settlement and subsequent restorations.

.24 Excavated materials shall be piled, stored and/or disposed of during the progress of construction in such places and in such a manner that a minimum of damage or disfigurement of existing ground will result. On completion of the work remove any excess from site and/or dispose of as arranged or directed by the Consultant. The site shall be left clear and unencumbered to the Consultant's satisfaction.

3.22 TESTING AND BALANCING

.1 All water piping shall be tested to a pressure of at least 1000kPa (335 ft).

.2 Piping connected to the fan-coil and chilled water system shall be tested at 2500kPa (840ft.).

.3 All drains shall be tested for tightness and grade as required by the Ontario Water Resources Commission Act respecting Plumbing revised to date, and local authorities.

.4 Make tests before application of pipe covering and before pipes are concealed behind furring.

.5 Make any tests required by the Consultant during the progress of the work or at its completion. Provide all necessary labour and equipment for such tests. Such tests shall be carried out solely for the purposes of determining if the work as actually installed meets specified requirements.

.6 All tests must last at least 2 hours and if leaks develop, these must be corrected and the test repeated to the satisfaction of the Owner and the local authorities.

.7 Caulking of threaded joints shall not be permitted; faulty piping shall be replaced with new pipe and fittings.

.8 Notify the local Plumbing Inspector of all tests and conduct same to their satisfaction and in the presence of their representatives.

.9 Provide all labour and equipment for tests and conduct same. Repeat tests until system is shown to be leak-tight and in proper working condition, all to the satisfaction of all Inspectors having authority.

.10 All piping shall be completely flushed out. After the cleanout period, the systems

shall be drained, each strainer cleaned out and the systems refilled. Boiling out of systems shall be carried out as specified elsewhere.

.11 All high pressure steam piping shall be tested in accordance with the requirements of all jurisdictional authorities including local or Provincial authorities.

.12 All necessary adjustments to the automatic temperature control systems shall be made and the controls left in first class operating condition.

.13 Supply lubricating oils, packing, etc., for proper operation of the systems. The final tests and acceptance will not be made until the work is finally completed.

.14 After the job is completed, keep one skilled mechanic on the job to operate it for two days and instruct permanent operators of the plant in the method of operation, one day during the heating season and one day during the cooling season. Refer to further testing as outlined under further divisions of these specifications.

3.23 AIR BALANCING

.1 The air balancing must be carried out by a firm specializing in such work. The firm shall be an independent testing company with at least 5 years of proven experience in the balancing of air systems and shall have completed not less than 5 jobs of comparable size and complexity.

.2 Air systems shall be balanced with clean filters in place and so that the fans operate at as low a static pressure as possible.

.3 Static pressure dampers shall be installed where static pressure must be reduced for control of either pressure or noise.

.4 Fan speeds and dampers shall be adjusted until air quantities within 5% of those shown on drawings for each outlet, minimum noise level and minimum static at fan are obtained.

.5 Adjust each outlet by anemometer, velometer, pitot tube, or anemotherm readings to provide proper air quantities. Adjust each supply outlet to provide proper throw and distribution in accordance with space and occupancy requirements.

.6 Upon completion of the air balance and submittal of the air balance report, provide, if called for, a spot check on the system with the Consultant's representative. If actual air quantities do not agree with the air balancing report data, completely rebalance the system until satisfactory to the Consultant.

.7 Furnish all necessary equipment including gauges, pitot tubes, anemometers, velometers, etc., required for the testing and air balance, of quality and capacity to ensure proper accuracy. The Consultant may require proof of calibration of instruments.

.8 Upon completion of the balancing, supply the Consultant with three complete sets of final balancing report showing actual air quantities at each outlet.

.9 The report shall include the following information:

.i Diffusers, grilles, registers, floor outlets: System, room no., outlet designation and required air volume as per drawings, test air volume, test air velocity.

.ii Air supply systems: Provide design and test information including fan number, fan make, total fan air volume, minimum outside air volume, return air volume, total pressure, total static pressure, suction static pressure, discharge static pressure, fan RPM, motor make, size, motor nameplate information, rated amperage, actual amperage.

.iii Exhaust systems: Provide information including fan number, size and model, motor size, motor nameplate information, rated amperage, actual amperage, fan RPM, total pressure, static pressure, suction static pressure, air volume.

3.24 WATER BALANCING

.1 Completely balance all water and control systems to conform to specified quantities and to the intent of the design of the mechanical system.

.2 Water balancing of all hydronic heating systems and chilled water systems shall be carried out by a balancing company with minimum 5 years experience in projects of this size and complexity.

.3 Water balancing shall be initiated by checking each pump NHP, suction and discharge pressures, and where possible, pressure drop across rated equipment, e.g. heat exchangers and coils, etc. water distribution shall be checked and adjusted to all equipment by means of measuring air and off conditions at coils and for water temperature change entering and leaving coils.

.4 Water systems shall be balanced with clean strainers in place for all pumps.

.5 Control balances shall be initiated by checking and recording the operating sensibility of all controls under all operating conditions.

.6 Check and record water supply and return temperatures for chilled water, condenser water.

.7 After all systems have been balanced satisfactorily, mark final positions of valves. Submit a report in triplicate containing the following:

.i Suction and discharge pressure and temperature readings and water flow for each pump in the system.

.ii Pump curves for each pump showing plotted design and field conditions.

.iii Water on and off temperatures at each major piece of equipment such as cooling coils, heating coils, heat exchangers, etc.

.iv Rated and actual motor current at full load conditions, voltage and manufacture of every motor.

.v Circuit setter flow rates.

3.25 FIRE STOPPING & SMOKE SEALS

.1 Primers to manufacturer's recommendations for specific material, substrate, and end use.

.2 Water (if applicable) to be potable, clean, and free from injurious amounts of deleterious substances.

.3 Damming and backup materials, supports and anchoring devices to be to manufacturer's recommendations; and in accordance with tested assembly being installed as acceptable to authority having jurisdiction.

.4 Sealants for vertical joints to be non-sagging.

.5 Firestop and smoke seal around mechanical and electrical assemblies penetrating non-rated fire separations.

.6 Rigid ducts with dimensions greater than 1300 mm to be fire stopped by bead of fire stopping material between retaining angle and fire separation, and between retaining angle and duct, on each side of fire separation.

.7 Remove excess materials and debris and clean adjacent surfaces immediately after application.

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

END OF SECTION

ARTICLE NAME **PAGE**

SECTION 20 05 70
VARIABLE FREQUENCY DRIVE

PART 1 GENERAL

1.1 DESCRIPTION

.1 Provide a Variable Frequency Drive (VFD) for each fan/pump as specified in the schedule.

.2 Acceptable VFD manufacturers shall be AC Tech, Siemens Electric, Toshiba, Allan Bradley.

1.2 STANDARDS

.1 All VFD's to be certified by cUL or CSA/UL approved.

1.3 SUBMITTALS

.1 Provide catalog, technical data, outline dimensions, shipping section dimensions weight, control schematics, external connection diagram showing function and identification of all terminals requiring field connections.

PART 2 PRODUCTS

2.1 DESIGN

.1 Manufacturer shall submit a computerized harmonics analysis of the facility system based on the most recent single line diagram. Analysis shall illustrate the effect of VFD's on system harmonics.

.2 Manufacturer shall provide input line reactors and/or line filters required to reduce the total harmonic distortion (THD) to 5% at the point of common coupling or 3% at each VFD input where the analysis has shown that the incremental effect of the addition of the VFD's would cause the THD to exceed these values as per IEEE 519-1992.

.3 The VFD shall be of the fully digital pulse width modulated (PWM) type utilizing soft switching insulated gate bipolar transistors (IGBT's) in the inverter section of the VFD. The VFD shall accept AC line voltage variation of +10%, - 15%. No transformers shall be used on either the input or output of the VFD.

.4 The VFD enclosures shall be NEMA 1. They shall be designed and manufactured for installation within sprinklered buildings. Enclosures shall have solid steel top and front covers. Side ventilation openings shall be allowed as long as they are protected by louvers.

.5 Provide incoming, horsepower rated, disconnect switch with an operating mechanism, door interlocked and padlockable in the open position.

.6 Provide input line fuses coordinated with the VFS's electronic protection circuit so as not to blow under normal output faults such as overcurrent, short ground fault.

.7 If soft switching IGBTs are not utilized, then provide output filters on all 460 & 575 volt VFD's to limit the dv/dt to 1,000 volts/0.5 micro seconds at the motorterminals.

2.2 PROTECTION

.1 Provide the following VFD protection features as a minimum:

.i Line over and under voltage protection.

.ii Phase loss and unbalance protection.

.iii Short circuit for line to line to ground faults.

.iv Electronic instantaneous overcurrent protection.

.v Current limit, adjustable between 25% and 120%.

.vi The VFD shall have a continuous duty service factor of 100% of rated output current with I2t overload protection rating of 120% for 1 minute.

.vii Internal over temperature protection.

.viii Electronic motor stall protection to trip the VFD off should a motor overload or stall occur.

2.3 ENVIRONMENT

.1 The VFD shall have the following minimum environmental tolerances.

.i Ambient temperature range of -10C to 40C. Units located in non –heated areas shall be provided with thermostically controlled heater weather enclosure.

.ii Maximum humidity of 95% non-condensing.

.iii Maximum altitude of 1000m for rated output.

2.4 PERFORMANCE

.1 The VFD shall have the following performance features as a minimum:

.i Minimum efficiency of 97% at maximum load and speed.

.ii Minimum line side displacement power factor of 0.96 at all speeds and

loads.

.iii Adjustable minimum and maximum motor frequency of 0 to 120Hz.

.iv Separately adjustable acceleration and deceleration ramps from 0.1 to 3,600 seconds with damping and smoothing parameters for (0% to 100 % speed)

.v DC Injection Braking.

.vi Automatic restart after an inverter fault trip. The VFD shall attempt to restart automatically 5 times with Lock-Out after the fifth attempt if a restart has not occurred.

.vii The VFD shall restart the motor at the speed at which it is rotating and then re-accelerate to the speed called for by the speed reference signal.

.viii Capable of running without a motor connected for setup and testing.

.ix Capable of accepting the opening of a remote motor disconnect while running without causing damage to the VFD.

.x Auto restart after power outage.

.xi Skip frequency reject point to prevent the fan / pump from operating at a resonant speed. Adjustable centre frequency with a band width of 0 – 10 Hz.

.xii Automatic / Manual signal follower for 4 – 20mA, 0-20mA, 0-10 VDC or 2 – 10 VDC reference.

2.5 OPERATOR INTERFACE

.1 Provide a door mounted keypad with a 32 character Alpha-numeric high resolution display to allow the operations personnel to set up and monitor the VFD parameters, observe output speed, load or other programmable values and monitor status and fault information, complete with tactile keys and backlit display.

.2 Provide maintenance monitoring to display the time since starting, total elapsed run time and total KWH. Also provide maintenance target alarm to alert the operator with a displayed message.

.3 Provide the following control functions on the door mounted keypad:

.i Run (Hand and Auto Mode)

.ii Stop (Hand and Auto Mode)

.iii Parameterisation button (to toggle between parameters)

.4 Provide a selectable display to observe the following parameters:

.i Frequency

.ii Frequency Setpoint

.iii Motor Current

.iv DC-Link Voltage

.v Motor Torque (% nominal)

.vi Motor RPM

2.6 FAULT INFORMATION

.1 Provide fault diagnostics to simplify troubleshooting. In the event of a fault condition, the display shall indicate the nature of the fault, Including:

.i Overvoltage

.ii Undervoltage

.iii Overcurrent

.iv Overload

.v Overheating of motor (monitoring with PTC)

.vi Inverter over temperature

.vii Main phase missing (for 3 phase units)

2.7 BYPASS

.1 Provide components and circuitry necessary to safely bypass the motor from the VFD to line, or from the line to the VFD at zero speed.

.2 Provide a door interlocked input circuit breaker to ensure positive shutdown of all input power to both the VFD and bypass. Motor protection to be provided in both modes of operation by a common thermal motor overload relay.

.3 Provide mechanically interlocked contactors on the output of the VFD and in the bypass circuit.

.4 The entire bypass assembly, as well as all associated auxiliaries, shall be a modular design for single piece installation.

.5 Provide an enclosure door to include an inverter / bypass selector switch with indicator lights for each mode of operation.

2.8 COMMUNICATION AND CONTROL

.1 Provide the following to interface with the Energy Management Control System (EMCS):

.i Dry contact closure from EMCS for run Command (Auto Mode)

a. 4-20 mA (0-20 mA, 0-10 VDC, 2-10 VDC) Signal from EMCS for speed control (Auto Mode)
b. Dry contact (N.O.) output to EMCS to indicate
c. Inverter Fault
d. Inverter Running
e. 0-20 mA or 4-20 mA analog output to EMCS, proportional to 0-100% speed or load
f. Terminal for interlocking of up to 5 external interlocks e.g. Firestat Freezestat, etc.

.2 Provide serial communications interface and software to permit remote monitoring and modification of all VFD parameters. Interface shall be via RS-485 communications standards.

.i Provide a process controller with the following feature as a minimum.

.ii Input: Field process signal (temperature, pressure, etc.).

.iii Output: 4-20mA or 0-10 V speed reference to the VFD.

.iv Programmable proportional, integral and derivative gains.

.v Operator adjustable process setpoint.

.3 Provide Johnson Controls MetaSys N2, Siemens P1, Modbus or LonWorks communications protocol as required to allow direct interface with the Building Automation System. Co-ordinate with the BAS contractor.

2.9 SYSTEM OPERATION

.1 If “ Manual “ mode is selected the VFD/motor shall start when the run key is depressed. The speed shall be controlled by depressing the Accelerate or Decelerate keys on the keypad or by the direct speed set mode

.2 If “ Auto “ mode is selected the VFD/motor shall start when a contact closure run command is received from the EMCS. The speed shall be controlled by a speed reference signal from the EMCS.

.3 In the event of a power outage the VFD shall automatically restart when the power returns provided the run command is maintained.

.4 In the event of an inverter fault trip the VFD shall attempt to restart

automatically up to maximum of 5 attempts. If, after 5 attempts, restart does not occur, the VFD shall lock out.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Install each VFD in accordance with manufacturer's recommendations and local, provincial and national safety codes.

.2 Use motors with a minimum of CLASS F insulation. Motor shall meet NEMA MG-1 Part 31.

.3 Provide onsite commissioning (start-up) of the VFDs by a factory authorized technician. Allow a minimum of ½ day per system. Also include an allowance for a second visit to site of one day duration to train operating personnel in the operation and maintenance of the VFDs.

.4 Upon completion of the installation the supplier of VFDs shall supply four complete sets of service and maintenance manuals including wiring and connection diagrams.

.5 Upon completion of the commissioning the supplier of VFDs shall supply four complete sets of typed report and one floppy disk of parameters ready for uploading for future use.

END OF SECTION

ARTICLE NAME **PAGE**

SECTION 20 06 40
SOUND AND VIBRATION CONTROLS

PART 1 GENERAL

1.1 REFERENCE

.1 Basic Mechanical Materials and Methods Section 20 05 00 forms an integral part of this Section.

1.2 INTENT

.1 Provide sound and vibration isolation for all equipment as required to maintain acceptable noise (NC) levels in the occupied areas of the building.

.2 Obtain copies of approved shop drawings of equipment to be isolated. These drawings to show belt centres, operating weights and motor positions.

.3 Obtain all other applicable mechanical, structural and architectural drawings required to complete the vibration and sound control installation drawings.

.4 All vibration isolation, plenums shall be supplied by a single manufacturer, who will take on complete responsibility for the entire project.

.5 Vibro-Acoustics Limited and Vibron Ltd has been used as a base for this Specification.

1.3 SHOP DRAWINGS

.1 Refer to Section 01300 for details regarding shop drawing submission requirements.

.2 Submit shop drawings for the following:

.i Vibration Isolators

.ii Spring Hangers

PART 2 PRODUCTS

2.1 VIBRATION ISOLATORS

.1 All springs shall be completely stable, colour coded and selected to operate at no greater than two-thirds solid load.

.2 All spring isolators shall be complete with levelling devices, 6mm thick ribbed neoprene sound pads and zinc plated hardware. For applications subject to

outdoor or high humidity conditions, the housings shall have a two-coat system of rust resisting paint and the springs shall have two coats of neoprene unless otherwise specified.

.3 Type CM closed spring mounts shall be complete with top and bottom housings separated with neoprene rubber stabilizers.

.4 Type FS open spring mounts shall have extra stable iso-stiff springs with a minimum horizontal stiffness to vertical stiffness ratio (Kx/Ky) of l.0.

.5 Type CSR open controlled mounts shall have heavy rigid steel base frame, built in limit stops and removable spacer plates. Springs shall be iso-stiff with a minimum horizontal to vertical stiffness ratio (Kx/Ky) of l.0.

.6 Type MD elastomer rubber mount shall have threaded insert and hold down bolt holes.

.7 Type R waffle pads shall be 30 durometer natural rubber (14MPa tensile), a minimum of 12mm thick and selected for an optimum loading of 42kPa. When pads are built into spring isolators or hangers, 50 durometer (21MPa tensile) pads are acceptable with an optimum loading of 630kPa.

.8 Type N waffle pads shall be 50 durometer neoprene (12500kPa tensile), minimum of 12mm thick and selected for an operating load of 630kPa.

.9 Type RSR rubber-steel-rubber pads shall consist of two layers of 12mm thick type R pad, as specified above, bonded to 6mm steel plate. All holes to be sleeved and complete with an isolation washer.

.10 Type NSN neoprene-steel-neoprene pads shall consist of two layers of 12mm thick type N pad, as specified above, bonded to 6mm steel plate. All holes to be sleeved and complete with isolation washer.

.11 Type KIP Kinetic precompressed moulded fibreglass pads shall be coated with a flexible moisture impervious elastomeric membrane. Glass fibres, produced by the multiple flame attenuation process, shall have a diameter not exceeding 0.0046mm.

.12 Pads shall be capable of sustaining 300 per cent overload without damage, permanent set, collapse or permanent loss in natural frequency.

2.2 SPRING HANGERS

.1 Type SH shall have fabricated steel housing with one coat of anti-rust paint, and be complete with a colour coded stable spring, retaining cups and acoustic washer.

.2 Type SHR shall be as for type SH above but shall have a 25mm elastomeric element in lieu of acoustic washer.

PART 3 EXECUTION

3.1 INSTALLATION OF SPRING HANGERS

.1 All piping over 50mm diameter connected to spring isolated equipment shall be supported with minimum 25mm static deflection spring mounts or hangers as follows:

.i Up to 25mm diameter - first 3 points of support

.ii 125 to 200mm diameter - first 4 points of support

.iii 250mm dia and over - first 6 points of support

.2 The first point of support shall have a static deflection of twice the deflection of the isolated equipment, but not more than 50mm.

.3 Any piping supported from the mechanical floor shall be isolated on type CM or SL mounts with the deflection being equal to that of the isolated equipment.

.4 All exhaust fans shall be provided with the spring vibration isolators.

.5 On roof fans and make up air units, provide base spring mounts with vertical and lateral rigidity on all fans to minimize sound and vibration attenuation.

.6 An actual noise test with chillers, Pumps, etc. operational will be conducted during quiet hours to minimize background ambient noise impact on the readings and submitted with analysis for approval.

END OF SECTION

ARTICLE NAME **PAGE**

SECTION 20 07 40
MECHANICAL INSULATION

PART 1 GENERAL

1.1 REFERENCE

.1 Basic Mechanical Materials and Methods Section 20 05 00 forms an integral part of this Section.

1.2 INTENT

.1 Work to be done under this Section shall include furnishing of labour, materials, and equipment required for installation of Thermal Insulation as shown, as specified and as otherwise required, in a satisfactory manner, for all Sections of the Mechanical Contractor.

.2 Coordinate with the Heat Tracing installers requirements (P&D and Sprinkler Sections) to allow heat tracing installed prior to insulating the piping in garage and other areas.

.3 Pipe covering, equipment and duct insulation shall be provided by a recognized specialist insulation applicator with an established reputation for this type of work.

.4 Product type designations of Fiberglas Canada Ltd., for insulation materials, Flintkote and Childers for coatings, sealers and adhesives, are used in Specification and on Drawings to indicate physical properties and quality standards not otherwise described. Equivalent products of the following manufacturers are acceptable:

.i Insulation Materials

.a Owens Corning Canada
.b Johns Manville Canada Ltd.
.c Knauf Fibreglass

.ii Coatings, Sealers and Adhesives

.a Foster Division, Amchem Products Inc.
.b Dow Corning
.c Childers

1.3 MATERIALS LIST

.1 Where applicator proposes to use materials other than those specified as acceptable, he shall submit a complete list of such materials, indicating thickness of material for each individual service.

.2 Do not purchase materials so submitted until approval in writing has been received.

1.4 STANDARDS

.1 The type, manufacture and application of pipe covering materials including application of sealer coat, shall be in strict accordance with requirements and final approval of local and Provincial authorities having jurisdiction.

.2 All materials shall be asbestos free.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Pipe Insulation: Fibreglass one-piece or sectional insulation with All Service Jacket, 88 kg per cubic metre density.

.2 Duct and Equipment Insulation: Fiberglas AF-545 with Reinforced Foil and Flame Retardant Kraft Facing (RFFRK), 72kg per cubic metre density.

.3 Vapour Barrier Lag Adhesive: Flintstik 230-04 or Childers CP-82.

.4 Insulation Lagging Adhesive: Flintkote 120-09 or Childers CP-50.

.5 Glass Fabric Reinforcing: Flintkote Yellowjacket or Childers Chilglas.

.6 Canvas Cloth: 200g per sq m.

.7 PVC Jacketing and Fitted Pipefitting Covers: Manville Zeston, 25/50 rated.

.8 Aluminium Jacketing: .41mm thick aluminium jacket with 13mm wide bands of same thickness.

PART 3 EXECUTION

3.1 WORKMANSHIP

.1 Ensure the pipe fittings and equipment are dry and clean before applying covering.

.2 Do not apply insulation until the item to be covered has been tested.

.3 Apply covering in a neat workmanlike manner so that finished job is of uniform diameter and smooth in finish. Locate longitudinal seams so as to be invisible.

.4 Mitre insulation at pipe elbows 25mm size and smaller and wrap joint with Mac-Tac tape. Use PVC Pipefitting Covers or cover joint with canvas pasted on and extending one covering diameter each side of joint throat.

.5 Neatly cover flanges at fittings, strainers, expansion joints, valves and equipment, 75mm size and over, using "box" type flange insulation.

.6 Treat insulation and finishes so that maximum flame spread does not exceed a rating of 25 or as directed by local bylaws or requirements. Smoke developed classification shall not exceed 50 where required by applicable Codes.

.7 To maintain the integrity of fire ratings and to control transmission of noise tightly pack annular space between sleeve and pipe covering where insulated pipes pass through sleeved openings in walls or floors, for full length of sleeve, with approved fireproof insulating packing and finish flush at each end with caulking compound, aluminum colour, as manufactured by:

.i The Tremco Manufacturing Co. - Last-Meric

.ii Canadian Hanson & VanWinkle Co. Ltd. - Poly-Tite Joint

.iii Foster Div., Amchem Products Inc. - Elastoler Sealant - 95-44

.8 Pipes covered with insulation having a vapour barrier jacket shall pass through walls or floors with continuous covering. Protect exposed pipe insulation at floor line with an l8 gauge galvanized iron jacket approximately 100mm high, secured to floor slab in an approved manner.

.9 A steel insulation shield shall be placed between the hanger and the insulated pipe by pipe installer.

.10 At pipe support points with steel insulation shields use insulation with higher crushing strength to ensure that integrity and continuity of insulation and vapour barrier are maintained.

3.2 HOT FLUID PIPING

.1 Cover domestic hot water piping, domestic tempered water piping, domestic water recirculation piping, hot water heating system piping, Glycol System with one piece fibreglass insulation with factory applied fire resistive all service jacket. Covering shall be 40mm thick for pipes smaller than 60mm and 50mm thick for larger pipes.

.2 Cover fittings, valves, flanges and strainers with insulating cement of a thickness equal to that of the adjacent insulation, regardless of whether the adjacent pipe covering is recanvassed or not. Provide PVC jacket in service rooms and parking areas.

3.3 HOT EQUIPMENT

.1 Cover domestic hot water storage tanks, convertors, heat exchangers, condensate receivers, with 40mm insulation wired on. Recover with 12mm thickness of insulating cement, reinforced with 25mm hexagonal wire mesh. The final finish shall consist of canvas jacket adhered with lagging adhesive and

brushed with one coat of lagging adhesive.

3.4 COLD WATER PIPING

.1 Cover domestic cold water piping, soil and waste piping, rainwater piping, (including roof hoppers and fittings), AC Condensate drain piping, with 40mm thick insulation with vapour barrier. Insulation thickness may be reduced to 25mm for piping 50mm size and under. Provide PVC jackets in exposed piping in Parking garage, service and mechanical room areas.

.2 Armaflex insulation may be used for this service with vapour barrier and PVC cover.

.3 Vertical runs of soil, waste and rainwater piping may be left uninsulated where installed in airtight pipeshafts without ducts, but only if not subject to freezing (not close to outside walls or in parking garage) and not subject to sweating due to free air motion.

.4 Cover fittings and valves with a layer of glass fibre insulation with vapour barrier. Recover with insulating cement to insulation on adjacent piping and canvas neatly pasted on with adhesive regardless of whether the adjacent pipe covering is recanvassed or not. Use PVC jackets in all visible exposed areas.

3.5 COLD EQUIPMENT

.1 Cover cold water and glycol systems, heat exchangers, water cooled condensers of compressors, expansion tanks of the chilled water and secondary water system, aftercoolers of control compressors, with 38mm rigid glass fibre mesh blanket with integral vapour barrier and high rib metal lath. Recover with 12mm thickness of insulating cement, reinforced with 12mm hexagonal wire mesh and PVC jacket.

.2 With 38mm thick flexible fibreglass insulation, sealed with glasfab lapping. Recover with 3mm of fire resistant vapour seal adhesive trowelled smooth and sealed over the edge of the adjacent jacket.

.3 The final finish shall consist of canvas jacket adhered with lagging adhesive and brushed with one coat of lagging adhesive.

3.6 CHILLED WATER PIPING

.1 Cover chilled water piping, secondary circuit water piping, heat exchangers, equalizer lines to the expansion tanks on chilled water systems, refrigerant suction piping, and external spray washer piping and pump, with glass fibre insulation with fire resistant vapour barrier jacket and fire proof adhesive at joints.

.2 Cover fittings, valves, flanges and strainers on chilled water piping with a layer of glass fibre insulation with vapour barrier and finished with insulating cement to thickness of insulation on adjacent pipe. Recover with canvas neatly pasted on

with adhesive, regardless of whether the adjacent pipe covering is recanvassed or not.

.3 Wrap butt joints with 100mm wide vapour barrier strips of same material as jacket. Insulation shall pass unbroken through pipe sleeves. Thickness of insulation shall be 25mm except for chilled water piping 150mm size and over which shall have 40mm thick insulation. Insulate or pack around anchor plates where the above pipes are anchored, with a similar type of insulation to that used on piping.

.4 Completely cover expansion joints and flexible hose connectors on chilled water piping with same type of insulation as used for chilled water piping. Allow for movement and flexing of joints and flexible hose connectors.

.5 The portion of the runouts to the coil units that is located within the units, shall be insulated with Armaflex pipe insulation. Joints shall be sealed with fireproof vapour proof adhesive suitable for from 4 C to 105 C water temperatures and shall be installed in accordance with manufacturer's recommendations.

3.7 REFRIGERATION EQUIPMENT

.1 Surfaces of the chiller equipment that are subject to sweating and where recommended by chiller manufacturer, expansion tanks of the chilled water and secondary water system, shall be covered with two layers of 25mm thick Armaflex sheet insulation adhered to surface with insulation adhesive.

.2 Install insulation in accordance with insulation manufacturer's recommendations.

.3 Apply two coats of Armaflex finish directly to the insulation surface.

3.8 REFRIGERANT PIPING

.1 Liquid refrigerant lines outside the building (from the inside of the building to the condensing unit) and the entire length of the refrigerant suction lines inside the building and outside the building, shall be insulated with 19mm thick Armaflex foamed plastic insulation as manufactured by Armstrong.

3.9 PUMPS

.1 Enclose chilled water pumps with removable armaflex preformed insulation to suit pump shape for service from outside.

.2 Seal joints and edges with adhesive and reinforce with glass cloth membrane.

3.10 DUCTWORK AND AIR HANDLING EQUIPMENT

.1 Externally insulate:

.i exhaust air plenums

.ii exhaust ducts min. 2meters back from outdoor connection

.iii air supply unit casings of all units

.iv all air supply ducts

.2 Do not apply insulation to casings, ducts or plenums which have been lined with acoustic insulation, unless indicated otherwise. External insulation shall extend 300mm over internal acoustic lining.

.3 Ensure that sheet metal surfaces on which insulation is to be applied is free from moisture, dirt, and rust, before applying insulation.

.4 Cover plenums, casings, and ductwork which are to be thermally insulated with 25mm thick rigid preformed flexible foil faced duct insulation with factory applied fire retardant vapour barrier, or field applied Kraft laminate attached with adhesive.

.5 Insulate circular ductwork with vapour seal 25mm flexible reinforced foil faced duct insulation.

3.11 RECOVERING AND FINISHING

.1 Recover exposed pipe insulation in finished rooms, fan rooms, mechanical equipment rooms, duct and pipe shafts where access is available, pipe spaces, penthouses, with canvas jacket neatly applied or PVC jacket in all exposed areas of the plant and mechanical room. Roof piping shall be Aluminum jacketed..

.2 Hot and cold water piping where above the floor and exposed in finished areas, shall be covered with Johns-Manville Metal-on jacket insulation.

.3 Insulation exposed to outdoors shall be finished not with canvas, but a layer of 880 kg per cu m roofing felt, lapped at all joints, sealed with lap cement and held in place with metal bands on not more than 300mm centres.

.4 Supply and make up air ducts, pipimg etc. on the roof shall be insulated and provided with Aluminium jacket. All joints shall be below the duct and jacket tied with SS steel straps.

END OF SECTION

ARTICLE NAME **PAGE**

SECTION 21 30 00
SPRINKLERS

PART 1 GENERAL

1.1 REFERENCE

.1 All work under this Section shall be governed by and subject to the provisions of Section Basic Mechanical Materials and Methods.

.2 All work under this Section shall be the responsibility of the Sprinkler Contractor, except as otherwise specified herein, noted on the drawings, or modified by the Contract Documents.

1.2 RESPONSIBILITY AND SCOPE

.1 Site verify existing sprinkler system. Extend a separate ZONE to include new area of the building in its entirety, including stair cases, plant, elevators, offices, service rooms on the new areas and existing plant areas affected by the new construction.

.2 These specifications for the Fire Protection Systems are "Performance" specifications and are intended to establish design criteria and basic guidelines for the work. This contractor shall assume full responsibility for the layout and details of all fire protection work installation, testing and certification to meet the Strictest criteria of the requirements of Latest Ontario Building Code, NFPA 13 latest version, local governing Codes or regulations; and to the approval of The Ontario Fire Marshall. All sprinkler systems to be hydraulically designed.

.3 As minimum requirements, all fire protection work shall comply with the applicable provisions for the Latest National Fire Codes published by the National Fire Protection Association (NFPA), the local Fire Department and the Owners' Insurance Underwriter.

.4 Submit a complete set of Hydraulic Calculations, piping design and lay out drawings for the Architect, Engineer and upon meeting all comments, complete sets to Building Department/ Fire Department for review, comments, approval and for their record.

.5 The scope of work shall include all labour, materials, equipment and accessories necessary for the complete fire protection systems including, but not limited to the following major items:

.i Sprinkler contract starts at connection where indicated on drawings. Start at existing sorinkler main in water meter room and install a complete redesigned, hydraulically calculated sprinkler system for the new area with up right and office area concealed sprinklers.

.ii Sprinkler riser and accessories at the general location where indicated on

the drawings, including alarm checks, excess pressure pump, water motor gong, electric bell and accessories.

.iii Preparation of detailed shop drawings and hydraulic calculations for the fire protection systems to meet the approval of local authorities having jurisdiction on this project, Owners' Insurance Underwriter and as required by the Engineer.

.iv Payment of all costs relating to fees, permits, inspections, tests, and plan reviews for the fire protection work and systems.

vi All signs and labels required by the insurance rating agency and/or local authorities.

.v Hangers and supports, drains, test connections, sleeves, escutcheons, spare sprinkler heads with cabinet, and other necessary appurtenances.

.vi Perform all testing and submit completed contractor's test certificate for each sprinkler system.

1.3 SHOP DRAWINGS

.1 Prepare a set of construction shop drawings, immediately after the award of the contract, showing the complete system and have same approved by local authorities, Owners' insurance rating organization, and as required by codes and regulations. After the above approvals have been obtained, the contractor shall submit the drawings to the Architect Consultant and Engineer for approval. Materials shall not be ordered nor shall any work be installed until ALL the approvals have been obtained.

.2 To avoid interference and clear all obstructions, any piping layouts shall be coordinated in the field with contractors of other trades, prior to the submission of shop drawings for approval at no additional cost.

PART 2 PRODUCTS

2.1 PIPING MATERIALS

.1 Black steel Schedule 40 conforming to ASTM A120 or ASTM A53. Schedule 30 pipe may be used in sizes (200mm) 8" and larger. Light wall pipe with roll groove for mechanical couplings may be used for all piping where permitted by Codes and authorities. The "Pressfit" piping system may be used in sizes up to and including (50mm) 2".

.2 Fittings shall be cast iron, malleable iron or steel welding type. Screwed unions and couplings shall be used on piping (50mm) 2" and smaller. Screwed couplings, flanges, or welding shall be used to joint piping (65mm) 2-1/2" and larger, except where mechanical couplings are allowed as specified herein.

.3 Mechanical couplings and fittings such as "Firelock" and "Pressfit" manufactured

by Victaulic which are ULC listed for fire protection service and meeting with the approval of the insurance underwriting agency and governing Codes may be used to join above ground piping.

.4 All piping shall be concealed where ever ceiling occur and exposed in garage and service areas. Piping shall be concealed over washroom, kitchen and laundry room ceilings for distribution to the bedrooms and living room etc.

2.2 VALVES AND ACCESSORIES

.1 All valves shall be ULC listed for fire protection service.

.2 All gate and check valves shall be rated for 175 psig non-shock cold water pressure.

.3 Valves shall be as manufactured by Jenkins, Crane, Hattersley, Grinnell, Keystone, Victaulic.

.4 Except as otherwise specified, all valves shall be OS&Y U-42 (two way) type and shall be electrically supervised.

.5 Butterfly valves may be used in place of OS&Y valves where approved by authorities.

2.3 WET PIPE SPRINKLER SYSTEMS

.1 This contractor shall provide hydraulically calculated wet sprinkler system in the heated areas on all floors and areas designed to deliver the minimum densities over the hydraulically most remote design areas as specified below.

.2 System shall be installed in accordance with "ordinary Hazard Occupancy" and ordinary hazard occupancy using automatic spray heads.

.3 Provide all devices, supervised valves, flow switches, etc. for a complete system for the new building and any affected areas of the existing plant.

.4 The drawings and piping diagrams show intent of the wet sprinkler systems only. Complete design, approvals and certified installation shall be provided by the selected sprinkler contractor in accordance with all standards, regulatory and governing authorities. Piping installation, routing and heads types shall be provided to suit the drop ceiling areas, bulkheads, other services through these areas and site coordination with other trade drawings, trades and consultants to minimize any conflicts.

2.4 SPRINKLER HEADS

.1 Sprinkler heads shall be ULC listed semi recessed chrome plated pendant type and shall be of the type and temperature rating as required.

.2 Ceiling sprinklers in ground floor lobby and public corridors shall be fully

recessed concealed type Grinnell "Clean Line". Paint escutcheon plate to match ceiling.

.3 Sprinklers in offices, corridors and other areas with finished ceilings shall be semi-recessed chromeplated pendant type equipped with chrome escutcheon plates. Sprinklers in suites shall be side wall or equal to suit design of the living and bedrooms.

.4 Sprinkler in exposed areas shall be upright type with plain bronze finish. On cold areas use dry sprinkler heads.

.5 Low level sprinkler heads shall be provided with wire guard for protection in all areas, especially inside the suites and typical residential floors, corridors with ceiling and side wall heads.

.6 All sprinkler heads shall be equal to Grinnell "Dura Speed" series.

.7 Unless otherwise noted, fusible links for sprinkler heads shall be Ordinary Temperature rated. Locations and clearances for sprinkler heads near hot equipment or piping, etc. shall be complying with NFPA Pamphlet 13.

2.5 SPARE SPRINKLERS

.1 Provide not less than the minimum number of spare sprinkler heads, for each type and rating used on the job, in accordance with NFPA Pamphlet 13.

.2 Provide metal cabinet or cabinets for storage of spare sprinklers. Cabinets shall be provided, hinged door and latch and shall be finished with red enamel paint. Provide engraved plastic sign on each cabinet front to read: SPARE SPRINKLERS. Provide a sprinkler wrench in each cabinet.

PART 3 EXECUTION

3.1 INSTALLATION

.1 The entire installation shall apply with NFPA 13 as minimum requirements.

.2 Coordinate the installation of all fire protection systems with the work of all other trades. Provide all necessary offsets in piping to avoid interference with other equipment and systems and provide additional sprinkler heads due to offsets and/or interference as required to achieve design coverage at no additional cost.

.3 All horizontal piping shall be installed as high above finished floor as possible with due allowance for clearances for sprinklers as required by NFPA 13. Refer to notes on the drawings for additional requirements, if any, regarding clear heights for piping.

.4 Provide drain valves and piping as required to permit all sprinkler piping to be completely drained. Provide inspector's test connections in accordance with NFPA 13 and as required by governing Codes and the insurance underwriting

agency.

.5 All drains and test connections shall be discharged into the building drainage system through an approved indirect waste connection.

.6 All piping shall be concealed above ceiling in all areas. Drains and/or test connections shall not be terminated exposed in finished rooms, areas or toilet rooms.

.7 All piping through interior walls and partitions shall be sleeved and closed off with escutcheons where visible. Penetrations through fire rated walls shall be sleeved, packed, and grouted as required to maintain the fire rating of the wall. Piping through floors and exterior walls, including foundation walls, shall be sleeved, packed and grouted with non-shrinking cement as required to make watertight.

3.2 RISERS AND ALARMS

.1 Flanged connections shall be used at the base of all risers. Steel pipe shall not be extended into the ground at the base of risers. Provided cast iron flange and spigot piece at the floor penetration for connection to the steel pipe riser.

.2 Risers penetrating floors shall be sleeved, packed with oakum, and made watertight and non-shrinking grout.

.3 Each riser shall be equipped with an alarm check valve assembly, water motor alarm, drains, gauges, and related piping, valves and accessories. Water motor alarm gong shall be mounted on the exterior face of the building wall near the riser. Pressure gauges, complying with NFPA 13 complete with stop cock and draining provisions shall be provided on the supply and discharge side of each alarm check valve.

.4 Provide a pressure flow switch on the discharge side. Flow switches mounted in horizontal piping shall be mounted on the top side of the pipe. Water flow switches shall be mounted at least (600mm) 2 feet from elbows or tees and at least 10 pipe diameters from control valves.

3.3 TESTING AND VERIFICATIONS

.1 Sprinkler Installation:

.i Valves as shown to be fitted with supervisory switches. Wiring from supervised valves and provision of supervisory annunciator will be done under Electrical Division.

.ii Provide signs at each valve identifying portion of system controlled. Fasten signs to pipe in immediate vicinity of valve.

.iii Install excess pressure pump across alarm check valve(s) in accordance

with manufacturer's instructions.

.iv Wiring of trouble and flow alarms from zone sprinkler control cabinets and alarm check valves will be done under Electrical Division.

.v Provide drain valves at trapped low points in piping system.

.2 Testing and Approvals:

.i Test sprinkler systems in accordance with requirements of latest edition of NFPA 13.

.ii Schedule testing to give at least two weeks notice to following authorities:

.a Local Fire Department
.b Insurer's Representative
.c Owner's Personnel
.d Project manager
.e Consultants

.vi Prior to testing, ensure that flow switches, pressure switches, supervisory, and other devices are in working condition and function as specified and as recommended by manufacturer.

.vii Obtain Contractor's Material and Test Certificate for above ground piping.

.viii On completion of project obtain Certificate of Approval showing that work is in accordance with rules and regulations of national Fire Protection Association.

.ix Copies of Certificates to be distributed as per shop drawing requirements.

END OF SECTION

ARTICLE NAME **PAGE**

SECTION 22 10 00
INSIDE PLUMBING AND DRAINAGE

PART 1 GENERAL

1.1 REFERENCE

.1 Basic Mechanical Materials and Methods Section 20 05 00 forms an integral part of this Section.

1.2 INTENT

.1 Provide all labour, materials, plant, tools, transportation, testing and put into proper operation a complete plumbing and drainage system to the full intent of the drawings and/or specifications.

.2 In general, the major divisions of the work are as follows:

.i Plumbing fixtures, floor drains, roof hoppers and other plumbing fittings and equipment. Extension of existing roof rainwater leaders from roof to new second floor roof and roof drains over elevator and elevator room area.

.ii Storm and sanitary drainage piping inside the building and to 1.5m (5 ft.) outside the building.

.iii Domestic hot, cold, and recirculation piping inside the building and to 1.5m (5 ft.) outside the building.

.iv System of natural gas piping.

.v Compressed air system.

.vi Service connections to equipment furnished by others.

.vii Miscellaneous Plumbing Work as shown on drawings and/or as specified herein.

1.3 WORK UNDER OTHER SECTIONS

.1 Underground piping from 1.5m outside the building - under Section 22 04 90 Outside Plumbing and Drainage.

.2 Thermal insulation - under Section 20 07 00 Mechanical Insulation.

1.4 STANDARDS

.1 All work shall conform to the National Building Code; the Ontario Building Code; and all regulations of City, Local, Provincial or Territorial Authorities

having jurisdiction. In case of confliction of codes with Specifications and Drawings, the most severe requirements shall apply. Where Drawings call for pipe sizes larger than minimum of the codes, Drawings shall be followed. The codes, however, shall not be violated under any circumstances.

1.5 SHOP DRAWINGS

.1 Refer to Section 013300 for details regarding shop drawing submission requirements.

.2 Submit Shop Drawings for the following:

.i Valves

.ii Plumbing specialties, including cleanouts, floor drains, backwater valves, scupper drains, area drains, trap primers, grit & Oil grease interceptors, etc.

.iii Storm and sanitary sump pumps

.iv Submersible pumps

.v Domestic hot water tanks and heaters

.vi Fire extinguishers

.vii Plumbing fixtures, including water closets, lavatories, sinks, showers, faucets, traps, stops, etc.

PART 2 PRODUCTS

2.1 PLUMBING PIPE AND FITTINGS

.1 Buried storm and sanitary drainage piping and fittings shall be plastic SDR 35 type.

.2 Above ground sanitary drainage piping and fittings, including main vent piping, shall be cast iron Class 4000 with mechanical joints, factory coated with raw linseed oil, or type "DWV" hard drawn copper with drainage type cast bronze or wrought copper solder fittings.

.3 Branch vents shall be type "DWV" hard drawn copper with cast bronze or wrought copper solder type fittings. Buried vents may be plastic ABS DWV type piping.

.4 Domestic water piping installed above the floor, including hot and cold and recirculating piping shall be Type "L" hard drawn copper tubing with cast bronze or wrought copper solder type fittings. No copper piping shall be in contact with ferrous materials. Unions or flange connections similar to Epco "Di-Electric" pipe fittings shall be used when making such connections.

Copper pipe and fittings shall be in accordance with the latest issue of C.S.A. Standard Specification. ASTM Standard B88. Copper pipe with roll groove and mechanical coupling Victaulic Style 606 is acceptable for 50mm (2") pipe size and larger.

.5 Buried water pipe (100mm) 4" size and larger shall be Class 150 Ring-Tite PVC or cement lined ductile cast iron water pipe. Buried water pipe less than 100mm 4" size shall be soft temper copper with no joints below the floor, Type "L".

.6 Above ground sump and sewage pump discharge piping from pump to gravity drain shall be Type "L" copper.

.7 Piping for special systems such as Natural Gas, Compressed Air etc., are specified in other articles of this Specification Section.

2.2 VALVES

.1 All potable water system valves shall be Lead Free as described in OBC.

.2 All valves shall be suitable for 1.5MPa water working pressure and up to and including 60mm (2 1/4") size, shall be all brass.

.3 Check valves 50mm (2") size and smaller shall be 15 degree swing type with brass disc, for screwed ends.

.4 Valves on branch piping supplying plumbing fixtures from mains and riser shall be globe valves set behind access doors, except for unfinished areas, where they may be exposed.

.5 Gate valves on steel pipe up to and including 60mm (2 1/4") size shall be Jenkins for screwed ends Globe valves

.6 Valves on copper pipe up to and including 60mm (2 1/4") size shall be brass solder joint globe valves rising stem.

.7 Ball valves size 50mm (2") and less may be used in lieu of globe and gate valves, for soldered ends for on-off service.

.8 Butterfly valves may be used in lieu of globe and gate valves size 60mm (2 1/4") and over as follows:

.9 Outside hose bibbs shall be 20mm (3/4") non-freeze type, Zurn ZN-1305VB or approved equal in Enpoco, Ancon or Jay R Smith satin bronze box face, loose key handle, brass wall sleeve, locknut and BFP. In general, all bibbs shall be located approximately 60cm (2 ft.) above grade.

.10 Inside hose bibbs shall be Zurn Z-81302 or approved equal, chrome plated 12mm (1/2") or 20mm (3/4") bibb and located in general 1m above floor unless

otherwise specified.

.11 Valves shall be Jenkins, Crane, McAvity, Red & White. Butterfly valves shall be Jenkins, Keystone, Victaulic or Grinnell.

2.3 COMPRESSED AIR DRYER AND COMPRESSED AIR FILTERS

.1 Supply and install a second new compressed air refrigerant dryer 500CFM capacity at 39 degree F, suitable for a 75 HP existing compressor, auto drain, 316 SS Steel brazed heat exchanger, Hotgas Bypass valve , accessories, pressure and temperature gauges, isolation valves, automatic built-in controls, 575V/ 3Ph/60Hz, 15A etc. as shown on the drawings.

.2 Provide Grade G,H filters with 580CFM flow capacities with isolation and bypass valves equal to IR P985.1G & H grades with liquid and oil coalesced filters at 580CFM each for oil, particles, liquid and water 2.5”NPT cartridges to suit.

.3 Contractor shall provide 3 spare sets of cartridges for each filter as spare parts.

.4 All piping shall be copper type L cleaned and degreased.

2.4 CLEANOUTS

.1 Cleanouts shall be Zurn ZN1600 series or approved equal in Watts, Ancon or Jay R Smith to suit floor construction, complete with secondary seal plugs.

.2 Cleanout plugs shall be gasketed and fastened with brass hex bolts.

.3 Cleanouts in waterproofed areas shall have flashing clamp devices to receive the waterproofing membrane.

2.5 FLEXIBLE CONNECTORS

.1 Flexible connectors shall be Flexonics RW-81 or RW-91, all bronze construction, of length as recommended by manufacturer.

2.6 FLOOR AND ROOF DRAINS AND BACKWATER VALVES

.1 Roof hoppers for conventional built-up roof shall be Zurn ZA-121EBC duracoated cast iron body with clamp collar, integral gravel stop, under deck clamp, elevating body plate, hardware, 6-1/2" (165mm) high cast dome strainer, or equal in Watts Ancon, J.R. Smith. For controlled flow, use Zurn ZACF-121-EBC.

.2 Roof hoppers for I.R.M.A. roof shall be Zurn-ZA-212-85-RC dura coated cast iron body with clamp collar, integral gravel stop, stainless steel perforated

extension, sump receiver, under deck clamp, hardward, 6-1/2" (165mm) high cast dome strainer, or equal in Watts, Ancon, J.R, Smith. For controlled flow, use Zurn ZACF-121-85-RC.

.3 Floor drains in finished areas shall be Zurn ZXN-415-A dura coated cast iron body with anchor flange, cast iron reversible waterproofing clamp with weepholes, seepage collection sump and 5" (127mm) diameter x 2" (12.7mm) thick polished nickel bronze strainer or equal in Watts, Ancon or J.R. Smith. For tiled areas, use Zurn ZXN-415-H with 6" x 6" (152mm x 152mm) x 2" (12.7mm) thick polished nickel bronze strainer.

.4 Floor drains in mechanical equipment rooms, underground parking garages, garbage rooms, areas where carts are used or traffic is heavy, shall be Zurn Z-534-Y with heavy duty adjustable duracoated cast iron tractor grate, complete with bucket, or equal in Watts, Ancon or J.R. Smith.

.5 Combination drains (floor and funnel drains) in mechanical rooms and fan rooms shall be Zurn Z-415-F or equal in Watts, Ancon or J.R. Smith. In finished areas, combination drains shall be Zurn ZN-415-F with polished nickel bronze finish. Hub drains in finished area shall be Zurn ZN-415-S with polished nickel bronze finish or equal in Watts, Ancon or J.R. Smith.

.6 Scupper drains shall have duracoated cast iron body with cast oblique strainer and combination frame and membrane flashing clamp, Zurn Z-187 or equal in Watts, Ancon or J.R. Smith.

.7 Area drains shall have duracoated cast iron body with galvanized dome strainer, Zurn Z-556-D or equal in Watts, Ancon or J.R. Smith.

.8 Backwater valves shall be Zurn Z-1090 or equal in Watts, Ancon or J.R. Smith. Where backwater valves are located more than one foot below floor level, include an access pit with steel cover and cover frame set in floor of proper depth and size to permit servicing of the backwater valve and running trap.

.9 Floor drains, hub drains, funnel drains, etc., shall be trapped and provided with a 3mm (1/8") water connection for trap seal. Install trap primer units, Zurn Z-1022-A or equal in Watts, Ancon or J.R. Smith.

.10 Drains located in on-grade parking lot shall be Zurn-610-H or equal in Watts, Ancon or J.R. Smith complete with membrane clamp and ductile iron grate.

.11 Floor drains in waterproofed areas protected with a waterproofing membrane, shall have flashing ring and clamping device to receive the waterproofing membrane.

.12 Promenade drains shall be Zurn FD-2280PV3-B5C) with polished brass locking grate or chrome plated equal in Watts, Ancon or J.R. Smith.

.13 Planted area drains shall be equal to Zurn ZA-130-SSM.

.14 Paved area drains shall be equal to Zurn Z-610H Btm. outlet, Z-610-H-90 side outlet.

.15 Hub drains shall terminate 25mm (1") above finished floor. Provide welded steel funnel caulked into hub and sized to accommodate all open drains.

.16 All Floor drains and associated equipment shall be Zurn or equal.

2.7 FIRE EXTINGUISHERS

.1 Extinguishers shall be NFE Model No. ABC10 or equal in Chubb or Levitt Safety, complete with suitable mounting bracket.

.2 Where indicated on drawings, provide recessed cabinets suitable for flush mounting NFE Model No. 102R or equal in Levitt Safety or Chubb.

2.8 PLUMBING FIXTURES

.1 Plumbing fixtures shall be as described in the attached Plumbing Fixture Schedule.

.2 Fixtures shall be complete with necessary trim, including traps, faucets, supplies, stops, strainers, escutcheons, spuds, wastes, tail pieces, gaskets, brass bolts and carriers of type capable of being secured to floor slab.

.3 Provide wheel handle or screwdriver stop valve on the hot and cold water supply to every fixture on the job, in addition to the valve or faucet on the fixture itself.

.4 Shop drawings for fixtures shall consist of a carefully prepared portfolio showing illustrations, dimension drawings and detail descriptions of the fixtures to be furnished.

.5 Plumbing Fixtures shall be Am Std, Crane, Toto or preapproved equal.

PART 3 EXECUTION

3.1 PIPING INSTALLATION

.1 All work shall be executed by plumbers holding certificates of competency. All fixtures and equipment shall be roughed-in, installed and connected exactly in conformity with respective manufacturer's details and all fitted with individual shut offs. All lines shall be laid or hung to approved falls, and all lines shall be arranged so that any or all systems may be completely drained. All roughing-in shall be concealed, save where specifically excepted by the Architect Consultant. Piping shall not touch the structure, sleeves, other piping, conduits or equipment at any point, save at the necessary connections. This shall be

observed carefully to avoid transmission of noise. Allow sufficient space in sleeves, etc. for thermal expansion of piping.

.2 Locate existing rood rainwater leaders and extend to new second floor roof and provide new roof drains to suit. Install new rain water leaders over top the elevator and elevator machine roof and connect to existing RWLs in floor below with horizontal runs.

.3 Re-route all plumbing piping and installation of valves, clean outs etc. in ceiling spaces of all floors to be accessible from one centrally located access door in the corridor area for group of suites. Provide access locations for prior approval from architect. Multiple access doors within 30 feet radius will not be permitted. In T-bar and Wood Slat ceiling areas, locate all valves and devices at the designated locations only as noted on architectural drawings.

.4 Where piping is installed in filled ground, or earth that cannot support piping, piping shall be supported on a concrete pad or piers, or alternatively it shall be cast iron hung at every joint from reinforcing rods 10mm (3/8") diameter min. asphalt coated as described in Ontario Building Code. Where piping passes through foundation walls, it shall be supported on a reinforced concrete pad as specified under "Excavation and Backfill" in Section 20 05 00.

.5 In all piping 75mm (3") size and over, located anywhere, install copper or brass flanges at each valve and at apparatus.

.6 Water pipe in boiler room and mechanical equipment rooms shall be copper as previously specified but disconnecting copper or brass flanges shall be installed at boilers, chillers, etc., using wrought copper streamlined fittings and with Silfos solder within 8m (25 ft.) of such connections.

.7 Pipes to circular wash fountains and island fixtures shall be insulated, wrapped with polyken tape and run in individual ABS Plastic conduits.

3.2 JOINTS

.1 Joints in cast iron pipes shall be Mechanical type.

.2 Joints in screwed steel pipe shall be made up with an approved joint compound. The use of lampwick will not be permitted. Pipe threads shall be full and clean cut. Pipes shall be reamed after being cut.

.3 Joints in copper piping shall be made using special tools of proper size. Ends shall be cut off at right angles to pipe and reamed. Inside of fitting and outside of pipe shall be thoroughly cleaned with steel wool and coated with flux. Joints shall be soldered with a blowtorch or oxyacetylene flame using single or double tip torch depending on fitting size. Use hard solder made up of 95% tin and 5% antimony for pipe sizes up to and including 78mm (3"). Use Silfos for pipe sizes 100mm (4") and above. Working parts of valves must be removed during soldering. Wrought copper streamlined fittings must be used where

Silfos is specified.

.4 Joints in plastic piping to be solvent welded.

.5 All solders and jointing materials shall meet the current code requirements regarding the maximum allowable lead content.

3.3 CLEANOUT INSTALLATION

.1 Provide cleanouts for drains 16m (50 ft.) apart in all straight runs of sewers, at all changes of direction, at the end of all branches, at the base of all riser lines, on all exposed or accessible traps (except water closet traps), at all points on the system where so indicated or required by Code, or where necessary because of interruption of general line of flow.

.2 Cleanouts shall be full size of pipe up to 100mm (4") and not less than 100mm (4") for larger pipes. Full size "Y" or "TY" branches shall be provided for cleanouts on drains and their branches.

.3 All cleanouts shall be made accessible and wherever necessary branch connections shall extend to finished surfaces of floors with polished bronze floor plate and frame for each, set flush with floor and with vandalproof socket head screws to match the cover finish.

.4 Care shall be taken to locate all Barrett type cleanouts above any curbs, bases, etc. Barretts shall be covered with access doors as specified.

3.4 PIPE HANGERS

.1 Provide pipe hangers and supports for all piping and equipment supplied and installed under this Section. Refer to Section 20 05 00 for detailed requirements.

3.5 FLASHING

.1 All piping extending through the roof or other waterprooofed area shall be flashed with Thaler Roofing Specialties Products roof flashing. Flashing shall be left ready as directed by the roofers or water proofers for them to make watertight connections.

.2 Piping other than cast iron may be flashed with 0.5mm sheet copper soldered at all joints and provided with a conical weather drip clamped to pipe.

.3 Where pipes pass through walls, flashing shall be turned back into the wall and caulked.

3.6 PIPE EXPANSION AND CONTRACTION

.1 Provide for the expansion and contraction of pipe work. Erect all pipe in such a

manner that the strain and weight does not come upon cast connections or apparatus. Provide bends or swing joints for this purpose.

.2 Provide anchors and expansion loops where required and where shown on drawings. Anchors shall be equal in strength to the pipe being anchored, both in shear and in bending.

3.7 TRAP PRIMERS

.1 All floor drains, hub drains, funnel drains etc., shall be trapped and provided with a 10mm (3/8") water connection for trap seal.

.2 Install insulated flush valve tanks at high level for priming and/or P.P.P. Model P1 & P2 Prime Rite automatic primer valves complete with distribution units.

3.8 BACKVENTS

.1 Every plumbing fixture shall have its own trap and these shall be vented in accordance with the Ontario Building Code or any other local rules and regulations. Vents are shown on drawings only to indicate the required routing.

.2 Vents smaller than 75mm (3") shall be increased to 75mm (3") before passing through the roof.

3.9 AIR CHAMBERS/ WATER HAMMER ARRESTERS

.1 Provide air chambers at least 600mm (24") long on all supplies at each fixture. They shall be of the same size as the main supply pipe to the fixture, and shall be concealed in the rough work.

3.10 DRIPS AND DRAINS

.1 Supply and install 12mm (2") drip cocks with hose connectors at the base of all water risers and all low points. These shall be Dahl 2316 or James Robertson JR-4532 (Type "C" for copper pipe).

3.11 COLD WATER DISTRIBUTION

.1 Connect to existing water service and run new piping to all fixtures, hose bibbs and all other miscellaneous equipment requiring cold water connections on the job.

.2 Provide a RPBFP at connections to mechanical equipment as required by OBC and City ordinance/ Bylaws.

.3 Provide individual Pressure Reducing Valves for any group of washrooms or individual washroom to keep pressure below 75PSI.

3.12 HOT WATER DISTRIBUTION

.1 Provide a complete new hotwater piping system including Electric DHW tanks, recirculating pumps, and make all necessary water connections to the new fixtures and equipment where shown and required.

.2 Run hot water piping as indicated on the Drawings and connect to all fixtures, and all other miscellaneous equipment requiring hot water connection.

.3 There shall be no high points or air pockets in any recirculation lines. Lines shall be so arranged and graded that air shall collect at the fixtures or at the hot water tanks. Where it is impossible to avoid high points, install automatic air eliminator traps, Sarco Type 13WN with discharge piped to nearest drain.

3.13 DRAINAGE AND SANITARY SEWER SYSTEM

.1 The general arrangement of the storm and sanitary drainage piping is shown on the Drawings. Install a complete drainage system as shown.

.2 Include connections to existinf building piping at suitable location. Coordinate with Civil drawings for locations.

3.14 SPECIAL WATER AND WASTE CONNECTIONS

.1 Supply and install all hot and cold water, waste and vent connections required in the mechanical equipment rooms, and in any other locations where shown or required for all items shown on Mechanical or Architectural Drawings. Co-operate with all other trades to the extent of properly locating any connections they require and connect up complete to all pieces of apparatus so served, installing a valve on each water and gas connection close to each piece of apparatus. Install a cast brass trap with cleanout and vent on the waste connections, unless waste discharges into a floor drain, hub or combination drain. Include piping from apparatus waste connection to such open drains in the latter case. This applies to chillers, and other misc. equipment.

.2 Supply and install all necessary gas pressure and water pressure regulators where required by individual apparatus and equipment and run necessary vents to atmosphere.

.3 In all direct connections of city water to equipment such as expansion tanks, boilers, fill connection to piping systems, provide a back-flow preventing device, approved by Ontario Water Resources Commission and local Plumbing Inspection reduced pressure Backflow preventers to be Watts, Clayton or Singer manufacture.

.4 Provide backflow connectors on all inside and outside hose bibb connections equal to Watts manufacture.

.5 All exposed valves, traps, etc. to be chromeplated.

3.15 NATURAL GAS PIPING

.1 Make all necessary arrangements, and do all necessary work for connection to existing gas service and piping in the building where shown on the Drawings. Continue piping with connections to all gas fired equipment on the job as indicated on the Drawings. Include the supply and installation of a lever operated approved type gas cock at each piece of equipment close to the point of connection.

.2 Gas piping shall be standard weight black steel pipe with standard weight malleable iron screwed fittings. Piping shall be welded wherever required by the Gas Utility Inspection Officials. Piping shall be installed and tested in strict accordance with C.S.A. B149 Standard, together with any other local rules and regulations having jurisdiction.

.3 All concealed or buried piping shall be welded, vented and protected as required by the Gas Company. No such piping shall be installed or concealed until approval is obtained from the Gas Company.

.4 All gas piping to be painted and identified by this Section as required by Code.

3.16 COMPRESSED AIR

.1 Provide new compressed air piping Connect into control compressed air main where indicated and provide all piping from this point to all equipment and systems as needed.

.2 Piping shall be type "L" copper pipe with 95/5 soldered fittings. Install tees with 12mm 1/2" globe valves for draining at all low points in the system.

.3 Alternatively, Sch 40 steel piping may be used.

.4 Provide dryers and liquid separators before connection to any equipment.

.5 Provide drip leg at all low points before CA branch piping take-off to equipment.

3.17 THERMAL INSULATION

.1 Refer to Insulation Section of Mechanical specifications for general requirements along with the requirements noted below specifically for this section. Strickest of the two shall apply where applicable and in conflict.

.2 Domestic cold water piping, domestic hot water piping, shall be covered with fibreglass pipe insulation 25mm (1") thick ASJ. Insulation shall be complete with factory applied fire resisting vapour barrier jacket. Vapour barrier jackets shall be adhered at longitudinal laps and joint seal strips with fire resisting vapour barrier lap cement. For concealed piping, insulation is to be held in

place by bands (or wire) space at 300mm (12") centres. Fittings shall be insulated with insulating cement or fibreglass blanket with a layer of insulating cement, and finished with canvas. Cold water fittings shall be additionally vapour sealed with vapour barrier lap cement and canvassed. Insulation at hanger points shall be carefully vapour sealed in a similar manner.

.3 Soil waste and rainwater piping shall be similarly covered. Only vertical runs of single pipe concealed tight in small wall chases where no free air motion can occur to cause sweating, need not be insulated.

.4 Insulate all Hot Storage Tanks with 40mm (1 5/8") thick Fibreglas AF454.

.5 The insulation shall be cut or mitered where necessary to fit the shape and contour of the equipment. The insulation shall be banded or wired in place on 300mm 12" centres or impaled over pins on 450mm 18" centres. Point up all open joints with insulating cement.

.6 Apply 25mm (1") hexagonal mesh over insulation, lacing edges together. Apply 12mm (1/2") thick coat of insulating cement and trowel to a smooth finish. Adhere canvas over the cement with an approved lagging adhesive. Size canvas with one additional coat of same adhesive.

3.18 TESTING

.1 All water piping shall be tested to a pressure of at least 1050kPa or 2.5 times the system operating pressure whichever is greater.

.2 All drains shall be tested for tightness and grade as required by the Ontario Building Code and local authorities.

.3 All tests shall be made before the application of pipe covering and all concealed pipes shall be tested before being covered up. Underground drains shall be tested before backfill is placed.

.4 Any tests required by the Architect Consultant during the progress of the work or at its completion, shall be made without cost to the Owner. Such tests shall be carried out solely for the purpose of determining if the work as actually installed meets specified requirements.

.5 All tests must last at least 2 hours and if leaks develop, these must be corrected and the test repeated to the satisfaction of the Engineer and the local authorities.

.6 Caulking of threaded joints shall not be permitted, faulty piping shall be replaced with new pipe and fittings.

.7 Notify the Architect Consultant and the local Plumbing Inspector of all tests and conduct same to their satisfaction and in the presence of their

representatives. Provide all labour and equipment for tests and conduct same. Repeat tests until system is shown to be leak-tight and in proper working condition, all to the satisfaction of all inspectors having authority.

3.19 FIXTURE INSTALLATION AND SUPPORTS

.1 Supply, install and connect up complete all plumbing fixtures shown on the Drawings. Protect all fixtures until the building is accepted by the Owner.

.2 All wall hung plumbing fixtures shall be supported by wall brackets. The bolts for these brackets are to be carried through the wall and through a steel plate 150mm (6") wide, 3mm thick and full length of bracket, plus 50mm (2") or to suit studs on wall.

.3 Water closets shall be set in mastic to prevent water on floor from entering space between floor and bowl or pipe sleeve.

3.20 STERILIZATION OF POTABLE WATER SYSTEM

.1 Before placing into service, chlorinate the potable water piping system by injection of mixture of 5% calcium hypochlorite and 95% water thoroughly mixed from paste form to full mixture.

.2 Inject the mixture into the mains in such a manner as to ensure treatment of the entire line.

.3 Retain a dosage of 50 p.p.m. in the line for 4 hours after which a residual of 5 p.p.m. minimum should be obtained.

.4 When a pipe line is already filled with water, inject a concentrate chlorine mixture at intervals along the pipe line. The retention period in this case shall be 8 hours.

.5 Operate all valves during chlorination so that they will be sterilized in the procedure. After chlorination period flush out the lines at extremities until water tests are equal, chemically and bacteriologically to those of the source of supply.

END OF SECTION

ARTICLE NAME **PAGE**

SECTION 23 20 00
HEATING AND COOLING

PART 1 GENERAL

1.1 REFERENCE

.1 Basic Mechanical Materials and Methods forms an integral part of this Section.

1.2 INTENT

.1 Provide all material, equipment and labour required for a complete heating system and cooling system as shown on the drawings and as described herein.

1.3 WORK UNDER OTHER SECTIONS

.1 Inside Plumbing and Drainage Section will provide hub, floor and funnel drains. Inside Plumbing and Drainage Section will provide domestic cold water piping to all equipment in the boiler room, fan rooms, equipment rooms, etc. Cooperate with Inside Plumbing and Drainage Section in properly locating and arranging all such connections.

.2 Thermal insulation - under Mechanical Insulation.

.3 Automatic control valves will be supplied under - Controls, but shall be installed under this Section.

1.4 SHOP DRAWINGS

.1 Refer to General Section for details regarding shop drawing submission requirements.

.2 Submit Shop Drawings for the following:

.i Pumps

.ii In-Line Circulators

.iii Heat Generators

.iv Condensers and Condensing Units

.v Water Chillers

.vi Heat Exchangers

.vii Packaged Air Conditioners
.viii

.ix Fan-Coil Units

.x Metal Hose Connections

.xi Air Cushion Tanks

.xii Water Treatment

.xiii Antifreeze Mixing and Feeding System

PART 2 PRODUCTS

2.1 PIPE

.1 Unless otherwise specified, piping shall be as follows:

.i Hot water heating piping, glycol piping, chilled water piping, steam & condensate piping shall be new, standard weight steel pipe, C.S.A. Specification B-63-1949 Grade B Schedule 40.

.ii Steel pipe 50mm 2" and under shall be butt welded. Pipe 60mm 2 1/4" and over shall be electric resistance welded.

.iii Domestic water piping and drain lines from ducts, plenums, hoods, shall be type "L" hard drawn copper tubing.

2.2 FITTINGS

.1 All elbows on any steel piping where welding is employed, shall be of the prefabricated type, Tube-Turn or equal. Long radius elbows shall be installed where pipe bends are used to take up expansion.

.2 All screwed fittings in steel piping shall be minimum 1050kPa class. All welding fittings shall be standard weight where used with Schedule 40 pipe. They shall be extra heavy where used with Schedule 80 pipe.

.3 All fittings used with copper pipe shall be wrought copper streamline fittings. Where it is necessary to connect threaded pipe to copper tubing, use unions or flange connections similar to Epco "Di-Electric" pipe fittings.

.4 All fittings used in connection with red brass I.P.S. pipe, shall be screwed and of cast bronze.

2.3 MECHANICAL JOINT PIPING

.1 Grooved mechanical joints may be used in lieu of welded flanged or screwed joints in chilled water, condenser water, glycol systems in mechanical rooms only. Piping in all other areas shall be welded and/ or threaded for sizes stipulated earlier in these specifications.

.2 Acceptable suppliers are Victaulic Couplox and Grinnell. Use the following Victaulic materials or equivalent in Grinnell:

.i Butterfly Valve: Model 700 Series, VIC 300.

.ii Valve support couplings: Style 07 Zero flex. Such couplings shall be used in all equipment rooms.

.iii Strainer: Style 730.

.iv Check Valve: Style 715, 711, 716.

.v Suction Diffuser: Style 731.

2.4 VALVES

.1 Valves shall be Jenkins, Crane, McAvity, Red & White or Lunkenheimer - Morrison manufacture. Butterfly valves shall be Jenkins, Keystone, Victaulic or Grinnell.

.2 Valves shall be suitable for the operating pressures of the system in which they are installed.

.3 Generally valves shall be gate valves with wedge discs, except for valves used in by-pass service around control and pressure reducing valves, or where otherwise shown and/or specified, where globe or angle valves shall be used.

.4 Valves 20mm 3/4" and smaller shall be globe type, or where used for on-off operation may also be ball type.

.5 Balancing valves shall be lockshield type globe, angle, or butterfly valves.

.6 Gate Valves

.i 50mm 2" and smaller shall be Jenkins Fig. 810 for screwed ends; Jenkins Fig. 813 for soldered ends.

.ii Ball valves may be used in lieu of gate valves in 50mm 2" size and smaller, Jenkins Fig. 33 for screwed ends and Fig. 34 for soldered ends.

.iii 60mm 2 1/4" and larger shall be Jenkins Fig. 454.

.7 Globe Valves

.i 50mm 2" and smaller shall be Jenkins Fig. 106-B or 108-B; Jenkins Fig. 106-B-P or 108-B-P for copper pipe.

.ii 60mm 2 1/4" and larger shall be Jenkins Fig. 142.

.8 Butterfly Valves

.i Butterfly valves may be used in lieu of gate and globe valves for size 60mm 2 1/4" and over.

.ii Size 60mm 2 1/4" to 125mm 5" - Jenkins Fig. 2232EL lug type with bronze disc and EDPM liner and lever operated.

.iii Size 150mm 6" and over, as above with gear operator Jenkins Fig. 2232EG.

.9 Check Valves

.i Size 50mm 2" or smaller, Jenkins Fig. 4092 screwed ends; Fig 4093 soldered ends.

.ii Size 60mm 2 1/4" and larger, Jenkins Fig. 587.

2.5 UNIONS AND FLANGES

.1 Unions in copper pipe, 50mm 2" diameter and smaller, shall be wrought copper with ground joints, and with soldered connections. For 60mm 2 1/4" and 75mm 3" copper pipes, unions shall be brass ground joints. For copper pipes larger than 75mm 3", flanges shall be 1050kPa cast brass.

.2 Unions in steel pipe 50mm 2" and smaller shall be brass to iron ground joint. For steel pipe 60mm 2 1/4" and larger, flanges shall be 1050kPa steel slip on type.

.3 Gaskets for cold water service shall be 1.6mm red rubber. Gaskets for other services shall be 1050kPa 1.6mm of material suitable for these services.

.4 Bolts for flanges shall be carbon steel, A.S.T.M. A-107.

2.6 METAL HOSE CONNECTIONS

.1 Metal hose vibration absorbers shall be Flexonics RW 91, bronze braded assemblies with close pitch corrugations and 1050kPa 2.1MPa working pressure. Use screwed connections for sizes up to 60mm 2 1/4", flanged connections for larger sizes. Vibration absorbers with screwed connections shall have a union nut and nipple at one end. Hose live length shall be 300mm 12" for sizes up to 50mm 2", 450mm 18" for sizes 75mm 3" to 125mm 5", and 700mm 30" for larger sizes.

2.7 AIR CUSHION TANK

.1 Expansion tank shall be sized as shown on drawings and shall meet the requirements of the Ministry of Commercial and Consumer Relations and

A.S.M.E. for a working pressure of 860kPa.

.2 Tanks shall be pre-pressurized bladder type with initial charge of minimum 35PSI as the minimum operating pressure at top of the building.

.3 Tank shall be complete with manual air vent, sight glasses, drain valve and relief valve.

2.8 CHILLER WATER CIRCULATING PUMPS

.1 Pumps shall be vertical in-line B&G/ XYLEM type and Motor HP more than 2HP shall be with outside mechanical seal and split type spacer coupling to permit servicing the seal without disturbing pump or motor or electrical wiring.

.2 Each pump system (operating & stand by) shall be provided with an automatic lead/ lag switch over system with local Audio/ Visual alarm with silencing switch on the lead pump failure to start or fail after start up for each of the pump systems. Back Up pump shall start automatically.

.3 Pumps shall have radially split casings. They shall be single stage centrifugal type with cast iron casing, bronze impeller and stainless steel shaft. Pumps shall be suitable for a maximum working pressure of 860kPa.

.4 The driving motor shall be of the vertical, solid shaft, normal thrust, "P" base, squirrel cage induction type.

.5 The complete pumping unit, including the seal, shall be suitable for the service shown in the pump schedule. The pump manufacturer shall conduct running tests to verify the conditions of head and capacity specified.

.6 Pump casings shall have renewable bronze casing and/or impeller wear rings on both sides of the impeller.

.7 Inlet and discharge ports shall be flanged. All pumps shall have such performance characteristics that the motor will not be overloaded at low head conditions, nor will the pump develop excessive head at low flow conditions. Impeller diameter shall be not larger than 85% of maximum allowable for a particular casing size. Velocity in discharge nozzle shall not exceed 3.5m/s.

.8 Impellers shall be enclosed bronze, dynamically balanced.

.9 Approval information shall include characteristic curves, power, head, capacity data and general construction details.

.10 Pumps shall be suitable for continuously circulating water at temperatures between 4 C and 100 C at 700 kPa suction pressure.

.11 Pumps shall be B&G, Armstrong or approved equal.

2.9 SELF PRIMING PUMPS

.1 Pumps shall be base mount Gorman Rupp type and Motor HP more than 2HP shall be with outside mechanical seal and split type spacer coupling to permit servicing the seal without disturbing pump or motor or electrical wiring.

.2 Each pump system (operating & stand by) shall be provided with an automatic lead/ lag switch over system with local Audio/ Visual alarm with silencing switch on the lead pump failure to start or fail after start up for each of the pump systems. Back Up pump shall start automatically.

.3 Pumps shall have capacity to draw water from tank at a suction of up to 10feet and flow through the building loop to the equipment. Pumps shall be suitable for a maximum working pressure of 860kPa.

.4 The complete pumping unit, including the seal, shall be suitable for the service shown in the pump schedule. The pump manufacturer shall conduct running tests to verify the conditions of head and capacity specified.

.5 Inlet and discharge ports shall be flanged. All pumps shall have such performance characteristics that the motor will not be overloaded at low head conditions, nor will the pump develop excessive head at low flow conditions. Impeller diameter shall be not larger than 85% of maximum allowable for a particular casing size. Velocity in discharge nozzle shall not exceed 3.5m/s.

.6 Approval information shall include characteristic curves, power, head, capacity data and general construction details.

.7 Pumps shall be suitable for continuously circulating water at temperatures between 4 C and 100 C at 700 kPa suction pressure.

.8 Pumps shall be Gorman Rupp pumps or PRE approved equal only.

2.10 VACUUM LIQUID PUMPS

.1 Supply and install two Travainni PSF TERSE vacuum pumps with flow capacity and vacuum rating as noted on the drawings. Pumps shall be one on and one strand by with lead/ lad pump control panel to lead lag as well start lag pump on lead pump failure and alarm at the controller.

.2 Provide pump pressure gauges, temperature gauges on piping, controls, pressure sensors, all related controls and one point connection to the pump skid to maintain set suction vacuum pressure to draw chilled water through the equipment at controlled level.

.3 VFDs on pumps will be set to design pressures and flows to suit site conditions and locked at the point..

.4 Only specified product will be used. Alternates are not allowed.

2.11 IN-LINE CIRCULATORS

.1 Line circulators up to 2HP motor size of B&G/ Xylem or equal shall be of iron construction with brass impellers, bronze sleeve bearings, mechanical seal, spring type coupling, direct driven at 1750 R.P.M. by standard protected type motor. Pumps shall be suitable for continuous circulation of water at temperatures up to 100 C. Provide an Automatic Switchover Panel with local Audio/ Visual Alarm on lead pump failure and back-up pump start up for Dual Pump Systems only.

.2 Line circulators shall be equal in B&G, Armstrong or approved equal.

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2.12 GAS VENTS

.1 Provide Metalbestos or equal mm dia. vents for each boiler, as required by the boiler manufacturer, through roof, complete with weather top, cone flashing, storm collar and all other necessary fittings to make a complete installation. For High efficiency boilers, provide combustion air and flue gas vents through the wall or roof as noted on the drawings.

.2 Supply and install all necessary structural steel hangers, etc., for the breechings.

2.13 REFRIGERATION CHILLER EQUIPMENT

.1 Provide a complete roof top package air cooled liquid chilling refrigeration system.

.2 Chiller shall be REFPLUS industrial grade, heavy duty performance for year round process cooling chilled water requirements.

.3 Chiller shall be 100 ton capacity, 270GPM flow rate at 6 deg C chilled water leaving temperature and 51 deg C condensing temperature with 40% propylene glycol solution. Chiller shall be equipped with systems to operate up to minus 22 C outdoor conditions.

.4 System shall be capable of operating down to -22 deg C outdoor temperature. Provide head pressure controllers, baffles, accumulator and low ambient accessories for each circuit .

.5 Chiller shall be multiple compressor type, three compressors minimum and final capacity step not more than 25% of full load. Construction and ratings shall meet latest A.R.I. Standard 950, ANS B9.1, NEC and applicable A.S.M.E. codes.

.6 Compressors shall be serviceable hermetic type, mounted on spring vibration isolators, vibra absorbers in refrigerant piping, check valves for remote condensers and equipped with crankcase heaters to control oil dilution during

shutdown.

.7 Factory installed circuit breakers shall open all phases on overload in any phase.

.8 Cooler shall be shell and tube type with removable heads, insulated and with vapour barrier.

.9 Include control transformer, chilled water flow switch and gauge panels with suction and discharge gauges for each circuit and all accessories for a packaged installation on roof.

.10 Provide refrigerant piping between chiller and condenser using Type L hard drawn copper with forged refrigeration fittings and Silfos solder. Size refrigerant piping for a total pressure drop of 1.1 deg C. Provide the initial charge of Freon and the necessary makeup during the warranty period. Chiller unit shall have a 5 year warranty.

.11 Provide a complete unit mounted built-in control panel wired and completely standalone operation to monitor and set chiller set points, system status, faults and alarms and archival information.

.12 Also provide a remote control sensor, to be mounted in Heat Exchanger room below to monitor chiller status, start-stop, set point adjustments, alarms history and other data.

.13 Provide complete fill of a 40% propylene glycol and 60% water fix in the system. Also provide one spare 50 gallon tank of propylene glycol for refill.

2.14 ANTIFREEZE HEAT EXCHANGER

.1 Shell and Tube Heat exchangers for cooling of the glycol mixture with chiller water and plant process water r shall provide chiller water to 40% propylene glycol water heat exchange in a 2 Pipe Building cooling system as noted on the drawings. (see drawings for further details).

Chiller EWT & LWT	(43-53ºF)	40% Propylene Glycol
Process/Plant EWT & LWT	(55-45ºF)	Water

Flow Rate 240 GPM AS PER SCHEDULE ON DRAWINGS.

Pressure Drop 7 feet Max.

.2 Heat exchanger shall be ITT, Armstrong or equal in Alfa Laval,

2.15 ANTIFREEZE FEEDER

.1 Provide a self regulating pressure controlled glycol feed system with 55 gallon tank, 120V pump, pressure gauges, controls, safeties, equal to Axiom or

approved equal SF100 commercial grade feeder.

.2 Glycol feed system will be Axiom SF 100 with complete packaged controls and one point connection.

.3 Provide a 50 gallon propylene glycol tank as spare for future in the chiller pump room. ,

2.16 FAN COIL UNITS

.1 Ceiling mounted horizontal fan coil heating and cooling units shall be Trane or Carrier 42 CE and filter or approved equal. Install DX coil along side the 2- pipe switch over heating and cooling coils only where noted. Coils shall be four row. Pipe condensate to drain.

.2 Concealed ceiling fan-coil units shall be Trane or Carrier 42CE, complete with remote wall mounted electronic programmable thermostat to control the fan and to energize/de-energize the unit. Filters shall be in the return grille provided under Ventilation, Heating and Air Conditioning Section. Cooling coil shall be four row.

.3 Thermostats in corridors, lobbies and other public areas shall have protective guards and locking devices.

2.17 BASKET STRAINER AND MICRON BAG FILTERS

.1 Supply and install two 25 micron or better 316 stainless steel housing bag filters of 270 gallon/ minute 10 degree celcius chilled water flow rate for each filter and bag filters. Pumps shall draw water from tanks to the heat exchanger HE-1, complete with chemical feeders, isolation valves, filter pressure gauges and accessories.

.2 Provide isolation valves and chemical treatment for the open loop system to minimize the clogging and fouling of the HE-1 tubes.

.3 System shall be equal to Rosedale Products, Duplex Basket Strainer and filters Model 8 , 12” dia,, 6” dia flange connections, 270GPM flow each (max 440Gal Capacity each), 30” two basket depths, standard bags, 9 feet pressure drop, operating pressure 125psi max, all standard accessories, valves, gauges, butterfly design, .

.2 Provide 24 cartridges as spare after initial start up of the system.

2.18 WATER TREATMENT

.1 Provide a complete system of water treatment for the systems specified herein, to control scale, corrosion, microbiological fouling. The program shall be administered by the chemical supply company, who shall provide installation

drawings and on-site supervision.

.2 It shall be the responsibility of the chemical supply company to instruct the operating personnel before acceptance of the installation by the Architect Consultant. Copies of written instructions of the treatment dosages, control charts and test procedures shall also be provided.

.3 he water treatment supplier shall provide 6 service calls (1 every 2 months) during the first year's operation. Each call shall include tests of all pertinent systems. The specific amounts of chemicals, and the type of chemical shall be supplied as specified.

.4 The systems to be provided with chemical feed equipment and chemicals are:

.i Open loop Chilled water system

.ii Open loop vacuum pump chilled water system

.iii Closed loop Glycol Chilled Water System

.5 This division shall be responsible for the supply of chemicals, and for the cleaning and flushing of all water systems. All chemicals, chemical feed systems, test equipment and system administration shall be provided by the chemical supply company. Chemicals and chemical feed equipment shall be as supplied by Dearborn Chemical Company Limited.

.6 Provide two separate pre-fabricated, wall mounted chemical feed and bleed-off systems, for the prevention of scale and corrosion in the open recirculating water system. The systems shall feed a non-acid type of scale and corrosion inhibitor.

.7 Supply and install two water treatment systems, one system for closed loop and second for open loop chilled water system. Each System shall consist of the following components:

.i PVC mounting panel of 610 mm x 457 mm x 10 mm dimensions, with four bolt holes, suitable for wall mounting.

.ii Magnetic impulse solenoid pump with manual stroke length adjustment and stroke frequency adjustment from contact head water meter. The pump shall also have a manual stroke frequency override. The pump shall be rated at sufficient capacity to feed required chemical at system pressure and be complete with suction line, foot valve, and injection fitting a discharge hose.

.iii System shall include contact head water meter calibrated for one litre per impulse. The meter shall be of bronze construction with four digit totalizer.

.iv Predetermining counter/timer to receive contact closure signal from

contact head water meter, and activate integral timer for pre-set time interval. The counter/timer shall be capable of counting the next set of contact closures while timer is activated from previous cycle. The counter/timer shall have an override option to be activated by an input from a conductivity monitor.

.v Solenoid valve, normally closed, to be energized by the predetermining counter/timer.

.vi Unit shall be complete with piping, valves and solenoid valve sized to suit system requirements for makeup and bleed-off and shall be pre-wired and piped to make a complete and operable system.

.8 The inlet to the water meter shall be connected to the makeup water supply line, and the outlet from the meter shall be connected to the supply line to the cooling tower. The inlet to the solenoid valve shall be connected to the bleed-off line from the system, and the outlet from the solenoid valve shall be connected to the drain. The water meter will register each litre of water passing through it, and shall operate the chemical pump one stroke per impulse. The pulse counter will count the pulses and provide a signal to open the solenoid valve at a predetermined number of pulses. The chemical pump shall have the capability to be operated independently of the water meter if desired. The biocide injector shall be connected to the water recirculating water supply and return lines. When the timer opens the normally closed solenoid valve, biocide will be introduced into the condenser water system.

.9 The biocide feeder shall consist of the following components.

.i PVC wall mount panel, 229mmx457mmx10mm, with four bolt hole suitable for wall mounting

.ii 13mm 1/2" brass eductor

.iii 7 day programmable electronic timer with maximum 10 open/close cycles per week

.iv two 13mm 1/2" solenoid valves, energized to open, on suction side of eductor

.v two 13mm 1/2" PVC throttling valves

.10 Provide 205 litres phosphonate-polymer scale and corrosion inhibitor.

.11 Provide 22 litres algaecide

.12 Provide 22 litres alternate algaecide

.13 All biocide provided for control of algae, slime or other microbiological growth shall be registered under the Canada Pesticides Control Act.. No non-registered

biocide shall be acceptable. Vendor must provide registration number with approval drawings.

.14 Provide the following testing equipment for each system:

.i One (1) only, test cabinet

.ii One (1) only, test kit for "P" Alkalinity and Chloride.

.iii One (1) only, test kit for determination of scale inhibitor level.

.15 Supply and install two bypass type chemical feeders, one for the closed loop and second for the open loop Chilled Water System type "HV" by-pass feeders. Each feeder shall have a capacity of 2 USG (7.6 litres) and shall be of steel construction with a working pressure 300 PSIG (2068.5 k Pa). Feeder shall be complete with valve kit containing isolating valves and drain valve.

.16 Supply and install on each Chilled Water, a Filterite medium flow filter. The filter shall be Model 6CM2-1 1/2. Filter cartridges shall be capable of removing suspended solids of250 micron size. Supply 30 cartridges.

.17 Provide sufficient Molybdate - type corrosion inhibitor to raise initial Molybdenum level to 60-80 ppm in system water.

.18 Provide additional 25. I.G. (114 litres) DEARBORN 545.

.19 Provide the following testing equipment for each system.

.i One (1) only Dearborn type "T" test cabinet

.ii One (1) only Test Set for Molybdenum

.20 Provide all wiring from outlets provided by the Electrical Contractor, starters, and relays for a complete installation.

2.19 TANK FLOAT LEVEL CONTROL SYSTEM

.1 Supply and install one level control system, float control or equal in electronic level meter to open and close domestic water valve to maintain constant water level in the tanks at all time. of chemical to be added after the system has been cleaned, flushed out and tested.

.2 Float control shall be set up initially to maintain water level at a set point. Mark in indelible ink the level on the tank wall for future reference.

2.20 COOLING SYSTEM WATER TREATMENT

.1 Supply and install for the cooling system one LP chemical pot feeder complete with filter pad valves and 25 micron bypass filter. Include initial charge of

chemical to be added after the system has been cleaned, flushed out and tested.

.2 Provide one drum 25 gallon drum supply of chemicals and two 6 monthly testing and filling by the chemical company for the warranty period.

.3 provide a complete test kit and train staff for the water testing on site and maintain the chemical levels in the pipes.

PART 3 EXECUTION

3.1 INSTALLATION OF PIPING

.1 Steel pipe 50mm 2" and larger shall have welded joints. At connections to apparatus, valves, at convenient points in long runs of piping and at connections to risers, flanges or unions shall be installed. Locate piping in a manner to allow all valves serving one area to be serviced through one access door such as Hotwater/ Chilled water risers etc. All valves shall be in corridors for access and servicing.

.2 Steel pipe less than 50mm 2" size may be welded or assembled using screwed fittings. All reducing fittings in horizontal pipe shall be eccentric.

.3 Approved grooved couplings, Victaulic or equal, may be used for assembly of steel pipe, instead of welding.

.4 Oil piping of all sizes shall be welded throughout.

.5 Water piping shall slope up in direction of flow 0.25%. Branch piping shall have greater slope.

.6 Piping shall be reamed and cleaned before assembly. It shall be installed straight and true with uniform grade.

.7 Piping shall be reamed and cleaned before assembly. It shall be installed straight and true with uniform grade.

.8 Piping shall not touch the structure, sleeves, other piping, conduits or equipment at any point, save at the necessary connections. This shall be observed carefully to avoid transmission of noise.

.9 The runs of mains and details of connections are shown on the Drawings.

.10 All welding shall be performed by first class certified welders.

.11 Risers shall be valved where they connect to the mains, and in addition supply and install 20mm 3/4" drain valves with hose end at the base of all risers. In cases where there are no down-feed risers, or connections, the drain valve shall be between the shut-off valve and the heel at the riser. In cases where there are down-feed connections from the riser runouts below the level of the main, all

piping shall grade in such a manner that the up- and down-feed risers and branch connections shall drain to the drain valves installed at the lowest points in the piping.

.12 Provide drains at all low points in piping systems terminating with a plugged gate valve.

.13 rovide overflow and drain piping from apparatus to hub, floor and funnel drains.

.15 Where either mains or branches are less than 150mm 6", weld branch connections directly into the main pipe run if the main is 50mm 2" or larger and at least one pipe size larger than the branch, otherwise welding outlet fittings or prefabricated welding tees must be used. Where branches are welded directly into the main pipe run, openings must be cut true and bevelled, and any branch pipes must not be allowed to project inside the main pipe. Openings into mains must not be cut large enough to permit entry of welding metal and slag within the pipes.

.16 For all connections between mains and branches where both are 150mm 6" or over, use welding tees.

.17 Joints between copper pipes shall be made with copper to copper couplings soldered. No copper material shall be in contact with ferrous material. Solder shall be 95/5 tin antimony.

.18 For all changes in pipe sizes and connections to valves and equipment other than pipe size, use eccentric reducers for air elimination and proper grading of pipe.

.19 Valves shall be installed so as to be readily accessible for servicing and repacking. Valves installed in locations where operation is difficult shall be provided with extension spindles or operating chains, sprockets and guides.

.20 Provide flanges or unions at all equipment requiring servicing and/or replacing.

3.2 SAFETY RELIEF VALVES

.1 Safety relief valves shall be installed where required and in accordance with the A.S.M.E. Boiler and Pressure Vessel Code and all other Codes and authorities having jurisdiction.

.2 Run discharge lines from discharge elbow and safety valve independently of any other drain lines to nearest hub drain.

3.3 AIR VENTS

.1 Provide for each up-fed hot water heating element a 25mm 1" by approximately 150mm 6" air chamber with screwdriver operated air vent piped for easy access. These shall be installed in such a manner that they will not interfere

with the operation of the dampers. Provide slots in dampers for this purpose.

.2 Provide a similar air vent for each force flow heater and unit heater.

.3 In addition, provide a #37 Maid-O-Mist automatic air vent on the return end of all hot water heating elements located on the top floor.

.4 At down fed heating elements where piping is installed in such a manner that there are no air pockets in the piping and elements, the air vent assemblies may be omitted.

.5 At the high point in piping leaving boilers provide S.A. Armstrong VortexAir Separator Model VA, a full pipe size air chamber at least 5 pipe diameters high. Connect the top of the air chamber air separator to the thermal expansion tank or provide it with a Sarco Type 13WN automatic air vent piped to nearest open drain.

3.4 METAL HOSE CONNECTIONS

.1 Provide vibration absorbing metal hose connections in supply and return piping of air supply units. Suction and discharge pipes of circulating pumps.

.2 Firmly support or anchor piping near metal hose connections to prevent swaying of pipe.

3.5 BOILING OUT OF SYSTEMS

.1 After all the piping of the hot water heating system has been flushed out and thoroughly cleaned, chemically clean the system by introducing Bird Archer GQ-75 boiling out chemical at the rate of 40g/L of water. Circulate at approximately 66 C for 24 hours.

3.6 AUTOMATIC FEED ANTIFREEZE SYSTEM & ACCESSORIES:

.1 Supply and install a complete antifreeze system piping loops. Provide the initial charge of 40% propylene glycol to 60% water mixture to fill the system. Propylene glycol shall be as manufactured by Dow Chemicals, of type and with inhibitors as recommended by the manufacturer. Supplier of glycol shall warrant the glycol and inhibitors for two years and he shall include a service contract for two years. Also provide a 50 Gallon spare glycol tank at each system.

.2 Provide glycol circulating pump, expansion tank, filling tank, etc., as shown on drawings. Ensure positive air venting of all parts of the system.

.3 For filling of the system provide a completely automatic glycol feed system equal to SA Armstrong self-contained automatic glycol feed system , 50 USGal tank, 5.0 USGPM at 60 psi, 0.5 HP motor / 120V, complete with check valve and shut off valve in discharge, drain valve at bottom and fill connection at top, complete with a funnel. Set up the controls and demonstrate.

3.7 INSTALLATION OF CHILLER

.1 Provide units on a flat surface level within 1/8 inch and of sufficient strength to support concentrated loading with isolation spring assemblies under the units.

.2 Provide components furnished as per manufacturer's literature.

.3 Provide all water piping so units and water circuits are serviceable, without having to dismantle excessive lengths of pipe.

.4 Provide valves in water piping upstream and downstream of the evaporator and condenser water boxes for isolating shells for maintenance and to balance and trim system.

.5 Provide vapour proof flow switches in both the chilled water and condenser water piping properly interlocked to ensure that units can operate only when the flow is established.

.6 Provide wells and taps for thermometers, sensors and pressure gauges in water piping adjacent to inlet and outlet connections of evaporators and condensers.

.7 Provide drain valves to each water box piped to glycol feeder..

.8 Provide vent cocks to each water box and pipe to glycol feeder.

.9 Provide strainers ahead of all pumps and automatic modulating valves.

.10 Provide all necessary auxiliary water piping, for oil cooler and purge condenser in accordance with manufacturers recommendations.

.11 Provide pressure relief piping from pressure relief rupture disc to outside (according to CSA Standard B52-M1977).

.12 Provide certified wiring schematics to the electrical division for chiller, associated equipment and controls.

.13 Provide necessary wiring for control items, such as flow switches, temperature sensors etc., as recommended by the manufacturer.

.14 Provide necessary power wiring from starter to chiller control panel for control power transformer, purge motor, oil pump motor, oil heater, motor protection system, etc. as recommended by the chiller supplier.

3.8 PRESSURE WELDING

.1 Welding of pressure piping shall be carried out by welders certified for this work, all to the approval of the Provincial Authorities having jurisdiction over such work. No covering shall be applied before the inspections are carried out. Notify

authorities having jurisdiction, supply them with the necessary plans and pay all charges incurred in the inspections.

3.9 CONDENSATION UNITS

.1 Install unit where shown, make all condensate return and pump discharge connections and extend a vent to atmosphere. Carry a trapped overflow to nearest open drain.

3.10 HEAT EXCHANGERS

.1 Installation

.i Install heat exchangers level with shims under supports.

.ii Arrange piping around plate and frame heat exchangers to allow plate and gasket removal and re-assembly.

.iii Arrange piping around shell and tube heat exchangers to allow tube bundle removal by disconnecting two unions or flanges adjacent to head.

.iv Make piping connections to shell and tube heat exchangers and provide:

.a NPS 1 1/2 drain on water space.
.b NPS 1/2 vacuum breaker on steam space.
.c pressure relief valve, minimum size NPS 3/4 on water space, sized for capacity of heat exchanger.

.v Heat exchangers to be installed in vertical position.

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END OF SECTION

ARTICLE NAME **PAGE**

SECTION 23 70 00
VENTILATION, HEATING AND AIR CONDITIONING

PART 1 GENERAL

1.1 REFERENCE

.1 Basic Mechanical Materials and Methods forms an integral part of this Section.

1.2 INTENT

.1 Provide all material, equipment and labour as required for complete systems of ductwork and equipment for ventilation, heating, and cooling of the various areas of the building.

1.3 WORK UNDER OTHER SECTIONS

.1 Thermal insulation - under Mechanical Insulation.

.2 Refrigeration piping, refrigerant and testing of refrigeration system - under Refrigeration.

.3 Gas piping, domestic water piping and drains - under Inside Plumbing and Drainage.

1.4 SHOP DRAWINGS

.1 Refer to General Section for details regarding shop drawing submission requirements.

.2 Submit Shop Drawings for the following:

.i Rooftop units

.ii Condensing units

.iii Gas vents

.iv Fans

.v Grilles and diffusers

.vi Automatic controls

.vii Fire dampers

.viii Storm louvres

PART 2 PRODUCTS

2.1 ROOFTOP HEATING AND AIR CONDITIONING UNITS

.1 Supply and install complete package type rooftop self-contained air cooled units where shown on drawings. Units shall consist of compressor, condenser, evaporator, gas fired furnace where indicated, electric ignition, filters, motors, controls, compressor and fan contactors, thermal overloads and to give fan speed adjustable for l0% increase or decrease in speed from rated. Unit shall be completely weather proofed for outdoor installation and shall be internally insulated at the factory.

.2 Unit shall be supplied with a roof mounting curb, 18” high, with a nailing strip.

.3 Unit shall be complete with a power saver. Power saver shall have 100% exhaust air damper and relief section, and shall have adjustable outdoor air thermostat to lock out compressors on economizer control.

.4 Compressor(s) to have extended 5 year warranty.

.5 Each unit shall be complete with trapped condensate drain which shall spill onto roof. Include extension to drain if required so drain does not spill on flashing.

.6 Each unit shall be complete with programmable heating/cooling thermostat with sub-base with fan, off, auto and heat, auto, night set back etc., wiring required for low voltage temperature control.

.7 In the unoccupied position fresh air dampers shall close and the unit shall operate on 100% recirculated air to maintain set back space temperature.

.8 Size and fan characteristics for each unit shall be as specified in Fan Schedule.

.9 Unit shall be of Lennox, Carrier, Trane or York manufacture.

2.2 SPLIT SYSTEM AIR CONDITIONING UNIT

.1 Supply and install a complete split system air conditioning unit including condensing unit (roof mounted), cooling coil, electric heating section, interconnecting refrigerant piping, drain line and refrigerant, size and type as indicated on drawing. Include thermostat and associated wiring and interlock wiring between fan coil and condensing unit. Include 7 day timer which shall control unit in same manner as rooftop unit. Include necessary transformers for low voltage control. Control wiring by this Section.

.2 The compressor shall have an extended 5 year warranty.

.3 The refrigerant lines shall be sized for a total of not more than 14kPa pressure drop.

.4 Supply and install sight glasses for all liquid lines. Supply and install Sporlan liquid line strainers ahead of each thermovalve. Supply and install Sporlan solenoid and Sporlan thermovalve for each inlet. Suction lines shall be properly

looped in order to allow the return of oil to the compressor.

.5 All refrigerant pipe shall be type "L" nitrogen charged ACR grade copper with forged brass refrigeration fittings. Elbows must be of long radius type. Joints between copper pipes shall be made with copper to copper couplings, soldered using Silfos. No copper material shall be in contact with ferrous material. All refrigerant valves shall be Henry packed globe valves with wing type sealed cap. Valves shall be cast bronze.

.6 The Contractor shall supply and install the required number of C-19211 Sporlan "Catchall" driers for the systems.

.7 Base unit Mitsubishi, Sanyo, Fijitsu or approve equal.

2.3 AIR CONDITIONING UNIT

.1 Supply and install a self-contained air conditioning unit. Provide a matching outdoor air cooled condenser. Unit shall include refrigeration compressors, fan, cooling coil, air filters, refrigeration piping and necessary controls. Provide interconnecting liquid and hot gas refrigerant piping between the unit and the roof mounted air cooled condenser. Include remote mounted programmable thermostat, automatic heat cool and fan control. Provide transformer for low voltage control, control and interlock wiring between unit, condenser, return air fan, electric heating coil and thermostat. Provide a seven day timer to start and stop unit.

.2 Compressor(s) shall have extended five year warranty.

.3 All refrigerant pipe shall be Type "L" nitrogen charged ACR grade copper with forged brass refrigeration fittings. Elbows must be of long radius type. Joints between copper pipes shall be made with copper to copper couplings, soldered using Silfos. No copper material shall be in contact with ferrous material. All refrigerant valves shall be Henry Packed globe valves with wing type sealed cap. Valves shall be cast bronze.

.4 Base unit - Mitsubishi, Sanyo, Fijitsu, Carrier or approved equal.

2.4 GAS VENTS

.1 Provide system of gas vents as required by boiler manufacturers. Refer to boiler sizes and based on the supplier of the boilers, provide sized flue and combustion air vents. Gas vents shall be complete with draft hood connectors, weather top, cone flashing, storm collar, cleanout at vent base and all other necessary fittings to make a complete installation.

.2 Include vents for domestic hot water tanks.

.3 Gas vents shall be approved Selkirk or Metalbestos, Type B for draft hood vented systems.

.4 Gas vents shall be Type A for forced draft systems.

.5 Flashings and curbs at the roof are under roofing Division. Do all counterflashing in connection with gas vents.

.6 Unless noted otherwise on drawings, gas vents shall be terminated at the height above roof as specified in Ontario Gas Utilization Regulation.

.7 The complete installation shall be in accordance with all governing rules and regulations of all local and provincial authorities. Vents to be securely supported from building structure.

2.5 EXHAUST FANS (ROOF MOUNTED)

.1 Exhaust fans shall be supplied as indicated on Drawings. Units shall be Penn Domex centrifugal belt driven roof exhausters with 13mm mesh bird screen and motorized louvre dampers. Include backdraft damper or motorized damper as indicated for each fan. Roof mounted fans shall be complete with prefabricated soundproofing roof curb for installation on flat, sloped or peak of sloped roof as required. Include undercover lock-off switch and wiring between lock-off switch and motor.

.2 Exhaust fan(s) shall be interlocked as described in other sections of this specification.

2.6 PROPELLER FANS

.1 Propeller fans shall be non-overloading, of size, type and capacity listed in schedules. Wheels shall have not less than four dieformed aluminium or steel blades rivetted to machined steel hubs and shall be statically and dynamically balanced.

.2 Motors shall be totally enclosed, sleeve or ball bearing type. Provide wireguard where location is exposed.

.3 Where automatic dampers are not required, fans shall be complete with gravity backdraft dampers with galvanized steel frames, bronze bearings, felt edged min. 26 gauge aluminium blades.

.4 Provide 13mm mesh birdscreen.

.5 Acceptable Manufactures: Greenheck, Loren Cook (HTS), Twin City (EFI), Woods (HTS)

2.7 IN-LINE CENTRIFUGAL FANS

.1 Duct mounted supply, exhaust or return fans shall be of centrifugal belt driven in-line type. The fan housing shall be of the square design constructed of heavy

gauge galvanized steel and shall include square duct mounting collars.

.2 Fan construction shall include two removable access panels located perpendicular to the motor mounting panel. The access panels must be of sufficient size to permit easy access to all interior components.

.3 The fan wheel shall be centrifugal backward inclined, constructed of aluminium and shall include a wheel cone carefully matched to the inlet cone for precise running tolerances. Wheels shall be statically and dynamically balanced.

.4 Motors shall be heavy duty ball bearing type, carefully matched to the fan load and furnished at the specified voltage, phase and enclosure. Motors and drives shall be mounted out of the airstream.

.5 Precision ground and polished fan shafts shall be mounted in permanently sealed, lubricated pillow block ball bearings. Bearings shall be selected for a minimum (L10) life in excess of 100,000 hours at maximum catalogued operating speed.

.6 Drives shall be sized for a minimum of 150% of driven horsepower. Pulleys shall be of the fully machined cast iron type, keyed and securely attached to the wheel and motor shafts.

.7 Motor pulleys shall be adjustable for system balancing. A NEMA 1 disconnect switch shall be provided as standard, except with explosion resistant motors, where disconnects are optional. Factory wiring shall be provided from motor to the handy box.

.8 All fans shall bear the AMCA Certified Ratings Seal for both sound and air performance.

.9 Each fan shall bear a permanently affixed manufacturer's nameplate containing the model number and individual serial number for future identification.

.10 Provide direct drive or belt drive as specified on drawing.

.11 Acceptable Manufactures: Greenheck, Loren Cook (HTS), Twin City (EFI), Woods (HTS).

2.8 INFRA-RED HEATERS

.1 Supply and install gas fired infra-red heaters equal to Reznor, Schawb with a heating input of as noted on the drawings. Units shall be manufactured and installed in strict accordance with jurisdictional regulations. The ignition and control system shall be automatic ignition, 115 volt direct spark with 100% safety shut off. Also include programmable thermostats as shown on drawings. Provide mounting frame, combustion and flue gas vents through roof, supports and accessories.

.2 Heating in each zone of heaters shall be controlled by a thermostat as shown on

the drawings. Each zone of heaters shall be electrically interlocked with the zone exhaust fan so that the heaters will not operate unless the fan is operating. In addition, provide a pressure switch for the exhaust fan so that the heaters in the zone will not operate unless the pressure switch senses air flow. Include all interlock wiring, relays, controls, etc. for complete installation.

2.9 GAS FIRED UNIT HEATERS

.1 Supply and install, Reznor or equal in Modine, SChawb or approved equal unit heaters of size and characteristics shown on the drawings and described in the Equipment Schedule. Units shall be supplied complete with field installed flue gas venter, disconnect, 24 volt thermostat, and vertical and horizontal louvres. Heat exchanger shall be aluminized steel. Motors shall be 110 Volt, single phase, 60 cycle with inherent protection. Programmable thermostats to allow continuous fan operation. Supply and install necessary transformers, interlock wiring, etc. for low voltage temperature control. Provide mounting supports, combustion and flue gas vents through roof, and accessories.

.2 Install flue gas venter complete with air proving switch and all associated equipment. In addition, provide all necessary interlock wiring for flue gas venter and associated equipment.

2.10 GRILLES AND DIFFUSERS

.1 Supply and install all grilles and diffusers as required and as shown on drawings.

.2 Supply grilles shall be:

.i aluminium construction

.ii curved frame 32mm wide

.iii through frame screw mounting

.iv adjustable double deflection air foil blades on 19mm centres

.v Curved vane for corridors pressurization supply grilles

.vi vertical face bars

.vii key operated opposed blade dampers with removable key

.viii off-white baked enamel finish.

.ix prime coat finish for later painting by Division 9.

.3 Wall return and exhaust air grilles shall be:

.i fixed single deflection 45 degree horizontal face bars on 19mm centres

.ii construction, frame, mounting, dampers and finish as for supply grilles above.

.4 Ceiling return and transfer grilles shall be:

.i 0 degree deflection 12mm eggcrate grid

.ii T-bar type for lay-in ceiling

.iii frame as for supply grilles for drywall ceilings

.iv construction and finish as for supply grilles above.

.5 Door grilles will be provided by Division 8.

.6 Door grilles shall be:

.i steel construction
.ii inverted-V louvre blade sight proof core

.iii finish as for supply grilles above.

Special linear diffusers in Lobby and Amenities area and corridor type grilles are specified on drawings or here in this specifications. Linear Diffusers and Returns EH Price SDS 3 slots, 1 Inch size and SDAI insulated plenum or approved equal Corridor Make Up air Side Wall supply Grilles:—Airfoil curved vanes

.7 Diffusers shall be as follows:

.i steel construction

.ii combination damper and grid in drywall areas

.iii type indicated on drawings

.iv finish as for supply grilles above.

.8 Grilles and diffusers shall be equal to E.H. Price, Titus, Krueger, Nailor Industries.

.9 In the Gym, lobby, meeting hall, Amenities areas and lounge area, linear diffusers SDS with SDAI plenums shall be provided.

PART 3 EXECUTION

3.1 DUCTWORK

.1 All ductwork shall be constructed in strict accordance with the latest ASHRAE

Guide.

.2 All ductwork unless specifically noted otherwise, shall be made of galvanized iron. Metal shall be best quality open hearth steel. The galvanizing shall be carefully done to prevent cracking.

.3 All ducts shall be braced and stiffened so that they will not breathe, rattle, vibrate or sag.

.4 Rectangular ducts shall be constructed by breaking the corners and grooving the longitudinal seam, using the Pittsburgh lock or approved air tight joint. Elbows and transformation sections shall be formed with Pittsburgh corner seams or double seam corners.

.5 Ducts shall be free of obstruction, vibration and rattle. Leakage will be permitted to a maximum of 5% in the longest duct run.

.6 Where drawings indicate that the ductwork is to be insulated, make provisions for neat insulation finish around damper quadrants, access doors, etc. Mount metal collars of suitable size and width on insulated ducts to allow insulation to be neatly finished.

.7 Provide counterflashing for roof mounted equipment and any other duct openings in the roof.

.8 The sides of tapered fittings shall not slope at an angle exceeding 15 deg. from the line of air flow unless specifically shown or approval of the Consultant is obtained.

.9 The transitions at the axial fan shall not exceed l0 deg.

.10 Supply and install deflectors or splitters with quadrant dampers at all points on supply systems and exhaust systems where small ducts are taken from larger ones.

.11 Supply and install manual louvre dampers for balancing the system.

3.2 FIRE DAMPERS AND FIRE STOP FLAPS

.1 Supply and install a system of fire dampers and fire stop flaps. Dampers and flaps shall have ULC labels. Follow manufacturer's Installation Instructions.

.2 Dampers, housings, and method of installation shall comply with NFPA Standard No. 90A - "Air Conditioning and Ventilation Systems" and shall have C.S.A. and UL (Canada) approval.

.3 Fire dampers shall be located within the fire separation membrane which the duct is penetrating and the opening in the fire separation membrane, e.g. masonry wall or floor, shall be sleeved and fire stopped with approved fire stopping

material around and within the sleeve to provide for expansion and to maintain the integrity of the fire partition.

3.3 MOTORIZED DAMPERS

.1 Supply and install all motorized dampers indicated on drawings. Dampers shall be of Honeywell manufacture and opposed blade type.

.2 The Mechanical Contractor, unless specifically indicated otherwise, will provide all wiring for damper motor power and control from nearest lighting panel, except where the drawings indicate power outlets by Electrical Division. For these instances, the Mechanical Contractor will wire from the outlet to the damper motor.

3.4 ACCESS DOORS

.1 Supply and install access doors in ducts and plenums for servicing of control elements, fire dampers, balancing dampers, damper motors, coils and all other duct mounted equipment, and for oiling of bearings and removal of electric motors.

.2 Access doors in ductwork shall be a minimum of 450mm x 450mm clear, 1.3mm thick, or as close to these dimensions as duct size permits, with edges of door folded and duct opening provided with a frame. Door shall be secured with a minimum of 4 sash fasteners, shall be provided with a gasket, and shall be air tight. Fasteners shall be equal to Duro-Dyne SL-1.

.3 On insulated ducts access doors shall be double wall construction, with void filled with insulation equivalent to the duct insulation.

3.5 FLEXIBLE CONNECTIONS

.1 On the suction and discharge of all fans, provide 150mm wide airtight Duralon, elastomer coated, fibreglass fabric, flexible connections to isolate the fan from the ductwork.

3.6 STORM LOUVRES AND BIRDSCREENS

.1 Unless specifically noted otherwise provide all storm louvres, birdscreens. Provide birdscreen for roof mounted exhaust fans.

.2 Storm louvres shall be Airolite, size and type indicated on Drawing. Connect ductwork to same and seal to make weathertight connection between louvre and duct. Supply louvres in prime coat left ready for painting. Supply and install all anchor bolts and counter flashing for all roof mounted fans and ducts passing through roof to provide a weathertight installation.

3.7 OUTSIDE OPENINGS

.1 Openings will be left under other Divisions in the outside wall, roof, etc., where shown and required for fresh air intakes and exhaust.

.2 Flashing for roof curbs and ducts under General Division 7. Counterflashing by this Section.

.3 Supply and install all necessary ductwork and plenums for intakes and exhausts and patch around same to make a weathertight job.

3.8 EXTERIOR INTAKE AND DISCHARGE COWLS

.1 Supply and install exterior cowls where shown on plans. Cowls and hoods shall be equipped with 12mm mesh brass birdscreens fastened at the mouth of the intake or discharge of the cowls. Cowls shall be fabricated, set in place and flashed by this Section. Cowls shall be firmly secured to the structure. They shall be 18 U.S. gauge galvanized or as detailed. The flashing shall be soldered.

.2 Roof hoods, where shown, shall be galvanized steel, complete with bird screen. Units shall be equal to Penn "Airette".

3.9 STORM LOUVRES, WALL BOXES AND BIRDSCREENS

.1 Unless specifically noted otherwise provide all storm louvres, birdscreens.

.2 Storm louvres, wall boxes shall be Airolite, size and type indicated on Drawing. Connect ductwork to same and seal to make weathertight connection between louvre and duct. Supply louvres in prime coat left ready for painting. Supply and install all anchor bolts and counter flashing for all roof mounted fans and ducts passing through roof to provide a weathertight installation.

3.10 CONNECTION TO LOUVRES

.1 Extend ductwork up to weatherproof louvres and make connections to same. Fill and caulk all openings to prevent water from draining to the wall or ceiling between the louvre and ductwork.

3.11 ACOUSTIC INSULATION

.1 Insulate the inside of ductwork and plenums indicated on the drawings with 50mm thick Fibreglass type AF-545 rigid duct liner, neoprene coated. Fasten with Flintstick 230-14 adhesive and metal clips and washers on 300mm centres.

.2 All insulation shall be cut to fit tightly between bracing angles and sizes left inside the insulation shall be the duct sizes shown on the drawings, i.e. the drawing dimensions are the finished inside clear dimensions.

.3 Exposed edges of insulation shall be provided with metal nosings.

.4 Flame spread on insulation shall be in accordance with the requirements of all

Authorities having jurisdiction.

.5 Increase the duct size by 50mm in each direction to maintain the clear cross section shown on the drawings. This generally applies to ductwork above the roof for the rooftop A/C units on the roof.

3.12 VIBRATION ISOLATION FOR FANS

.1 Supply to Sound and Vibration Controls Section shop drawings of all equipment to be isolated. Such drawings shall be provided as soon as possible so that the progress of the project will not be hindered.

3.13 ADDITIONAL START-UP SERVICE

.1 In addition to service covered under guarantee provide start-up and shut-down of air conditioning systems for first full cooling season. Also provide start-up after the first full season.

3.14 LOCATION OF OUTLETS

.1 The position of all outlets shown on the Drawings is approximate only. Check the location of all outlets with the Consultant and make such adjustments in position as are necessary to conform with architectural features, acoustic tile pattern, etc., and the outlets required by the other trades, without extra charge. Ceiling outlets and their assemblies must be constructed so that they fit the spacing and manufacture of the removable acoustic ceiling.

.2 Be responsible for exact dimensions and positions of openings required for the passage of pipes, ducts, etc.

3.15 BALANCING OF AIR SYSTEMS

.1 Include in the tender price all costs for the balancing of all ventilation systems outlined in the specifications and shown on the drawings.

.2 Air systems shall be balanced with clean filters in place and so that the fans.

.3 Upon completion of the air balance and submittal of the air balance report, provide, if called for, a spot check on the system with the Consultant's representative. If actual air quantities do not agree with the air balancing report data, completely rebalance the system until satisfactory to the Consultant.

3.16 MOTORIZED DAMPERS, RELAYS AND INTERLOCKS

.1 All supply fans shall be interlocked with respective motorized intake dampers so that on start-up of fan, respective motorized dampers will open fully. Include all control wiring, relays, etc. Include Belimo or equal damper operators for dampers.

3.17 MOTORIZED DAMPER CONTROL

.1 Supply and install a modulating damper in ductwork and a heat/cool thermostat. Thermostat shall be controlled by a duct sensor sensing air temperature so that on rise in temperature, (winter operation) damper will close and on rise in temperature (summer operation), damper will open. Provide all necessary relays, etc.

3.18 MOTORIZED DAMPERS

.1 Provide all motorized dampers required on project. Dampers shall be Honeywell manufacture with gasketting blades. Include wiring of damper so damper is closed when respective unit is off.

3.19 SERVICE ROOM VENTILATION

.1 Provide line voltage thermostat for electrical room ventilation. Wiring of same by Section 16. Thermostat shall cycle fan and intake motorized damper to maintain 21 degrees C.

3.20 VENTILATION CONTROLS

.1 Provide line voltage thermostat for room ventilation. Wiring of same by Electrical Section. Thermostat shall cycle fan and associated motorized dampers to maintain 70 deg. F.

END OF SECTION

ARTICLE NAME **PAGE**

SECTION 25 10 00
CONTROLS

PART 1 GENERAL

1.1 REFERENCE

.1 Basic Mechanical Materials and Methods forms an integral part of this Section.

1.2 INTENT

.1 The work covered under this section of the specification shall include a temperature control system complete in all details, substantially as set forth and shown on the accompanying drawings or as described in these specifications, together with minor details not specifically mentioned, or shown, but as may be reasonably inferred and necessary to complete each system and place each in operating service.

.2 Wire components of temperature control system in accordance with requirements of Basic Mechanical Materials and Methods Section. Include wiring between control components and wiring from these components to electrical circuit of fans, pumps, and any other equipment or apparatus.

.3 Include all interlock wiring for interlocking between fans, computer control, compressor control sequences, condensers, etc., and provide necessary transformers, relays, etc. to accomplish specified control function.

1.3 WORK UNDER OTHER SECTIONS

.1 Motorized dampers shall be supplied and installed under Ventilation, Heating and Air Conditioning Section except for packaged equipment, where dampers and actuators are part of the unit being supplied under other Sections.

.2 Control valves shall be supplied and installed under Heating and Cooling Section.

.3 Misc controls for specific equipment (Boilers, Chillers, Pumps, Cooling towers, Heat pumps, Closed Loop Coolers, temperature sensors/ thermostats etc.) will be supplied complete with volume regulator and operator under specific sections .

1.4 SHOP DRAWINGS

.1 Refer to General Section for details regarding shop drawing submission requirements.

.2 Submit Shop Drawings for the following:

.i Room Thermostat Schedules

1.5 EXTENDED WARRANTY

.1 Guarantee the control system to be free from original defects in materials and workmanship for a period of two (2) years of normal use and service.

PART 2 PRODUCTS

2.1 THERMOSTATS

.1 All thermostats shall be with locking cover with 2-3 ºF local adjustment with open on power failure. Heating only tstats shall be NO for heating. Heating and cooling tstas shall be NO heating and NC for cooling cycles.

2.2 DAMPER OPERATORS

.1 Provide spring return for "fail-safe" in normally open or normally closed position as required.

.2 Size operators to control dampers against maximum pressure or dynamic closing pressure, whichever is greater.

.3 Provide adjustable external stops to limit stroke in either direction.

.4 Damper motors equal in Belimo or approved equal.

2.3 DAMPERS

.1 Modular maximum 1200mm 48" wide and 1800mm 70" high.

.2 Multiple sections with stiffening mullions and jack shafts.

.3 Frame: 2.5mm thick galvanized sheet metal.

.4 Blades: two sheets 0.8mm thick welded or rivetted, or one sheet 1.6mm thick galvanized sheet steel.

.5 Bearings: Nylon. Provide additional thrust bearings for vertical blades.

.6 Linkage: zinc plated steel.

.7 Seals: replaceable neoprene seals on side, top and bottom of frame and along all blade edges and blade ends.

.8 Performance Characteristics: 50L/s.m2 maximum allowable leakage against 1.0 kPa static pressure.

.9 Temperature range minus 40C to 90C.

PART 3 EXECUTION

3.1 ELECTRICAL WIRING

.1 All equipment installed under this Section shall be installed complete with all required electrical control wiring. Control wiring shall be #22 TWSH or #18 TWSH as required. Conduit shall conform to the electrical specification standards. All power wiring will be by the Electrical Contractor.

3.2 SEQUENCE OF OPERATION

.1 Chiller: Chiller shall operate to suit plant operations to provide cooling of process cooled water. Pumps shall be started and chiller shall start once flow through chiller is confirmed. Chiller shall maintain set water temperature in the heat exchanger loop serving plant equipment. Monitor chiller operation and alarm at BAS of supply glycol water temperature 5 F above set point. Set up the heat exchanger controls to maintain set process water temperature. Chiller circuits will be activated to maintain set supply water temperature to production equipment at 10 C at constant flow rates through chiller and heat exchanger. Monitor Heat exchanger return water temperature. Provide audio/visual alarm if plant loop temperature rises 3C above set point locally at the production area.

.2 Pumps:

.i Pumps will be started by plant operators to operate continuously for process water cooling.
.ii Pumps VFDs will be set to deliver set constant flow to suit the design water flows through the process equipment, chiller, heat exchangers and other items.

.3 Infra Red and Unit Heaters:

.i Provide all wiring and install all controls to maintain set space temperature during winter.
Ii Interlock the infrared heaters to operate when the exhaust fan in the space is operational.
Iii Lead lag panels will start lead and lag pumps based on weekly turnover. On lead pump failure, lag pump shall start automatically and audio/ video alarm at the lead & lag panels.

.4 Compressor Cooling;

.i Existing air compressors (two at 75HP each) are being cooled by city water. A new chilled water cooling loop is being added to use chilled water as primary cooling and city water as back up with manual switch over fro chilled water to city water.

Ii Provide chilled water motorized modulating control valves to regulate chilled water flow set at 75 degree F to suit compressor cooling requirements..

Iii On compressor off, valve shall close. On compressor on state, CV shall modulate to allow flow.

iv. Control valves shall be fail safe open.

v. During manual switch over, the chilled water inlet valves and discharge valves shall be closed manually and city water inlet and main drain valve will be opened manually to provide back up cooling for the compressors.

.5 AC and All Fan Coil Units (Excluding Suite VFCs):

.i Install thermostat and provide local temperature controls of the local AC and Fancoil units in all areas including elevator machine room.

.6 Roof Top Unit:

.i Install unit controls with wall thermostat, wiring and set for automatic heating and cooling operation to suit the space temperature.

.7 Exhaust fans:

.i Install fan controls and thermostats to suit as per drawings for ventilation of the space during summer..

.8 Mechanical Room, Transformer room and Miscellaneous Ventilation

.i Room thermostat shall cycle Exhaust Fan and open respective intake and exhaust dampers to maintain room temperature.

.9 Miscellaneous Exhaust Fans.

.i When fan is energized associated damper shall open.

.

END OF SECTION

1 General

1.1 REFERENCE STANDARDS

.1 ASTM International

.1 ASTM D698-12(2021), Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m^3)).

1.2 EXISTING CONDITIONS

.1 Examine subsurface investigation report which is available for inspection by the Owner.

.2 Known underground and surface utility lines and buried objects are as indicated on site plan.

2 Products

2.1 MATERIALS

.1 Fill material: As indicated in Section 31 23 33.

.2 Excavated or graded material existing on site suitable to use as fill for grading work if approved by the Consultant.

3 Execution

3.1 EXAMINATION

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

.1 Visually inspect substrate in presence of the Consultant.

.2 Inform the Consultant 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 the Consultant.

3.2 STRIPPING OF TOPSOIL

.1 Do not handle topsoil while in wet or frozen condition or in any manner in which soil structure is adversely affected as determined by Consultant.

.2 Commence topsoil stripping of areas after area has been cleared of grasses, weeds and brush.

.3 Strip topsoil to depths as indicated. Rototill grasses and retain as topsoil on site. Avoid mixing topsoil with subsoil.

.4 Stockpile in locations as indicated. Stockpile height not to exceed 2 m.

.5 Dispose of unused topsoil off site.

3.3 GRADING

.1 Rough grade to levels, profiles, and contours allowing for surface treatment as indicated on Drawings.

.2 Slope rough grade away from building 1:50 minimum, unless otherwise indicated on the Drawings.

.3 Prior to placing fill over existing ground, scarify surface to depth of 150 mm minimum.

.4 Maintain fill and existing surface at approximately same moisture content to facilitate bonding.

.5 Compact filled and disturbed areas to maximum dry density to ASTM D698, as follows, unless otherwise indicated in the soils report:

.1 85% under landscaped areas.

.2 95% under paved and walk areas.

.6 Do not disturb soil within branch spread of trees or shrubs to remain.

3.4 TESTING

.1 Inspection and testing of soil compaction will be carried out by testing laboratory designated by ULC. Costs of tests will be paid under a Cash Allowance in accordance with Division 01.

.2 Submit testing procedure, frequency of tests, testing laboratory as designated by ULC or certified testing personnel to the Consultant for review.

.3 All planting bed areas to be tested for existing soil profiles

3.5 CLEANING

.1 Progress Cleaning: Clean in accordance with Division 01.

.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 Division 01.

.3 Waste Management: separate waste materials for reuse or recycling in accordance with Division 01.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.6 PROTECTION

.1 Protect existing trees, landscaping, natural features, buildings, and pavement which are to remain as directed by Consultant. If damaged, restore to original or better condition unless directed otherwise.

.2 Maintain access roads to prevent accumulation of construction related debris on roads.

END OF SECTION

1 General

1.1 SUMMARY

.1 This Section includes requirements for design, supply and installation of temporary excavation support and protection systems forming a part of the permanent foundation system of the building.

1.2 SITE CONDITIONS

.1 Examine Site:

.1 Note all characteristics and features affecting work. No allowance will be made for difficulties encountered or expenses incurred on account of any site conditions or any growth or item existing thereon, visible or known to exist when bid is submitted.

.2 Underground Services:

.1 Notify public utilities or municipal authorities in advance of planned excavations adjacent to their services. Take care not to damage or displace encountered known and unknown services. When such services are encountered, immediately notify Consultant, and protect, brace and support active services. Where repairs become necessary, use the following procedure:

.2 Known Services:

.1 Repair at no expense to Owner.

.3 Unknown Services:

.1 Forward complete breakdown of estimated cost of such work. Proceed immediately with repairs upon receipt of written approval of cost of such repair work.

.4 In the case of damage to an essential service, notify Consultant immediately and repair service under Consultant's direction. Inform Consultant of services encountered which require adjustment, relocation or abandonment and arrange for disconnection and capping of pipe.

1.3 GEOTECHNICAL SITE INVESTIGATION REPORT

.1 Review in detail geotechnical site investigation report. Information given in Geotechnical Site Investigation Report was obtained for use of Owner in execution of design. It is presented in good faith to assist Contractor. No guarantee is made as to its detailed accuracy for every site location.

1.4 LEVELS

.1 Existing grade levels shown on drawings are furnished in good faith for the guidance of the Contractor. Check and verify levels at site. Should the actual grade levels of the site be other than shown, no claims will be entertained unless notification is made in writing to the Consultant. Do not proceed with the work until Consultant's approval is received. Allow Consultant sufficient time to inspect such claim.

1.5 STORAGE, DELIVERY, HANDLING AND PROTECTION

.1 Stockpile materials in designated areas. Stockpile topsoil and each type of fill material separately to prevent integration. Stockpile granular materials so as to prevent segregation.

.2 Keep surrounding roads free of soil deposits from material hauling trucks. Load trucks carefully to prevent spillage and wind drift.

.3 To protect neighbourhood from wind-blown sand and dust, sprinkle with water entire excavated area and stockpiled excavated materials when required.

.4 Protect adjacent property from damage which may occur from any cause in the performance of the work of this Section.

.5 Do not interfere with use of adjacent buildings.

.6 Take precautions against movement, settlement or collapse of sidewalks, public services adjoining property and be liable for all damage to same.

.7 Before commencing work verify location of survey monuments in the areas in which the work is to be executed. Should any of the monuments be disturbed due to the work be responsible for the expenditures incurred in restoring the monuments.

.8 Take precautions against movement or settlement of existing building. Provide and place bracing and shoring necessary for the safety and support of the structure and execute the work in a manner to prevent movement, settlement, damage or injury caused thereby or resulting therefrom.

.9 Shoring and Trench Timbering:

.1 In addition to requirements of local authorities, carry out in accordance with requirements of the Occupational Health and Safety Act, RSO 1990 C.0.1 and regulations for construction projects, and all other applicable regulations of the Ontario Ministry of Labour. In addition, follow recommendations of the Construction Safety Association brochure, "Shoring and Timbering in Trenches, latest edition", wherever applicable.

.10 Shoring and Bracing:

.1 Erect and maintain necessary shoring and bracing for excavations in a manner that will properly retain banks of excavations and prevent cave-in. Shoring to be erected in a manner that will allow all other work to be carried out while shoring is still in place. Shoring installation shall be entirely clear of footings, foundations, walls or other such work so that it may be removed entirely or in sections when it is no longer required or when directed without causing any damage or injury to structural work that has been completed.

2 Products

2.1 MATERIALS

.1 Fill Material:

.1 For base under floor slabs and other locations as recommended by geotechnical investigation report, shall be Granular 'A' material in accordance with OPSS Form No. 1010, well grade and maximum aggregate size of 3/4".

.2 Material shall be maintained at optimum moisture content during placing and while compacting work is in progress, in strict accordance with inspection engineer's instructions and to his approval.

3 Execution

3.1 PREPARATION

.1 Clear and remove, from site, obstructions to excavating. Establish and maintain accurate lines and levels as required. Provide batter boards, line stakes and templates, and establish permanent reference lines and bench marks required.

3.2 EXCAVATION - GENERAL

.1 Excavate with due regard for the peculiarities of soil conditions and take precautions to protect adjacent foundations and property.

.2 Excavate and remove sod, debris, topsoil or fill deposited within the building area. Remove topsoil to its full depth over the areas to be excavated or graded.

.3 Stockpile topsoil in a neat pile where directed. Remove surplus topsoil not required for regrading or landscaping from the site.

.4 Stockpile excavated material approved for re-use on the site so that such material will not interfere with site drainage, drainage of adjacent properties, or building operations. Remove subsoil and excavated material not required for regrading outside the building from the site, including material excavated by other Sections.

.5 Excavate to extent, elevations and depths required for completion of work, leaving sufficient space for removal of formwork, application of and installation of weeping drains. Excavate and construct for slabs, ramps, and driveways, to lines, elevations and cross sections shown on drawings to allow finishing sections to install their work to required thicknesses.

.6 Keep excavation free of water by bailing, pumping or system of drainage as required, and provide pumps, suction and discharge lines of sufficient capacity. Maintain until such time as permanent drainage system is installed or until Consultant's approval for removal of equipment is obtained. Take all necessary measures to prevent flow of water into excavation.

.7 Protect bottom and sides of excavated pits and trenches from freezing.

.8 Keep bottoms of excavations clean and clear of loose materials leveled and stepped at changes of levels except excavations made for drainage purposes which are to slope as required.

.9 If removal of earth causes displacement of adjacent earth, remove disturbed earth at no additional cost to Owner.

.10 Remove soft, wet or unconsolidated ground, quicksand and organic material encountered in excavating and fill void with well compacted, clean, dry fill of quality as herein specified. Where these conditions occur under or near footings, special arrangements will be made by Consultant. Similarly treat wells, cesspools, pits, etc. if encountered.

.11 After completion of excavation and prior to placing concrete or fill, notify inspection engineer so they may make inspection of exposed bearing surfaces. In event founding levels are subjected to rain or other moisture after inspection and approval but prior to installation of concrete, notify inspection engineer to re-examine all exposed bearing surfaces. Do not place concrete until re-examination has taken place and approval given.

.12 Provide protection to keep surface against which concrete or fill is to be placed free of frost. Thaw frozen surfaces against which concrete or fill is to be placed to unfrozen depth. Remove thawed softened material to firm base at no extra cost to Owner.

.13 Should nature of subsoil at depths shown prove to be unsatisfactory for placing of structural work thereon, then upon Consultant's written order, excavate to greater depth until satisfactory bottom is reached. Payment for such additional excavation and backfill will be on basis of contract unit prices.

.14 If excavations reveal seepage zones, springs or other unexpected subsurface conditions which may necessitate revisions or additions to any drainage system, inform Consultant immediately for remedial action.

.15 Excavated surfaces scheduled to receive concrete skim slabs shall be protected from excessive traffic and other disturbances and shall not be left exposed for extended periods of time.

3.3 TRENCH EXCAVATING

.1 Excavate with suitable machinery or by hand as may be necessary to depths and dimensions shown or required.

.2 Cut and trim sides of trenches evenly and as near vertical as possible, shore as required to prevent cave-ins.

.3 Keep bottoms of trenches clean and clear of loose material. Slope or grade as required. Hand trim at least last 4" of trench excavations to ensure minimum disturbance to load bearing value of trench bottoms.

3.4 BACKFILLING

.1 Proceed promptly with backfilling as building progresses and work to be backfilled has been inspected and approval to backfill obtained. Place backfill in 8" thick maximum layers. Compact each layer before placing next. Maintain optimum moisture content to achieve required densities.

.2 Backfill evenly on both sides of foundation walls to avoid unequal fill pressures on walls.

.3 Fill over-excavations under bearing surfaces and footings, or within pyramid enclosed by 7 in 10 slope from bearing surface with concrete of same strength as specified for footings. Fill over-excavation under all other areas with approved sand/gravel mixture and compact as directed. Fill over excavation at no additional cost to Owner.

.4 Withdraw shoring material during backfill.

.5 Place fill around foundation walls to that footings will have a minimum 5'-0" coverage, measured at 45 deg angle from bottom of footing to protect against frost until final grading is complete.

.6 Compaction equipment to be of size and type to permit required compaction without causing lateral forces resulting in displacement of foundation walls. Exercise caution in this regard to avoid movement of foundations.

.7 Backfill and fill shall not be placed over debris, organic matter, snow, ice or frozen ground. Fill shall not be placed at ambient air temperatures below 0EC without approval.

.8 Take care to avoid damage to waterproofing or displacement of waterlines, drains, conduit and other underground installations.

.9 Prior to placing fill for concrete floor slabs on earth, consolidate subgrade to obtain same compaction specified for fill material.

.10 Compact soil materials to not less than the following percentages of maximum dry unit weight in accordance with ASTM D 698.

Location	Fill Material	Max. Lift Thickness	Minimum Compaction
Under exterior slabs-on-grade	25 mm Crushed Gravel	6”	95%
Against exterior side of foundations	Native satisfactory clay, or imported clay suitable for backfill, to a minimum of 600 mm below rough grade.	6” lifts	100%
	Native satisfactory clay, or imported clay suitable for backfill.	6” lifts to 24” total	95%
Under paved areas	Native clay, or imported clay suitable for backfill to bring subgrade to sub-base level of road way, minimum 400 mm below final grade.	6”	100%
Under landscape areas	Native clay, or imported clay suitable for backfill, to a minimum 200 mm below final grade.	8”	95%
Other locations	Native clay, or imported clay suitable for backfill.	8”	98%

.11 Coordinate with Work of other Sections for the lines and levels of uncompacted subgrade required by those Sections.

.12 Compact with mechanical tampers, areas adjoining vulnerable building components which cannot be thoroughly compacted by drawn equipment. Install Granular 'A' where required, as recommended by Geotechnical Investigation Report.

3.5 TESTING

.1 Sequentially test each stage of backfill commencing at founding elevations and continuing through installation of subsequent lifts or material and compaction thereof.

.2 Do not proceed with installation of any material until preceding surface or layer meets design criteria. Cost for independent testing agency to conduct testing in addition to tests noted in paragraph above shall be paid for by Cash Allowance included within the contract for this purpose.

3.6 COMPACTION

.1 Density of fill in place shall be in accordance with latest revision of ASTM D698-91, 98% Standard Proctor Density for all fill unless specifically noted otherwise. Fill to underside of asphalt base - 98% Standard Proctor Density.

.2 Maintain optimum moisture content during backfill and fill compaction to achieve required density. Deposit in layers of such thickness that equipment being used for compacting can produce specified density.

.3 Puddling or flooding with water for consolidating granular fill will not be permitted. Addition of water is limited only to extent required to provide optimum moisture level of fill material.

.4 During and immediately after levelling, thoroughly compact each layer of fill by use of compaction equipment of size and type to permit required compaction without causing lateral forces resulting in displacement of foundation walls. Exercise caution in this regard to avoid movement of foundations.

.5 After a period adequate to reveal settlement has passed, place additional fill and compact in all depressions. Make good any subsequent settlement without extra cost to Owner.

3.7 WATER ON PREPARED SURFACES

.1 Promptly remove by approved methods, water rising from seeping or resulting from rainfall wherever such water is on surface of subgrade soil and compacted fill.

.2 Where proper drainage and pumping is not carried out as specified herein and any prepared subgrade soil under structural work, and any compacted fill under concrete slabs is softened or disturbed by water due to improper drainage and pumping, Contractor under this Section shall (A) without extra cost to Owner, remove unsatisfactory soil and fill; and (B) bear all incidental costs in connection with additional excavation, backfilling and structural work for footings and foundations, and additional excavation and placing and compacting of granular fill under concrete slab base course.

3.8 ROUGH GRADING

.1 Rough grade to profiles shown on required levels to allow installation of follow-up materials to produce final grades at levels indicated. Rough grade surface to be suitable to accept follow-up sections work.

3.9 DISPOSAL OF DEBRIS AND SURPLUS MATERIAL

.1 Remove from site and legally dispose of all rubbish, rocks and surplus materials resulting from site stripping, excavation and grading work.

.2 Vehicles employed in the cartage of this material shall not be loaded beyond the rated limits, nor in such a manner as to cause spillage. Any spillage or tire tracking occurring

upon public property or upon the property of others, shall not be allowed to remain to become a hazard and a nuisance but shall be cleaned up immediately.

.3 Break rock, concrete and unit masonry into pieces not exceeding 24" in any dimension.

END OF SECTION

PART 1 – GENERAL

1.1 General Instructions

.1 Read and be governed by Conditions of the Contract and Sections of Division 1.

1.3 Quality Assurance

.1 Subcontractors qualifications:

.1 Paving Work shall be done only by skilled Workers, with suitable machinery, supervised by foremen experienced in type of Work specified.

.2 Execute the Work of this Section by a Subcontractors who has equipment adequate for Project, and skilled Workers so that Work is performed expeditiously; and is known to have been responsible for satisfactory installations similar to that specified.

.3 Materials and mixes that vary to a minor degree from those specified in this Section will be acceptable if they are based on standards of the engineering department of a jurisdiction having authority at the location of the Project and which are approved.

.2 Perform Work on public property in accordance with design and material requirements of applicable local authorities which are imposed in addition to requirements specified in this Section.

.3 Comply with requirements of Ontario Provincial Standard Specifications (OPSS) 310 and 1150.

1.4 Delivery, Storage and Handling

.1 Commence placing and perform compaction of granular base courses only when subgrade temperature is at least 2°C and rising.

.2 Commence laying of asphalt binder courses only when base surfaces are at least 2°C, and the temperature is rising.

.3 Commence laying of asphalt surface courses only when binder course surfaces are completely dry, at least 7°C and the temperature rising.

.4 Suspend paving operations if temperature drops below specified minimums.

1.5 Submittals

.1 A copy of the batch ticket from the asphalt plant shall be supplied certifying that aggregate and asphalt meet specifications and record the weight of each load.

1.6 Warranty

.1 Provide a labour, material and Workmanship warranty against defects such as ponding, cracking in surfaces, excess settlement areas, for a period of two (2) years.

PART 2 – PRODUCTS

2.1 Granular Base and Sub Base

.1 As per Specification 31 23 33

2.2 Asphaltic Material

.1 Asphaltic Material HL3A as conforming to the requirements of Ontario Provincial Standard Specification OPSS 1150.

2.3 Pavement Composition

Pavement Layer	Minimum Thickness	Compaction Requirements
Surface	40 mm SP9.5 (HL-3 Fine)	OPSS 310 (TS -310)
Binder	135 mm SP19.0 D (HL-8)	OPSS 310 (TS-310)
Granular Base	150 mm Granular A (TS 1010)	100% SPMDD (ASTM D-698)
Granular Subbase	150 mm Granular B Type II (TS 1010)	100% SPMDD (ASTM D-698)
Total	475mm	

PART 3 – EXECUTION

3.01 INSTALLATION:

.1 All work shall conform to OPSS and Details.

.2 The Contractor is to ensure that the sub-grade has been approved by the Consultant prior to placing granular materials.

.3 Lay granular base parallel to the final grade and compact to 98% Standard Proctor Density. Ensure there are no dips or uneven slopes. Ensure all areas are sloped to drain. Granular base to extend 150mm beyond edge of asphalt.

.4 All asphalt edges not contained by hard edges shall have uniform lines with a hand tamped 45° angle. All pathway edges shall have a “smooth”, curvilinear appearance. The Consultant reserves the right to request that sections of pathway be reworked to achieve the desired appearance.

.5 Exercise care to prevent contamination of materials.

3.02 MAINTENANCE:

.1 Maintain all asphalt up until the date of acceptance by the Owner.

.2 Maintenance shall include all repair work necessary to keep asphalt paving at required grades and to keep surface clean and intact until final acceptance.

.3 The Contractor shall keep all pathways clean and clear of any mud tracks or other debris both on and off the site.

3.03 Field Quality Control

.1 An inspection and testing company will be selected to verify that compaction of granular base courses conform to specified requirements.

.2 Payment for inspection and testing will be by cash allowance.

3.04 Adjustment and Cleaning

.1 Replace defective asphalt pavements with patches cut into pavement, in rectangular areas, and with joints made as specified.

END OF SECTION

1 General

1.1 SUMMARY

.1 Provide labour, materials, products, equipment and services to complete painted traffic lines and marking Work in accordance with the Contract Documents.

1.2 REFERENCE STANDARDS

.1 CAN/CGSB 1.74, Alkyd Traffic Paint.

.2 FED-STD 595B, Standard Paint Colours.

.3 OPSS 1712, Material Specification for Organic Solvent Based Traffic Paint.

1.3 SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00.

.2 Product Data:

.1 Performance criteria, compliance with appropriate reference standard, characteristics, limitations and troubleshooting protocol.

.2 Product transportation, storage, handling and installation requirements.

1.4 QUALITY ASSURANCE

.1 Applicator's qualifications: Perform Work of this Section by a company approved by manufacturer and having specialized equipment suitable for type of work specified.

1.5 SITE CONDITIONS

.1 Do not install Work of this Section outside of following environmental requirements without manufacturer's written acceptance:

.1 Traffic paint: Ambient air and surface temperature minimum 5°C and maximum 43°C. Maximum relative humidity 85%, wind speed is less than 60 km/h and no forecast of rain within 4 h of start of application.

2 Products

2.1 MATERIALS

.1 Traffic Paint:

.1 Organic solvent based, lead-free to OPSS 1712 or CAN/CGSB 1.74.

3 Execution

3.1 EXAMINATION

.1 Verify pavement surface is properly cured. Report defects to Consultant.

.2 Commencement of Work means acceptance of existing conditions.

3.2 INSTALLATION

.1 Traffic paint to be used for all other parking areas.

3.3 PREPARATION

.1 Clean pavement surface and remove loose material.

.2 Verify pavement surface is free from ponding water, frozen matter, dust, oil, grease, scaling or laitance and other foreign matter detrimental to performance.

.3 Prohibit traffic in work area, until Work of this Section is complete.

Soil Engineers Ltd.
CONSULTING ENGINEERS
GEOTECHNICAL • ENVIRONMENTAL • HYDROGEOLOGICAL • BUILDING SCIENCE
90 WEST BEAVER CREEK ROAD, SUITE 100, RICHMOND HILL, ONTARIO L4B 1E7 · TEL: (416) 754-8515 · FAX: (905) 881-8335

BARRIE	MISSISSAUGA	OSHAWA	NEWMARKET	GRAVENHURST	HAMILTON
TEL: (705) 721-7863	TEL: (905) 542-7605	TEL: (905) 440-2040	TEL: (905) 853-0647	TEL: (705) 684-4242	TEL: (905) 777-7956
FAX: (705) 721-7864	FAX: (905) 542-2769	FAX: (905) 725-1315	FAX: (905) 881-8335	FAX: (705) 684-8522	FAX: (905) 542-2769

March 16, 2022

Reference No. 2202-S029

Accord Plastics Corp.
56 Edilcan Drive
Concord, Ontario
L4K 3L6

Attn: Mr. Simon Lee

Re: Geotechnical Investigation Report
Proposed Soil Bearing Assessment
56 Edilcan Drive
Concord

Dear Sir:

As per your instructions, we have completed the borehole investigation for the captioned project and herein present our findings and recommendations.

The subject site of investigation is situated at 56 Edilcan Drive, in Concord. The investigated area is within an existing industrial building and the purpose of the investigation is to assess the soil bearing capacity and concrete compressive strength.

The field work, consisting of 2 boreholes to depths of 2.7 m and 3.0 m, was performed on February 28, 2022, at the locations shown on the Borehole Location Plan, Drawing No. 1, enclosed. Refusal augering was encountered at both boreholes at depth of 2.7 m and 3.0 m; it is inferred boulders or bedrock at these levels.

The investigation has revealed that beneath a concrete slab, 100 mm and 120 mm thick and a layer of granular fill, 200 mm thick, site is underlain by a stratum of silty clay till.

Grain size analysis was performed on 2 representative samples of the silty clay till, the results are presented on Figures 3.

No groundwater was detected and both boreholes remained dry upon completion of field work. The yield of groundwater, if encountered, from the silty clay till, due to its low permeability, will be small and limited

The recommended soil pressures, together with the corresponding suitable founding levels, are presented in the following table:

Borehole No.	Recommended Maximum Soil Bearing Pressure (SLS)/ Factored Ultimate Soil Bearing Pressure (ULS) and Corresponding Founding Levels	
	90 kPa (SLS)/140 kPa (ULS)	200 kPa (SLS)/320 kPa (ULS)
	Depth (m)	Depth (m)
1	0.6 or +	1.2 or +
2	0.6 or +	1.2 or +

The recommended soil pressures (SLS) for normal foundations incorporate a safety factor of 3. The total and differential settlement of the foundations founded on native soil is estimated to be 25 mm and 15 mm, respectively.

The footings must meet the requirements specified in the latest Ontario Building Code. As a guide, the structure should be designed to resist an earthquake force using Site Classification 'D' (Stiff Soil).

Concrete compressive strength test was carried on 1 concrete core sample and the result is shown at the following table.

Core Number	BH 1
Date Tested	March 3, 2022
Density (kg/m3)	2378
Corrected Compressive Strength (MPa)	58.8

We trust this Letter Report satisfies your present requirements; however, should any queries arise, please feel free to contact this office.

Yours very truly,
SOIL ENGINEERS LTD.

Frank Lee, P.Eng.

LICENSED PROFESSIONAL ENGINEER
F. K. W. LEE
29384508
PROVINCE OF ONTARIO

ENCLOSURES

Borehole Logs	Figures 1 and 2
Grain Size Distribution Graphs	Figure 3
Borehole Location Plan	Drawing No. 1
Subsurface Profile	Drawing No. 2

JOB NO.: 2202-S029

LOG OF BOREHOLE NO.: 1

FIGURE NO.: 1

PROJECT DESCRIPTION: Proposed Soil Bearing Assessment

METHOD OF BORING: ram sounder

PROJECT LOCATION: 56 Edilcan Drive, Concord

DRILLING DATE: 'Febryary 28, 2022

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
0.0	Concrete Surface							
0.0	100 mm CONCRETE SLAB 200 mm GRANULAR FILL silty fine sand layer Brown, stiff to hard	1	DO	10	0		6	Dry on completion
		2	DO	20	1		22	
	SILTY CLAY TILL occ. wet sand and silt seams and layers cobbles and boulders	3	DO	27	2		9	
		4	DO	50			10	
3.0	END OF BOREHOLE Refusal to augering Inferred boulders or bedrock				3 4 5 6			

Soil Engineers Ltd.

JOB NO.: 2202-S029

LOG OF BOREHOLE NO.: 2

FIGURE NO.: 2

PROJECT DESCRIPTION: Proposed Soil Bearing Assessment

METHOD OF BORING: ram sounder

PROJECT LOCATION: 56 Edilcan Drive, Concord

DRILLING DATE: 'Febryary 28, 2022

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
0.0	Concrete Surface							
0.0	120 mm CONCRETE SLAB 200 mm GRANULAR FILL silty fine sand layer Brown, firm to hard	1	DO	6	0		12	Dry on completion
		2	DO	15	1		19	
	SILTY CLAY TILL occ. wet sand and silt seams and layers cobbles and boulders	3	DO	22	2		12	
		4	DO	50/5			10	
2.7	END OF BOREHOLE Refusal to augering Inferred boulders or bedrock				3 4 5 6			

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GRAIN SIZE DISTRIBUTION

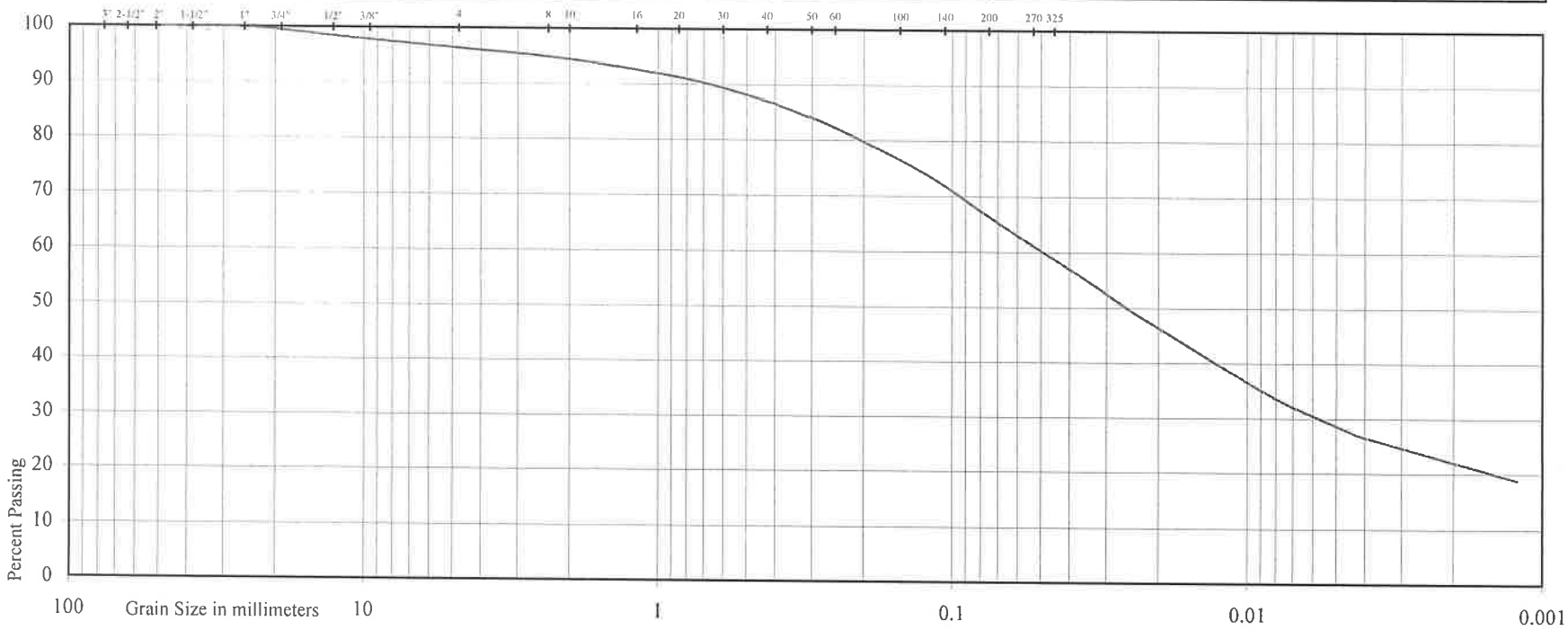
Reference No: 2202-S029

U.S. BUREAU OF SOILS CLASSIFICATION

GRAVEL		SAND				SILT	CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	V. FINE		

UNIFIED SOIL CLASSIFICATION

GRAVEL		SAND			SILT & CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	



Project: JOB NAME

Location: JOB LOCATION

Borehole No: 1

Sample No: 2

Depth (m): ?

Elevation (m): ?

Liquid Limit (%) = -

Plastic Limit (%) = -

Plasticity Index (%) = -

Moisture Content (%) = -

Estimated Permeability (cm./sec.) = 10^{-7}

Classification of Sample [& Group Symbol]: SILTY CLAY, TILL
sandy, a trace of gravel

Figure: 3

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

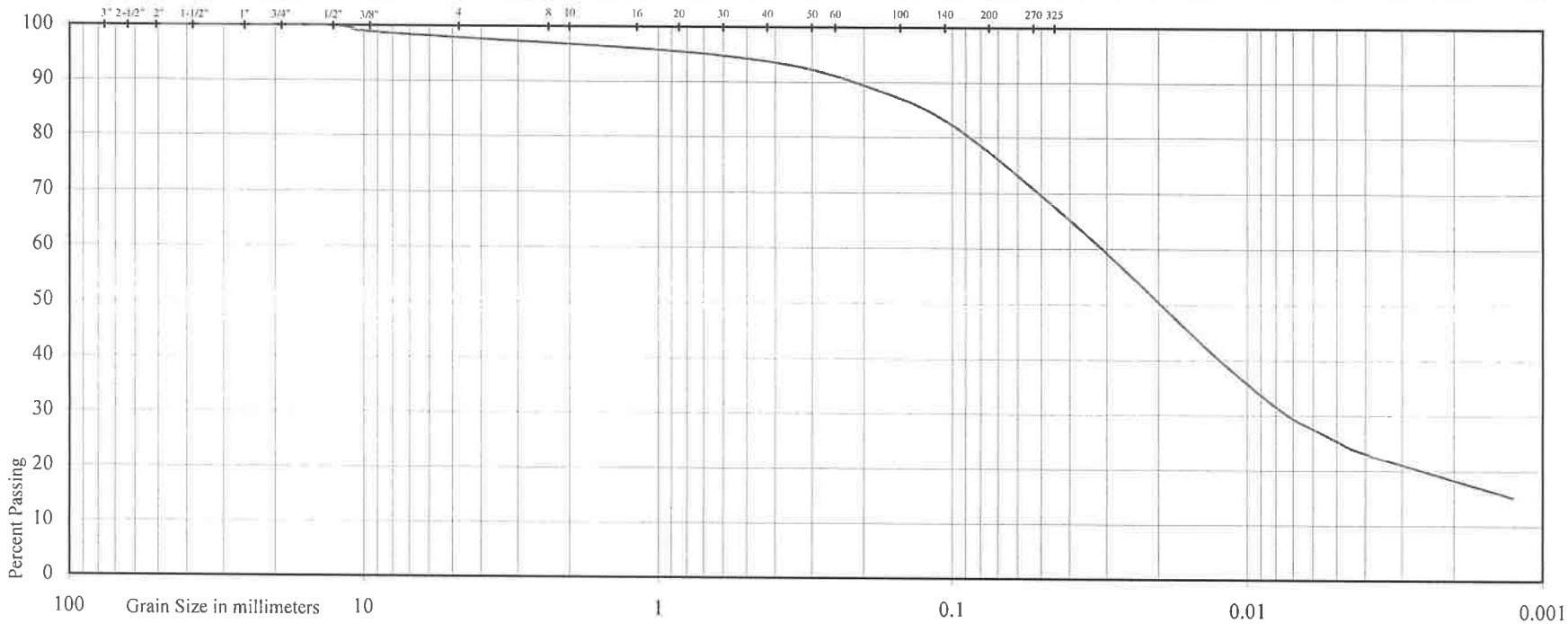
Reference No: 2202-S029

U.S. BUREAU OF SOILS CLASSIFICATION

GRAVEL		SAND				SILT	CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	V. FINE		

UNIFIED SOIL CLASSIFICATION

GRAVEL		SAND			SILT & CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	



Project: JOB NAME

Location: JOB LOCATION

Borehole No: 2

Sample No: 4

Depth (m): ?

Elevation (m): ?

Liquid Limit (%) = -

Plastic Limit (%) = -

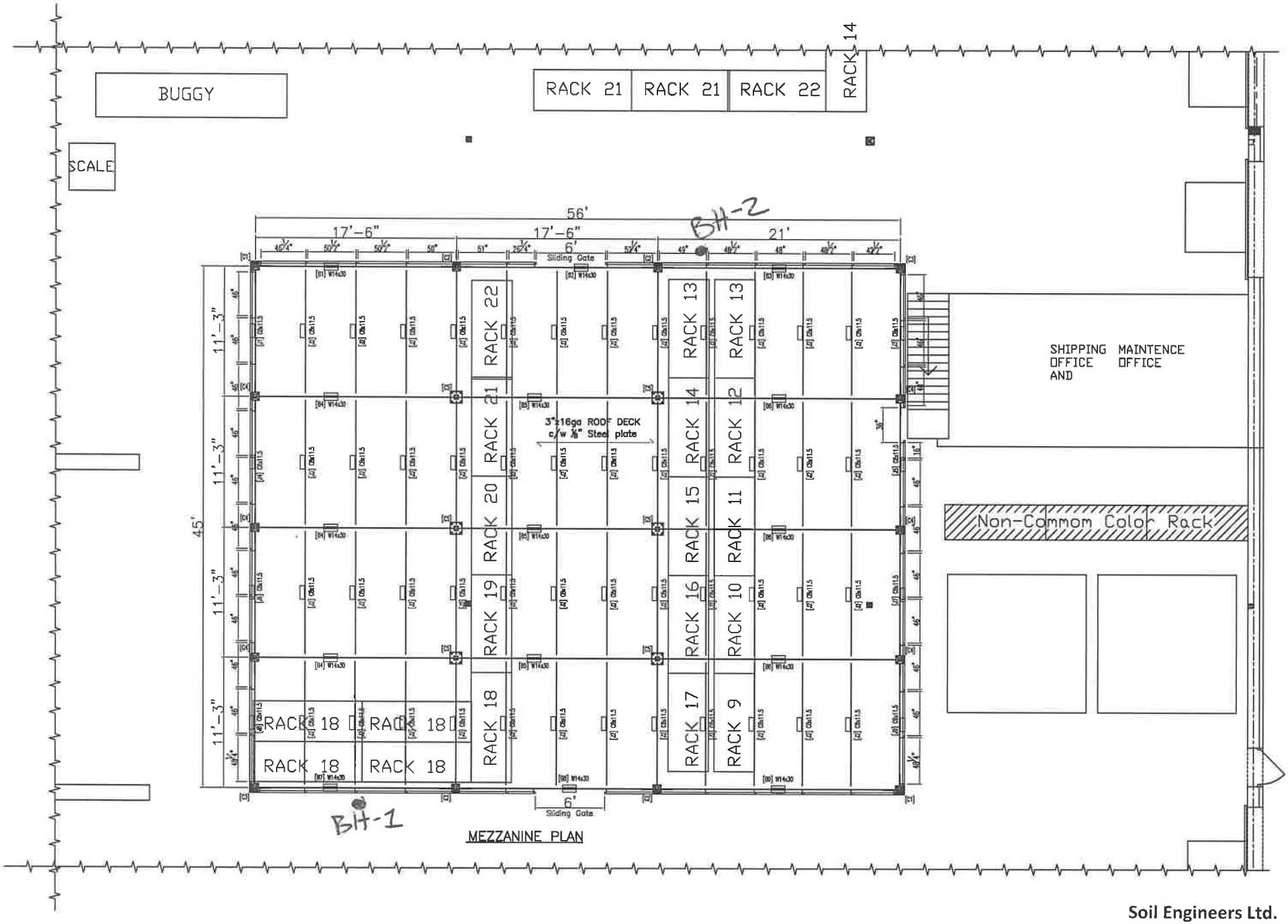
Plasticity Index (%) = -

Moisture Content (%) = -

Estimated Permeability (cm./sec.) = 10^{-7}

Classification of Sample [& Group Symbol]: SILTY CLAY, TILL
sandy, a trace of gravel

Figure: 3



MEZZANINE PLAN

Soil Engineers Ltd.
Reference No. 2202-S029
Drawing No. 1

Soil Engineers Ltd.
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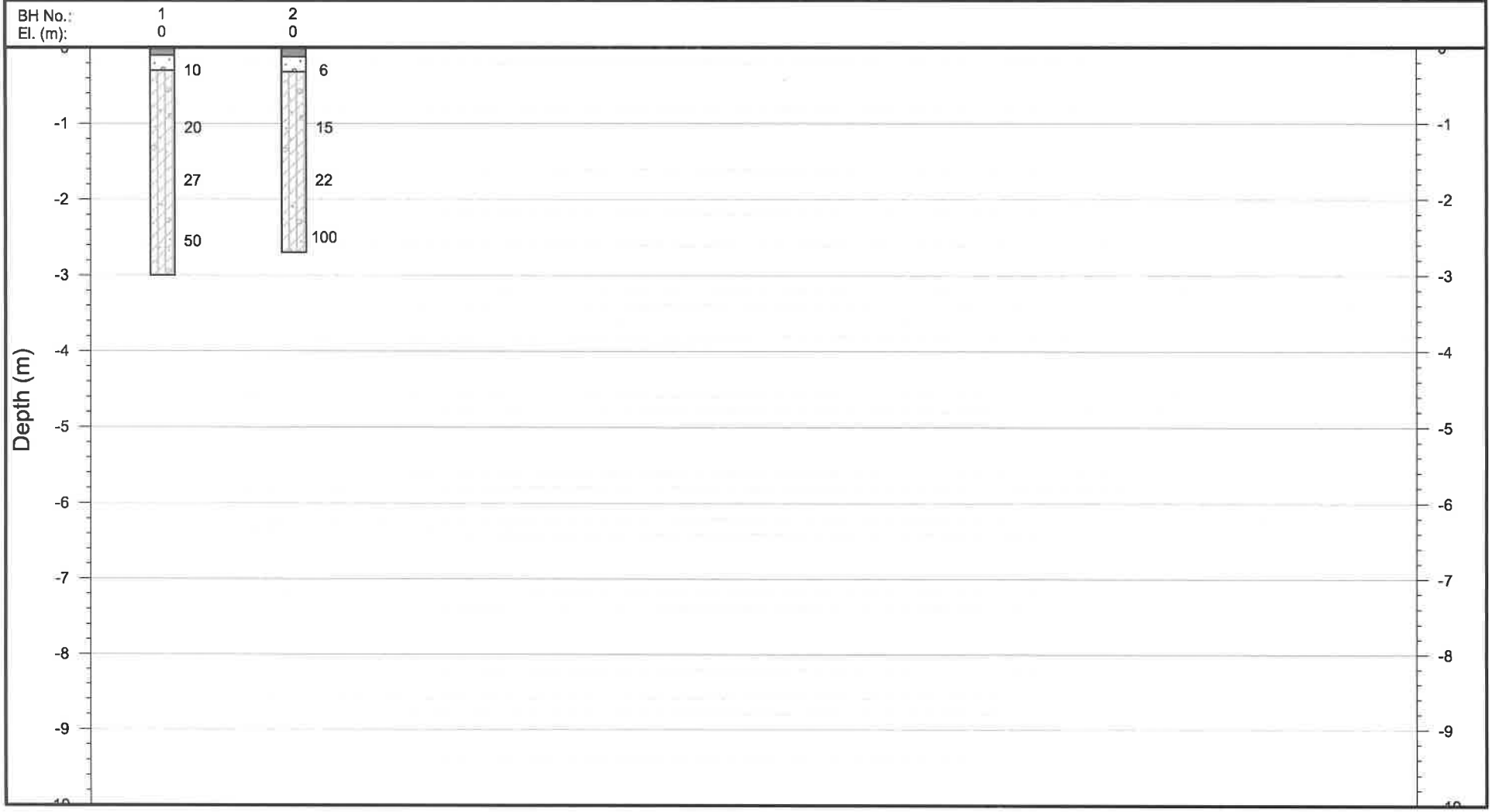
SUBSURFACE PROFILE
DRAWING NO. 2
SCALE: AS SHOWN

JOB NO.: 2202-S029
REPORT DATE: March 2022
PROJECT DESCRIPTION: Proposed Soil Bearing Assessment
PROJECT LOCATION: 56 Edilcan Drive, Concord

LEGEND
GRANULAR | CONCRETE | SILTY CLAY TILL



CANADA ENGINEERING SERVICES INC
Consulting Engineers - Geotechnical, Environmental and Structural

April 25, 2023 Report No. 230034-G1

Accord Plastics
56 Edilcan Drive
Concord, Ontario
M4M 2R8

Attention: Mr. Robert Ciancio, President / CEO

Re: Test Pit Investigation for Proposed Building Addition Over Top of Existing Two-Storey Light Industrial Building at Accord Plastics - 56 Edilcan Drive, Concord, Ontario

Dear Mr. Ciancio:

As requested we visited the above-mentioned site on April 21, 2023 to observe the soil at the bases of three test pits that were excavated around and within the existing two-storey light industrial building. It was understood that a building addition is being proposed to be constructed on top of the existing building.

Three test pits were dug down to a depth of approximately 1.5 m. The locations were as follows:

1. 10 m south of the northwest corner of the existing building (exterior)
2. 10 m south of the northeast corner of the existing building (exterior)
3. At gridlines 2 and F (interior)

The soils found within the test pits consisted of a moist, dense to very dense silty sand till, some clay and gravel sizes capable of supporting serviceability limit state (ULS) bearing capacity of 400 kPa (8000 psf) and a factored ultimate limit state (ULS) bearing pressure of 600 kPa (12000 psf). In addition, all test pits were dry upon completion.

The soils at the bases of the proposed footings and any underpinning that may be needed should be verified by staff from Canada Engineering Services Inc., for our recommendations to be reliable. The settlement from the recommended bearing capacities is expected to be a maximum of 19 mm differential and 25 mm total. The type of soil to be used for earthquake design is Type C

We trust that this report meets your requirements. Please call the undersigned if there are any questions.

Sincerely,
CANADA ENGINEERING SERVICES INC.

REGISTERED PROFESSIONAL ENGINEER
R. JAGDAT
PROVINCE OF ONTARIO

Ram Jagdat. P. Eng.
Consulting Engineer
Principal

Hazardous Building Materials Assessment (Pre-Construction)

56 Edilcan Drive,
Concord, Ontario

Prepared for:

Accord Plastics Corp.
56 Edilcan Drive
Concord, Ontario, L4K 3S6

November 17, 2023

Pinchin File: 333414.000

Issued to:	**Accord Plastics Corp.**
Issued on:	**November 17, 2023**
Pinchin File:	**333414.000**
Issuing Office:	**Toronto, ON**

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Operations Manager
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tstanisic@pinchin.com

EXECUTIVE SUMMARY

Accord Plastics Corp. (Client) retained Pinchin Ltd. (Pinchin) to conduct a hazardous building materials assessment in the building located at 56 Edilcan Drive, Concord, Ontario. Pinchin performed the assessment on November 2, 2023.

The objective of the assessment was to identify specified hazardous building materials in preparation for the upcoming construction of a 2nd floor on top of the existing 1-storey northern section of the building. The proposed work consists of but is not limited to the following activities, as described on the construction drawing ("Accord Vaughan," prepared by Workshop, dated October 3, 2023, Project No.: 22_31) provided by the Client via email on October 16, 2023.

- Demolish existing select exterior block wall.
- Demolish existing doors.
- Demolish existing columns.
- Cut back existing flooring and remove existing footing. Prepare to accept new concrete footing.
- Demolish existing overhead garage door.
- Demolish existing storage mezzanine, associated structure, & stairs.
- Excavate along exterior perimeter of the building to accommodate new columns and footings.
- Demolish existing floor and excavate for expanded water tank.

The results of this assessment are intended for use with a properly developed scope of work and safe work procedures.

SUMMARY OF FINDINGS

The following is a summary of significant findings; refer to the body of the report for detailed findings:

Asbestos: Grey caulking is present around metal window frames at the storage mezzanine.

Lead:

- Lead is present in paints.
- Batteries of emergency lights contain solid lead.

Silica: Crystalline silica is present in concrete and other materials such as masonry, concrete, mortar, and drywall.

Mercury: Mercury vapour is present in lamp tubes.

Polychlorinated Biphenyls (PCBs): PCBs are not present.

Mould and Water Damage: Visible mould and water damage was not observed during the assessment.

SUMMARY OF RECOMMENDATIONS

The following is a summary of significant recommendations; refer to the body of the report for detailed recommendations.

1. Prepare a scope of work and safe work procedures for the hazardous materials removal required for the planned work.
2. Do not disturb suspected hazardous building materials discovered during the planned work, which have not been identified in this report and arrange for further evaluation and testing.
3. Remove and properly dispose of asbestos-containing materials prior to renovation activities.
4. Recycle mercury-containing lamp tubes when removed from service.
5. Follow appropriate safe work procedures when handling or disturbing asbestos, lead and silica.

This Executive Summary is subject to the same standard limitations as contained in the report and must be read in conjunction with the entire report.

TABLE OF CONTENTS

APPENDICES

1.0 INTRODUCTION AND SCOPE

Accord Plastics Corp. (Client) retained Pinchin Ltd. (Pinchin) to conduct a hazardous building materials assessment in the building located at 56 Edilcan Drive, Concord, Ontario.

Pinchin performed the assessment on November 2, 2023. The surveyor was unaccompanied during the assessment. The assessed area was occupied at the time of the assessment.

The objective of the assessment was to identify specified hazardous building materials in preparation for building renovation activities.

The objective of the assessment was to identify specified hazardous building materials in preparation for the upcoming construction of a 2nd floor on top of the existing 1-storey northern section of the building. The proposed work consists of but is not limited to the following activities, as described on the construction drawing ("Accord Vaughan," prepared by Workshop, dated October 3, 2023, Project No.: 22_31) provided by the Client via email on October 16, 2023.

- Demolish existing select exterior block wall.
- Demolish existing doors.
- Demolish existing columns.
- Cut back existing flooring and remove existing footing. Prepare to accept new concrete footing.
- Demolish existing overhead garage door.
- Demolish existing storage mezzanine, associated structure, & stairs.
- Excavate along exterior perimeter of the building to accommodate new columns and footings.
- Demolish existing floor and excavate for expanded water tank.

The results of this assessment are intended for use with a properly developed scope of work.

1.1 Scope of Assessment

The **assessed area** is limited to the portion of the production areas in the building to be renovated, as described by the Client, and as identified in the drawings in Appendix I.

The assessment was performed to establish the type of specified hazardous building materials, locations and approximate quantities incorporated in the structure and its finishes.

For the purpose of the assessment and this report, hazardous building materials are defined as follows:

- Asbestos
- Lead
- Silica
- Mercury
- Mould

Based on the date of construction and known end of use dates, polychlorinated biphenyls are presumed not to be present in the building.

The following Designated Substances are not typically found in building materials in a composition/state that is hazardous and were not included in this assessment:

- Arsenic
- Acrylonitrile
- Benzene
- Coke oven emissions
- Ethylene oxide
- Isocyanates
- Vinyl chloride monomer

2.0 METHODOLOGY

Pinchin conducted an assessment to identify the hazardous building materials as defined in the scope.

The assessment included intrusive investigation of wall and ceiling finishes (drywall) to view concealed conditions at representative areas as permitted by the current building use. Destructive testing of flooring was conducted where possible (under carpets or multiple layers of flooring). Demolition of exterior building finishes, masonry walls (chases, shafts etc.), and structural surrounds was conducted as permitted by the current building use.

Limited demolition of masonry block walls (core holes) was conducted to investigate for loose fill vermiculite insulation. The core holes were temporarily patched with a suitable product (e.g. spray foam).

Sampling of roofing materials was conducted. Roof cuts and repairs to the roof were made by a qualified roofer retained by the Pinchin.

For further details on the methodology including test methods, refer to Appendix III.

3.0 BACKGROUND INFORMATION

3.1 Assessed Area Description

Description Item	Details
Use	Warehouse and offices
Assessed Area	One-storey production area
Total Area	The assessed area is ~15,000 square feet
Year of Construction	The building was constructed in 1987
Structure	Steel
Exterior Cladding	Brick veneer
HVAC	Natural gas-fired heating and electrically powered cooling rooftop packaged heating/ventilation/air-conditioning (HVAC) units, and a natural gas-fired rooftop mounted make-up air (MUA) unit.
Roof	Built-up roofing, metal
Flooring	Concrete
Interior Walls	Drywall, masonry
Ceilings	Drywall

3.2 Existing Reports

No existing reports were provided for reference.

4.0 FINDINGS

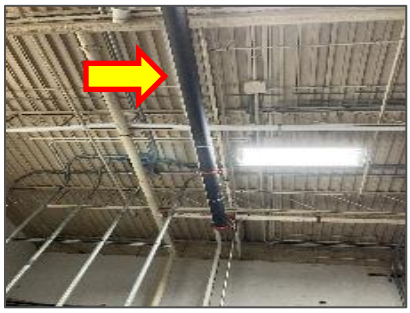
The following section summarizes the findings of the assessment and provides a general description of the hazardous building materials identified. For details on approximate quantities, condition, friability, accessibility, and locations of hazardous building materials; refer to the Hazardous Material Summary / Sample Log and All Data Report in Appendices V and VI.

Any quantities listed in this report or data tables are estimated based on visual approximations only and are subject to variation.

4.1 Asbestos

4.1.1 Pipe Insulation

Pipes in the assessed area are either uninsulated or insulated with fibreglass and jacketed in canvas.



Uninsulated pipe, Loc. 1.

Pipe insulated with fibreglass and jacketed in canvas, Loc. 1.

4.1.2 Duct Insulation and Mastic

Ducts present in the assessed area are uninsulated.

The following is a summary of duct mastics sampled, for a complete list of locations, refer to Appendix V.

Colour	Sample Location	Sample Number	Asbestos	Photo
Black and silver mastic	Roof (Loc. 3)	S0004A-C	No	

4.1.3 Mechanical Equipment Insulation

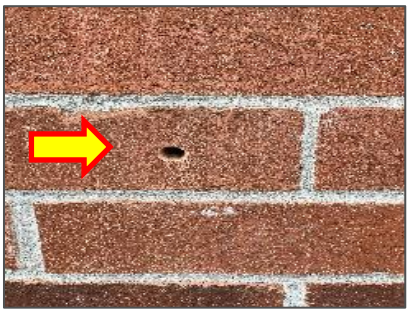
Fan units present in the warehouse and roof are uninsulated.

Air handling unit, Loc. 3.

4.1.4 Vermiculite

Destructive testing was conducted on masonry block and brick walls, including creating penetrations on interior and exterior perimeter walls of the production warehouse (Loc. 1). Two holes were made through interior and one hole at exterior walls. No vermiculite insulation was discovered within the wall cavities. The locations of destructive testing have been indicated on the drawings in Appendix I.

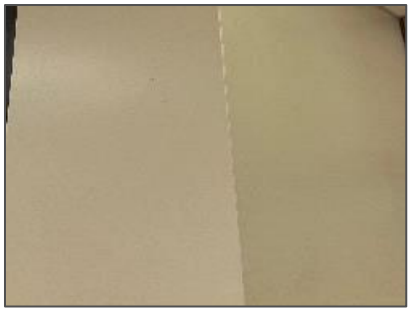
Interior block wall, Loc. 1 – Production warehouse.



Exterior block wall, Loc. 3 – Exterior.

4.1.5 Drywall Joint Compound

Drywall joint compound present on wall and ceiling finishes in the assessed area does not contain asbestos (samples S0009A-C and S0010A-C).



Non-asbestos drywall joint compound on walls and ceiling, Loc. 1.

4.1.6 Firestopping

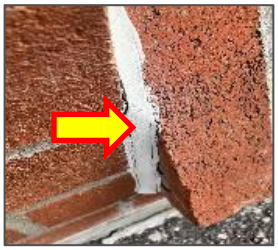
Firestopping sealant (tar) present at electrical conduit penetrations on roof does not contain asbestos (samples S0003A-C).

Non-asbestos firestop, Loc. 3.

4.1.7 Caulking

The following is a summary of sealants, caulking, and putties sampled, for a complete list of locations, refer to Appendix V.

Material, Description and Application	Sample Location (Location #)	Sample Number	Asbestos	Photo
Red caulking on vent	Roof (Loc. 3)	S0002A-C	No	
Dark brown caulking on air handling unit around seams	Roof (Loc. 3)	S0005A-C	No	
Black caulking on duct seams	Roof (Loc. 3)	S0006A-C	No	

Material, Description and Application	Sample Location (Location #)	Sample Number	Asbestos	Photo
Dark brown caulking on roof flashing	Roof (Loc. 3)	S0007A-C	No	
Grey caulking on expansion joints	Exterior (Loc. 2)	S0008A-C	No	
Grey caulking around window frame	**Mezzanine Garage (Loc. 4)**	**S0013A-C**	**Yes (Chrysotile)**	

4.1.8 Roofing Products

The materials associated with the Built-up Roof do not contain asbestos (samples S0001A-C).

Non-asbestos built-up roof, Loc. 3.

Non-asbestos built-up roof, Loc. 3.

4.1.9 Other Building Materials

Mortar present in the concrete block masonry and brick does not contain asbestos (samples S0011A-C and S0012A-C).

Mortar present on masonry wall, Loc. 1.

Mortar present on brick wall, Loc. 2.

4.1.10 Excluded Materials

The following is a list of materials which may contain asbestos and was excluded from the assessment. These materials are presumed to contain asbestos until otherwise proven by sampling and analysis:

- Electrical components
- Sealants on pipe threads
- Fire resistant doors
- Ropes and gaskets in cast-iron bell and spigot joints

4.2 Lead

4.2.1 Paints and Coatings

The following table summarizes the analytical results of paints sampled.

Sample Number	Colour, Substrate Description	Sample Location	Lead (%)	Photo
L0001	White on masonry wall	Production warehouse (Loc. 1)	0.00098	

Sample Number	Colour, Substrate Description	Sample Location	Lead (%)	Photo
L0002	Beige on masonry wall	Production warehouse (Loc. 1)	0.00054	
L0003	Yellow on metal structure	Production warehouse (Loc. 1)	<0.0020	
L0004	Dark grey on drywall, wall	Production warehouse (Loc. 1)	<0.00046	
L0005	**Yellow on paint**	**Roof (Loc. 3)**	**1.9**	

Results above 0.1% (1,000 mg/kg) are considered lead-containing, and over 0.5% (5,000 mg/kg) are considered lead-based.

Results less than or equal to 0.1% (1,000 mg/kg), but equal to or greater than 0.009% (90 mg/kg), are considered low-level lead paints or surface coatings in accordance with the EACC guideline.

Paint containing less than 0.009% (90 mg/kg) lead is assumed to be insignificant.

4.2.2 Lead Products and Applications

Lead-containing batteries are present in emergency lighting.

Lead-containing battery, Loc. 1.

4.2.3 Excluded Lead Materials

Lead is known to be present in several materials which were not assessed or sampled. The following materials, where found, should be presumed to contain lead.

- Electrical components, including wiring connectors, grounding conductors, and solder
- Solder on pipe connections

4.3 Silica

Crystalline silica is assumed to be a component of the following materials where present in the building.

- Concrete
- Masonry and mortar
- Drywall

4.4 Mercury

4.4.1 Lamps

Mercury vapour is present in fluorescent lamp tubes and other lighting that is known to contain mercury such as mercury vapour lamps.

4.4.2 Mercury-Containing Devices

Mercury-containing devices were not found during the assessment.

4.5 Polychlorinated Biphenyls

4.5.1 Caulking and Sealants

PCBs were banned in 1980; however, are found to be present in caulking and sealants until 1985. Caulking and sealants in the assessed area was installed in 1987 and are not suspected to contain PCBs.

4.5.2 Lighting Ballasts

Based on information from the Client and confirmed by visual observations (e.g., evidence of T-5 or T-8 fixtures with electronic ballasts) the fixtures will not contain PCB ballasts.

4.5.3 Transformers

All transformers in the building are dry type transformers and do not contain PCB-containing dielectric fluids; however, may contain capacitors, which could not be assessed for PCBs as the equipment was in service. Transformers will not be going to be impacted by the scope of work.

4.6 Mould and Water Damage

Visible mould growth and water damage was not observed during the assessment.

5.0 RECOMMENDATIONS

5.1 General

1. Prepare a scope of work for hazardous material removal required for the planned work. The scope should include safe work practices, personal protective equipment, respiratory protection, and disposal of waste materials.
2. If suspected hazardous building materials are discovered during the planned work, which are not identified in this report, do not disturb, and arrange for further testing and evaluation.
3. Provide this report and the detailed plans to the contractor prior to bidding or commencing work.
4. Retain a qualified consultant to specify, observe and document the successful removal of hazardous materials.
5. Update the asbestos inventory upon completion of the abatement and removal of asbestos-containing materials and any other relevant findings.

5.2 Building Renovation Work

The following recommendations are made regarding renovation involving the hazardous materials identified.

5.2.1 Asbestos

Remove asbestos-containing materials (ACM) prior to renovation, alteration, or maintenance if ACM may be disturbed by the work. If the identified ACM will not be removed prior to commencement of the work, any potential disturbance of ACM must follow asbestos precautions appropriate for the type of work being performed.

Asbestos-containing materials must be disposed of at a landfill approved to accept asbestos waste.

5.2.2 Lead

For lead-containing or lead-based paints (i.e., greater than the EACC guideline of 0.1% (1,000 mg/kg) for lead-containing paints, and 0.5% (5,000 mg/kg) for lead-based), construction disturbance may result in over-exposure to lead dust or fumes. The need for work procedures, engineering controls and personal protective equipment should be assessed on a site-specific basis to comply with Ministry of Labour, Training and Skills Development regulations and guidelines.

For paints identified as having low levels of lead (i.e., equal to or above 0.009% (90 mg/kg) but less than or equal to the EACC guideline of 0.1% (1,000 mg/kg) for lead-containing paints) special precautions are not recommended unless aggressive disturbance (grinding, blasting, torching) is planned. Exposure from construction disturbance of paints containing lead less than 0.009% (90 mg/kg) is assumed to be insignificant.

Items painted with paints containing elevated levels of lead may be a hazardous waste. Test lead-painted materials for leachable lead and other metals prior to disposal. Metallic components coated with lead paint do not require leachate testing and can be disposed of as non-hazardous construction and demolition (C&D) waste.

Lead-containing items should be recycled when taken out of service.

5.2.3 Silica

Construction disturbance of silica-containing products may result in excessive exposures to airborne silica, especially if performed indoors and dry. Cutting, grinding, drilling or demolition of materials containing silica should be completed only with proper respiratory protection and other worker safety precautions that comply with applicable regulations and guidelines.

5.2.4 Mercury

Do not break lamps. Recycle and reclaim mercury from fluorescent lamps when taken out of service. Mercury is classified as a hazardous waste and must be disposed of in accordance with applicable regulations.

6.0 TERMS AND LIMITATIONS

This work was performed subject to the Terms and Limitations presented or referenced in the proposal for this project.

Information provided by Pinchin is intended for Client use only. Pinchin will not provide results or information to any party unless disclosure by Pinchin is required by law. Any use by a third party of reports or documents authored by Pinchin or any reliance by a third party on or decisions made by a third party based on the findings described in said documents, is the sole responsibility of such third parties. Pinchin accepts no responsibility for damages suffered by any third party as a result of decisions made or actions conducted. No other warranties are implied or expressed.

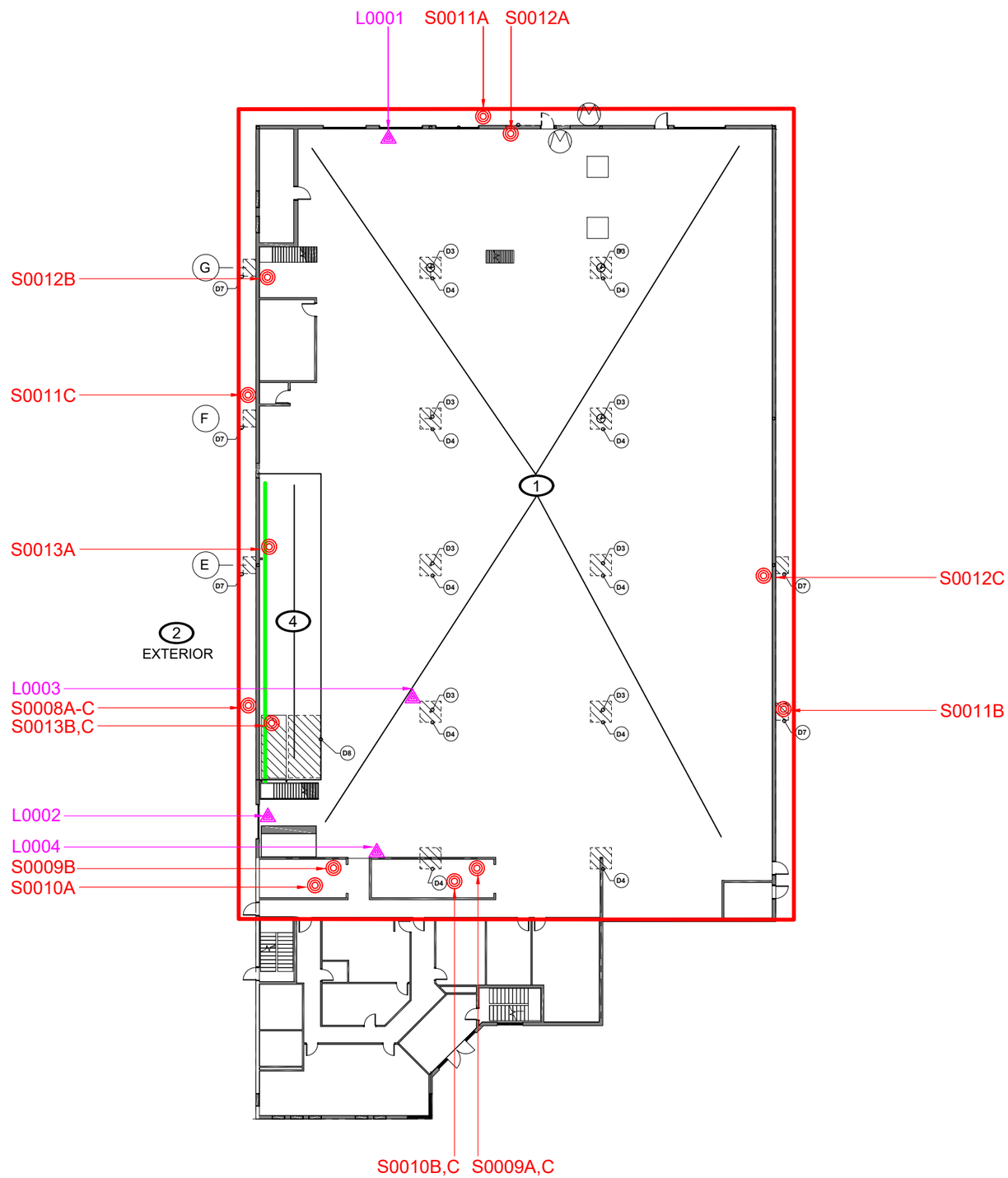
7.0 REFERENCES

The following legislation and documents were referenced in completing the assessment and this report:

1. Asbestos on Construction Projects and in Buildings and Repair Operations, Ontario Regulation 278/05.
2. Designated Substances, Ontario Regulation 490/09.
3. Lead on Construction Projects, Ministry of Labour Guidance Document.
4. The Environmental Abatement Council of Canada (EACC) Lead Guideline for Construction, Renovation, Maintenance or Repair.
5. Ministry of the Environment Regulation, R.R.O. 1990 Reg. 347 as amended.
6. Ministry of the Environment Regulation, R.R.O. 1990 Reg. 362 as amended.
7. Silica on Construction Projects, Ministry of Labour Guidance Document.
8. Surface Coating Materials Regulations, SOR/2016-193, Canada Consumer Product Safety Act.
9. Consolidated Transportation of Dangerous Goods Regulations, including Amendment SOR/2019-101, Transportation of Dangerous Goods Act.

APPENDIX I

Drawings



N

LEGEND

- PINCHIN LOCATION NUMBER
- SURVEY BOUNDARY/ASSESSED AREA
- ASBESTOS BULK SAMPLE
- LEAD BULK SAMPLE
- VERMICULITE DRILLHOLE

ASBESTOS-CONTAINING MATERIALS:

- GREY CAULKING

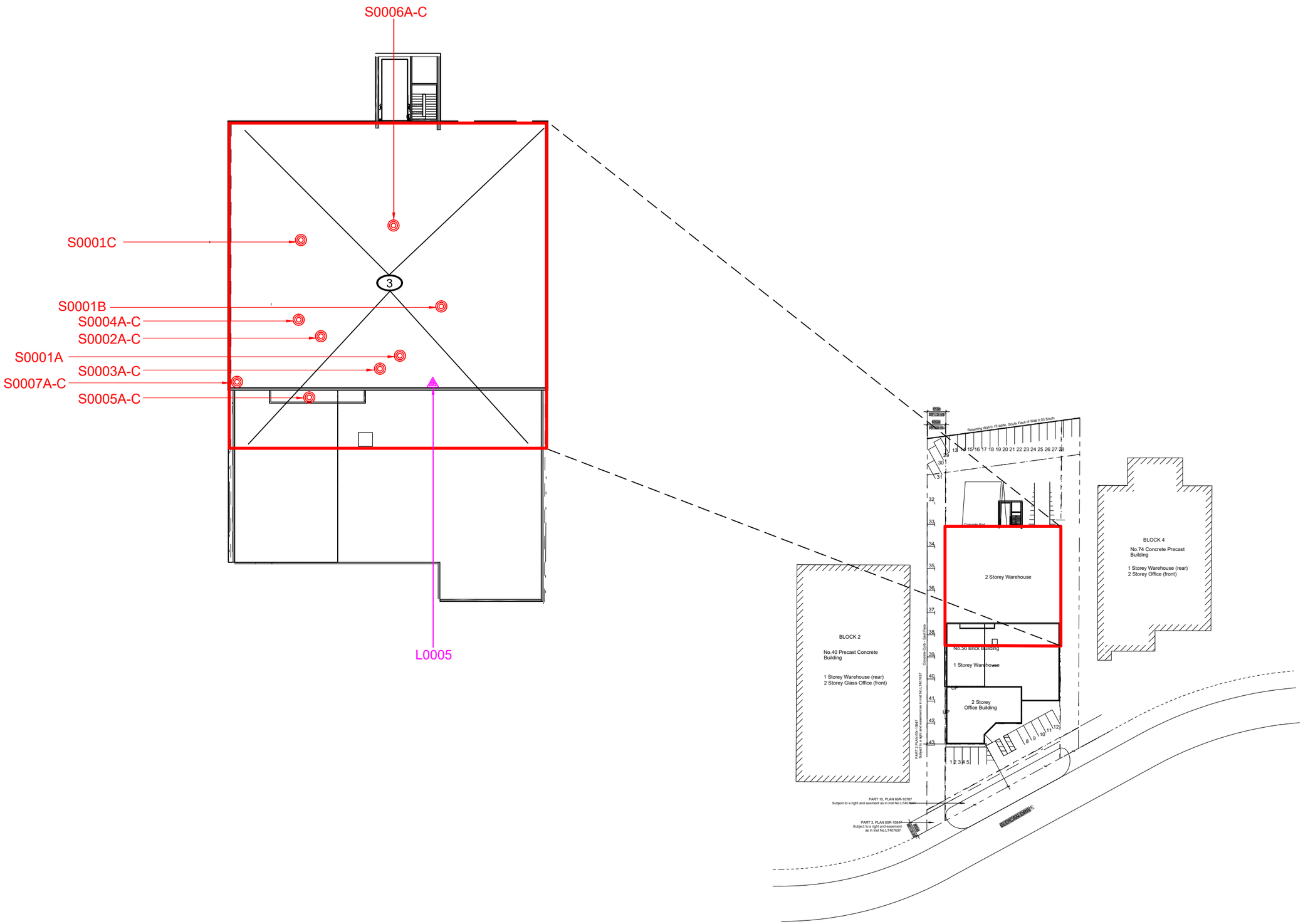
NOT ALL KNOWN OR SUSPECTED HAZARDOUS BUILDING MATERIALS MAY BE DEPICTED ON THE DRAWING. REFER TO THE HAZARDOUS BUILDING MATERIALS ASSESSMENT REPORT FOR A COMPLETE LIST OF KNOWN AND SUSPECTED HAZARDOUS BUILDING MATERIALS.

LEGEND IS COLOUR DEPENDENT. NON-COLOUR COPIES MAY ALTER INTERPRETATION.

BASE PLAN PROVIDED BY CLIENT.

PINCHIN

PROJECT NAME: HAZARDOUS BUILDING MATERIALS ASSESSMENT (PRE-CONSTRUCTION)	
CLIENT NAME: ACCORD PLASTICS CORP.	
PROJECT LOCATION: 56 EDILCAN DRIVE VAUGHAN, ONTARIO	
FIGURE NAME: GROUND FLOOR	
PROJECT NUMBER: 333414.000	SCALE: NOT TO SCALE
DRAWN BY: DP	REVIEWED BY: RR
DATE: NOVEMBER 2023	FIGURE NUMBER: 1 OF 2



N

LEGEND

- PINCHIN LOCATION NUMBER
- SURVEY BOUNDARY/ASSESSED AREA
- ASBESTOS BULK SAMPLE
- LEAD BULK SAMPLE
- VERMICULITE DRILLHOLE

ASBESTOS-CONTAINING MATERIALS:

- GREY CAULKING

NOT ALL KNOWN OR SUSPECTED HAZARDOUS BUILDING MATERIALS MAY BE DEPICTED ON THE DRAWING. REFER TO THE HAZARDOUS BUILDING MATERIALS ASSESSMENT REPORT FOR A COMPLETE LIST OF KNOWN AND SUSPECTED HAZARDOUS BUILDING MATERIALS.

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BASE PLAN PROVIDED BY CLIENT.

PINCHIN

PROJECT NAME: HAZARDOUS BUILDING MATERIALS ASSESSMENT (PRE-CONSTRUCTION)	
CLIENT NAME: ACCORD PLASTICS CORP.	
PROJECT LOCATION: 56 EDILCAN DRIVE VAUGHAN, ONTARIO	
FIGURE NAME: ROOF	
PROJECT NUMBER: 333414.000	SCALE: NOT TO SCALE
DRAWN BY: DP	REVIEWED BY: RR
DATE: NOVEMBER 2023	FIGURE NUMBER: 2 OF 2

APPENDIX II-A

Asbestos Analytical Certificates

Pinchin Ltd. Asbestos Laboratory
Certificate of Analysis

Project No.:	**0333414.000**		
Prepared For:	**R. Rai / A. Gimenez**		
Lab Reference No.:	**b303643**		
Analyst(s):	**R. Janssen**		
Date Received:	**November 3, 2023**	**Samples Submitted:**	**3**
Date Analyzed:	**November 7, 2023**	**Phases Analyzed:**	**12**

The Pinchin Ltd. Dartmouth asbestos laboratory is accredited by the National Institute of Standards and Technology, National Voluntary Laboratory Accreditation Program (NVLAP Lab Code 201032-0) for the 'EPA – 40 CFR Appendix E to Subpart E of Part 763, Interim Method of the Determination of Asbestos in Bulk Insulation Samples,' and the 'EPA 600/R-93/116: Method for the Determination of Asbestos in Bulk Building Materials'; and meets all requirements of ISO/IEC 17025:2017. The Pinchin asbestos laboratory uses the aforementioned methods of analysis.

Bulk samples are checked visually and scanned under a stereomicroscope. Slides are prepared and observed under a Polarized Light Microscope (PLM) at magnifications of 40X, 100X or 400X as appropriate. Asbestos fibres are identified by a combination of morphology, colour, refractive index, extinction, sign of elongation, birefringence and dispersion staining colours. A visual estimate is made of the percentage of asbestos present. A reported concentration of less than (<) the regulatory threshold indicates the presence of confirmed asbestos in trace quantities, limited to only a few fibres or fibre bundles in an entire sample. This method complies with provincial regulatory requirements where applicable. Multiple phases within a sample are analyzed and reported separately.

All bulk samples submitted to this laboratory for asbestos analysis are retained for a minimum of three months. Samples may be retrieved, upon request, for re-examination at any time during that period.

This report relates only to the items tested.

Pinchin Ltd. Asbestos Laboratory
Certificate of Analysis

Project No.: 0333414.000
Prepared For: R. Rai / A. Gimenez

Lab Reference No.: b303643
Date Analyzed: November 7, 2023

BULK SAMPLE ANALYSIS

SAMPLE IDENTIFICATION	SAMPLE DESCRIPTION	% COMPOSITION (VISUAL ESTIMATE)	
		ASBESTOS	OTHER
S0001A Built up roof material, Loc. 3	4 Phases: a) Homogeneous, black and brown, tar-coated, compressed, fibrous material.	None Detected	Cellulose 50-75% Tar and other Non-Fibrous Material 25-50%
	b) Homogeneous, black, tar material.	None Detected	Tar and other Non-Fibrous Material > 75%
	c) Homogeneous, black, layered, tar-impregnated, compressed, fibrous material.	None Detected	Cellulose 25-50% Tar and other Non-Fibrous Material 50-75%
	d) Homogeneous, black, layered, tar material.	None Detected	Tar and other Non-Fibrous Material > 75%
Comments:	Woven man-made vitreous fibre weave reinforcement is present embedded in phase b) of this sample. Man-made vitreous fibres are present on the surface of this sample.		
S0001B Built up roof material, Loc. 3	4 Phases: a) Homogeneous, black and brown, tar-coated, compressed, fibrous material.	None Detected	Cellulose 50-75% Tar and other Non-Fibrous Material 25-50%
	b) Homogeneous, black, tar material.	None Detected	Tar and other Non-Fibrous Material > 75%
	c) Homogeneous, black, layered, tar-impregnated, compressed, fibrous material.	None Detected	Cellulose 25-50% Tar and other Non-Fibrous Material 50-75%
	d) Homogeneous, black, layered, tar material.	None Detected	Tar and other Non-Fibrous Material > 75%
Comments:	Woven man-made vitreous fibre weave reinforcement is present embedded in phase b) of this sample. Man-made vitreous fibres are present on the surface of this sample.		

Pinchin Ltd. Asbestos Laboratory
Certificate of Analysis

Project No.: 0333414.000
Prepared For: R. Rai / A. Gimenez

Lab Reference No.: b303643
Date Analyzed: November 7, 2023

BULK SAMPLE ANALYSIS

SAMPLE IDENTIFICATION	SAMPLE DESCRIPTION	% COMPOSITION (VISUAL ESTIMATE)		
		ASBESTOS	OTHER	
S0001C Built up roof material, Loc. 3	4 Phases: a) Homogeneous, black and brown, tar-coated, compressed, fibrous material.	None Detected	Cellulose Tar and other Non-Fibrous Material	50-75% 25-50%
	b) Homogeneous, black, tar material.	None Detected	Tar and other Non-Fibrous Material	> 75%
	c) Homogeneous, black, layered, tar-impregnated, compressed, fibrous material.	None Detected	Cellulose Tar and other Non-Fibrous Material	25-50% 50-75%
	d) Homogeneous, black, layered, tar material.	None Detected	Tar and other Non-Fibrous Material	> 75%
Comments:	Woven man-made vitreous fibre weave reinforcement is present embedded in phase b) of this sample. Man-made vitreous fibres are present on the surface of this sample.			

Reviewed by:

Jason Stapleton
2023.11.09 13:31:18-04'00'

Reporting Analyst:

Pinchin Ltd.
2023.11.07 14:12:15-04'00'
Reid Janssen

Analyzed By: RJ

Reviewed By: JS

Report Sent By: _____

Pinchin Ltd. - Asbestos Laboratory
Internal Asbestos Bulk Sample Chain of Custody

Client Name:				**Project Address:**			
Portfolio/Building No:				**Pinchin File:**	333414		
Submitted by:	Rashmi Rai			**Email:**	rrai@pinchin.com		
CC Results to:	Andres Gimenez			**CC Email:**	agimenez@pinchin.com		
Date Submitted:	November	3	2023	**Required by:**	November	10	2023
# of Samples:	3			**Priority:**	5 Day Turnaround		
Year of Building Construction (*Mandatory, Years ONLY*):							
Do NOT Stop on Positive (Sample Numbers):							
Pinchin Group Company (*Mandatory Field*):				Pinchin			
HMIS2 Building Reference #:							
To be Completed by Lab Personnel Only:							
Lab Reference #:	b303643			**Time:**	24 hour clock		
Received by:	Reid Janssen			**Date:**	November	3	2023
Name(s) of Analyst(s):	R. Janssen						

Sample Prefix	Sample No.	Sample Suffix	Sample Description/Location (Mandatory)	
S	0001	A	Built up roof material, Loc. 3	a)ND b)ND c)ND d)ND
S	0001	B	Built up roof material, Loc. 3	a)ND b)ND c)ND d)ND
S	0001	C	Built up roof material, Loc. 3	a)ND b)ND c)ND d)ND

12

Pinchin Ltd. Asbestos Laboratory
Certificate of Analysis

Project No.:	**0333414.000**		
Prepared For:	**R. Rai / A. Gimenez**		
Lab Reference No.:	**b303644**		
Analyst(s):	**R. Janssen**		
Date Received:	**November 3, 2023**	**Samples Submitted:**	**36**
Date Analyzed:	**November 8, 2023**	**Phases Analyzed:**	**37**

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All bulk samples submitted to this laboratory for asbestos analysis are retained for a minimum of three months. Samples may be retrieved, upon request, for re-examination at any time during that period.

This report relates only to the items tested.

Pinchin Ltd. Asbestos Laboratory
Certificate of Analysis

Project No.: 0333414.000
Prepared For: R. Rai / A. Gimenez

Lab Reference No.: b303644
Date Analyzed: November 8, 2023

BULK SAMPLE ANALYSIS

SAMPLE IDENTIFICATION	SAMPLE DESCRIPTION	% COMPOSITION (VISUAL ESTIMATE)		
		ASBESTOS	OTHER	
S0002A Caulking on vent, Loc . 3	Homogeneous, red, caulking material.	None Detected	Non-Fibrous Material	> 75%
S0002B Caulking on vent, Loc . 3	Homogeneous, red, caulking material.	None Detected	Non-Fibrous Material	> 75%
S0002C Caulking on vent, Loc . 3	Homogeneous, red, caulking material.	None Detected	Non-Fibrous Material	> 75%
S0003A Firestopping on electrical conduit, Loc. 3	Homogeneous, black, tar material.	None Detected	Cellulose Tar and other Non-Fibrous Material	25-50% 50-75%
S0003B Firestopping on electrical conduit, Loc. 3	Homogeneous, black, tar material.	None Detected	Cellulose Tar and other Non-Fibrous Material	25-50% 50-75%
S0003C Firestopping on electrical conduit, Loc. 3	Homogeneous, black, tar material.	None Detected	Cellulose Tar and other Non-Fibrous Material	25-50% 50-75%
S0004A Duct, Duct mastic, Loc. 3	2 Phases: a) Homogeneous, black, mastic material.	None Detected	Non-Fibrous Material	> 75%
	b) Homogeneous, silver, mastic material.	None Detected	Non-Fibrous Material	> 75%

Pinchin Ltd. Asbestos Laboratory
Certificate of Analysis

Project No.: 0333414.000
Prepared For: R. Rai / A. Gimenez

Lab Reference No.: b303644
Date Analyzed: November 8, 2023

BULK SAMPLE ANALYSIS

SAMPLE IDENTIFICATION	SAMPLE DESCRIPTION	% COMPOSITION (VISUAL ESTIMATE)	
		ASBESTOS	OTHER
S0004B Duct, Duct mastic, Loc. 3	2 Phases: a) Homogeneous, black, mastic material.	None Detected	Non-Fibrous Material > 75%
	b) Homogeneous, silver, mastic material.	None Detected	Non-Fibrous Material > 75%
S0004C Duct, Duct mastic, Loc. 3	2 Phases: a) Homogeneous, black, mastic material.	None Detected	Non-Fibrous Material > 75%
	b) Homogeneous, silver, mastic material.	None Detected	Non-Fibrous Material > 75%
S0005A Caulking on air handling unit seams, Loc. 3	Homogeneous, dark brown, caulking material.	None Detected	Non-Fibrous Material > 75%
S0005B Caulking on air handling unit seams, Loc. 3	Homogeneous, dark brown, caulking material.	None Detected	Non-Fibrous Material > 75%
S0005C Caulking on air handling unit seams, Loc. 3	Homogeneous, dark brown, caulking material.	None Detected	Non-Fibrous Material > 75%
S0006A Caulking, caulking on duct seams, Loc. 3	Homogeneous, black, caulking material.	None Detected	Non-Fibrous Material > 75%
S0006B Caulking, caulking on duct seams, Loc. 3	Homogeneous, black, caulking material.	None Detected	Non-Fibrous Material > 75%

Pinchin Ltd. Asbestos Laboratory
Certificate of Analysis

Project No.: 0333414.000
Prepared For: R. Rai / A. Gimenez

Lab Reference No.: b303644
Date Analyzed: November 8, 2023

BULK SAMPLE ANALYSIS

SAMPLE IDENTIFICATION	SAMPLE DESCRIPTION	% COMPOSITION (VISUAL ESTIMATE)	
		ASBESTOS	OTHER
S0006C Caulking, caulking on duct seams, Loc. 3	Homogeneous, black, caulking material.	None Detected	Non-Fibrous Material > 75%
S0007A Caulking, Caulking on roof flashing, Loc. 3	Homogeneous, dark brown, caulking material.	None Detected	Non-Fibrous Material > 75%
Comments:	Silicon is present on the surface of this sample.		
S0007B Caulking, Caulking on roof flashing, Loc. 3	Homogeneous, dark brown, caulking material.	None Detected	Non-Fibrous Material > 75%
Comments:	Silicon is present on the surface of this sample.		
S0007C Caulking, Caulking on roof flashing, Loc. 3	Homogeneous, dark brown, caulking material.	None Detected	Non-Fibrous Material > 75%
Comments:	Silicon is present on the surface of this sample.		
S0008A Caulking, caulking on expansion joints, Exterior, Loc . 2	Homogeneous, grey, caulking material.	None Detected	Non-Fibrous Material > 75%
S0008B Caulking, caulking on expansion joints, Exterior, Loc . 2	Homogeneous, grey, caulking material.	None Detected	Non-Fibrous Material > 75%
S0008C Caulking, caulking on expansion joints, Exterior, Loc . 2	Homogeneous, grey, caulking material.	None Detected	Non-Fibrous Material > 75%
S0009A Wall, Drywall joint compound on wall, Loc. 1	Homogeneous, white, drywall joint compound.	None Detected	Non-Fibrous Material > 75%

Pinchin Ltd. Asbestos Laboratory
Certificate of Analysis

Project No.: 0333414.000
Prepared For: R. Rai / A. Gimenez

Lab Reference No.: b303644
Date Analyzed: November 8, 2023

BULK SAMPLE ANALYSIS

SAMPLE IDENTIFICATION	SAMPLE DESCRIPTION	% COMPOSITION (VISUAL ESTIMATE)	
		ASBESTOS	OTHER
S0009B Wall, Drywall joint compound on wall, Loc. 1	Homogeneous, white, drywall joint compound.	None Detected	Non-Fibrous Material > 75%
S0009C Wall, Drywall joint compound on wall, Loc. 1	Homogeneous, white, drywall joint compound.	None Detected	Non-Fibrous Material > 75%
S0010A Ceiling, Drywall joint compound on ceiling, Loc. 1	Homogeneous, white, drywall joint compound.	None Detected	Non-Fibrous Material > 75%
S0010B Ceiling, Drywall joint compound on ceiling, Loc. 1	Homogeneous, white, drywall joint compound.	None Detected	Non-Fibrous Material > 75%
S0010C Ceiling, Drywall joint compound on ceiling, Loc. 1	Homogeneous, white, drywall joint compound.	None Detected	Non-Fibrous Material > 75%
S0011A Mortar on masonry wall, Loc. 2	Homogeneous, grey, granular, cementitious material.	None Detected	Non-Fibrous Material > 75%
S0011B Mortar on masonry wall, Loc. 2	Homogeneous, grey, granular, cementitious material.	None Detected	Non-Fibrous Material > 75%
S0011C Mortar on masonry wall, Loc. 2	Homogeneous, grey, granular, cementitious material.	None Detected	Non-Fibrous Material > 75%
S0012A Mortar on masonry wall, Loc. 1	Homogeneous, grey, granular, cementitious material.	None Detected	Non-Fibrous Material > 75%

Pinchin Ltd. Asbestos Laboratory
Certificate of Analysis

Project No.: 0333414.000
Prepared For: R. Rai / A. Gimenez

Lab Reference No.: b303644
Date Analyzed: November 8, 2023

BULK SAMPLE ANALYSIS

SAMPLE IDENTIFICATION	SAMPLE DESCRIPTION	% COMPOSITION (VISUAL ESTIMATE)	
		ASBESTOS	OTHER
S0012B Mortar on masonry wall, Loc. 1	Homogeneous, grey, granular, cementitious material.	None Detected	Non-Fibrous Material > 75%
S0012C Mortar on masonry wall, Loc. 1	Homogeneous, grey, granular, cementitious material.	None Detected	Non-Fibrous Material > 75%
S0013A Caulking, Caulking on window, Mezannine, Loc. 4	Homogeneous, grey, caulking material.	Chrysotile 0.5-5%	Non-Fibrous Material > 75%
S0013B Caulking, Caulking on window, Mezannine, Loc. 4			Not Analyzed
Comments:	Analysis was stopped due to a previous positive result.		
S0013C Caulking, Caulking on window, Mezannine, Loc. 4			Not Analyzed
Comments:	Analysis was stopped due to a previous positive result.		

Reviewed by:

Jason Stapleton
2023.11.09 13:37:41-04'00'

Reporting Analyst:

Pinchin Ltd.
2023.11.08 12:52:24-04'00'
Reid Janssen

Analyzed By: RJ

Reviewed By: JS

Report Sent By: _____

Pinchin Ltd. - Asbestos Laboratory
Internal Asbestos Bulk Sample Chain of Custody

Client Name:				**Project Address:**			
Portfolio/Building No:				**Pinchin File:**	333414		
Submitted by:	Rashmi Rai			**Email:**	rrai@pinchin.com		
CC Results to:	Andres Gimenez			**CC Email:**	agimenez@pinchin.com		
Date Submitted:	November	3	2023	**Required by:**	November	10	2023
# of Samples:	36			**Priority:**	5 Day Turnaround		
Year of Building Construction (*Mandatory, Years ONLY*):							
Do NOT Stop on Positive (Sample Numbers):							
Pinchin Group Company (*Mandatory Field*):				Pinchin			
HMIS2 Building Reference #:							
To be Completed by Lab Personnel Only:							
Lab Reference #:	b303644			**Time:**	24 hour clock		
Received by:	Reid Janssen			**Date:**	November	3	2023
Name(s) of Analyst(s):	R. Janssen						

Sample Prefix	Sample No.	Sample Suffix	Sample Description/Location (Mandatory)	
S	0002	A	Caulking on vent, Loc . 3	ND
S	0002	B	Caulking on vent, Loc . 3	ND
S	0002	C	Caulking on vent, Loc . 3	ND
S	0003	A	Firestopping on electrical conduit, Loc. 3	ND
S	0003	B	Firestopping on electrical conduit, Loc. 3	ND
S	0003	C	Firestopping on electrical conduit, Loc. 3	ND
S	0004	A	Duct, Duct mastic, Loc. 3	a) ND b) ND

Sample Prefix	Sample No.	Sample Suffix	Sample Description/Location (Mandatory)	
S	0004	B	Duct, Duct mastic, Loc. 3	a)ND b)ND
S	0004	C	Duct, Duct mastic, Loc. 3	a)ND b)ND
S	0005	A	Caulking on air handling unit seams, Loc. 3	ND
S	0005	B	Caulking on air handling unit seams, Loc. 3	ND
S	0005	C	Caulking on air handling unit seams, Loc. 3	ND
S	0006	A	Caulking, caulking on duct seams, Loc. 3	ND
S	0006	B	Caulking, caulking on duct seams, Loc. 3	ND
S	0006	C	Caulking, caulking on duct seams, Loc. 3	ND
S	0007	A	Caulking, Caulking on roof flashing, Loc. 3	ND
S	0007	B	Caulking, Caulking on roof flashing, Loc. 3	ND
S	0007	C	Caulking, Caulking on roof flashing, Loc. 3	ND
S	0008	A	Caulking, caulking on expansion joints, Exterior, Loc . 2	ND
S	0008	B	Caulking, caulking on expansion joints, Exterior, Loc . 2	ND
S	0008	C	Caulking, caulking on expansion joints, Exterior, Loc . 2	ND
S	0009	A	Wall, Drywall joint compound on wall, Loc. 1	ND

Sample Prefix	Sample No.	Sample Suffix	Sample Description/Location (Mandatory)	
S	0009	B	Wall, Drywall joint compound on wall, Loc. 1	ND
S	0009	C	Wall, Drywall joint compound on wall, Loc. 1	ND
S	0010	A	Ceiling, Drywall joint compound on ceiling, Loc. 1	ND
S	0010	B	Ceiling, Drywall joint compound on ceiling, Loc. 1	ND
S	0010	C	Ceiling, Drywall joint compound on ceiling, Loc. 1	ND
S	0011	A	Mortar on masonry wall, Loc. 2	ND
S	0011	B	Mortar on masonry wall, Loc. 2	ND
S	0011	C	Mortar on masonry wall, Loc. 2	ND
S	0012	A	Mortar on masonry wall, Loc. 1	ND
S	0012	B	Mortar on masonry wall, Loc. 1	ND
S	0012	C	Mortar on masonry wall, Loc. 1	ND
S	0013	A	Caulking, Caulking on window, Mezannine, Loc. 4	CH 0.5-5
S	0013	B	Caulking, Caulking on window, Mezannine, Loc. 4	(ND)
S	0013	C	Caulking, Caulking on window, Mezannine, Loc. 4	(ND)

12

APPENDIX II-B

Lead Analytical Certificates

Your Project #: 333414
Your C.O.C. #: n/a

Attention: Andres Gimenez

Pinchin Ltd
2360 Meadowpine Blvd
Unit # 2
Mississauga, ON
CANADA L5N 6S2

Report Date: 2023/11/08
Report #: R7902684
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB#: C3Y6667
Received: 2023/11/06, 09:25

Sample Matrix: Solid
#Samples Received: 5

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Metals in Paint	5	2023/11/08	2023/11/08	CAM SOP-00408	EPA 6010D m

Remarks:

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCCFP, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Bureau Veritas 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvna.com

Your Project #: 333414
Your C.O.C. #: n/a

Attention: Andres Gimenez

Pinchin Ltd
2360 Meadowpine Blvd
Unit # 2
Mississauga, ON
CANADA L5N 6S2

Report Date: 2023/11/08
Report #: R7902684
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB#: C3Y6667
Received: 2023/11/06, 09:25

Encryption Key

AUTHORIZED REPORT
RAPPORT AUTORISÉ

Bureau Veritas
08 Nov 2023 17:58:40

Please direct all questions regarding this Certificate of Analysis to:
Nilushi Mahathantila, Project Manager
Email: Nilushi.Mahathantila@bureauveritas.com
Phone# (905) 817-5700
==========
This report has been generated and distributed using a secure automated process.
Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For ServiceGroup specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by Rodney Major, General Manager responsible for Ontario Environmental laboratory operations.

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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

Bureau Veritas Job #: C3Y6667
Report Date: 2023/11/08

Pinchin Ltd
Client Project #: 333414
Sampler Initials: RR

ELEMENTS BY ATOMIC SPECTROSCOPY (SOLID)

Bureau Veritas ID		XMZ484	XMZ484	XMZ485		
Sampling Date		2023/11/02	2023/11/02	2023/11/02		
COC Number		n/a	n/a	n/a		
	UNITS	L0001,WHITE ON MORTAR WALL,LOC.1	L0001,WHITE ON MORTAR WALL,LOC.1 Lab-Dup	L0002,BEIGE COLOR ON MOTAR WALL,LOC.1	RDL	QC Batch
Metals						
Lead (Pb)	%	0.00098	0.00082	0.00054	0.00010	9035726

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

Bureau Veritas ID		XMZ486		XMZ487		XMZ488		
Sampling Date		2023/11/02		2023/11/02		2023/11/02		
COC Number		n/a		n/a		n/a		
	UNITS	L0003,YELLOW COLOR ON METAL STRUCTURE,LOC.1	RDL	L0004,DARK GREY ON DRYWALL WALL,LOC.1	RDL	L0005,YELLOW COLOR ON METAL PIPE,LOC.3	RDL	QC Batch
Metals								
Lead (Pb)	%	<0.0020	0.0020	<0.00046	0.00046	1.9	0.013	9035726

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Bureau Veritas Job #: C3Y6667
Report Date: 2023/11/08

Pinchin Ltd
Client Project #: 333414
Sampler Initials: RR

TEST SUMMARY

Bureau Veritas ID: XMZ484
Sample ID: L0001,WHITE ON MORTAR WALL,LOC.1
Matrix: Solid

Collected: 2023/11/02
Shipped:
Received: 2023/11/06

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Metals in Paint	ICP	9035726	2023/11/08	2023/11/08	Thuy Linh Nguyen

Bureau Veritas ID: XMZ484 Dup
Sample ID: L0001,WHITE ON MORTAR WALL,LOC.1
Matrix: Solid

Collected: 2023/11/02
Shipped:
Received: 2023/11/06

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Metals in Paint	ICP	9035726	2023/11/08	2023/11/08	Thuy Linh Nguyen

Bureau Veritas ID: XMZ485
Sample ID: L0002,BEIGE COLOR ON MOTAR WALL,LOC.1
Matrix: Solid

Collected: 2023/11/02
Shipped:
Received: 2023/11/06

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Metals in Paint	ICP	9035726	2023/11/08	2023/11/08	Thuy Linh Nguyen

Bureau Veritas ID: XMZ486
Sample ID: L0003,YELLOW COLOR ON METAL STRUCTURE,LOC.1
Matrix: Solid

Collected: 2023/11/02
Shipped:
Received: 2023/11/06

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Metals in Paint	ICP	9035726	2023/11/08	2023/11/08	Thuy Linh Nguyen

Bureau Veritas ID: XMZ487
Sample ID: L0004,DARK GREY ON DRYWALL WALL,LOC.1
Matrix: Solid

Collected: 2023/11/02
Shipped:
Received: 2023/11/06

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Metals in Paint	ICP	9035726	2023/11/08	2023/11/08	Thuy Linh Nguyen

Bureau Veritas ID: XMZ488
Sample ID: L0005,YELLOW COLOR ON METAL PIPE,LOC.3
Matrix: Solid

Collected: 2023/11/02
Shipped:
Received: 2023/11/06

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Metals in Paint	ICP	9035726	2023/11/08	2023/11/08	Thuy Linh Nguyen

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GENERAL COMMENTS

Sample XMZ486 [L0003,YELLOW COLOR ON METAL STRUCTURE,LOC.1] : Metals: Due to limited amount of sample available for analysis, a smaller than usual portion of the sample was used. Detection limits were adjusted accordingly.

Sample XMZ487 [L0004,DARK GREY ON DRYWALL WALL,LOC.1] : Metals: Due to limited amount of sample available for analysis, a smaller than usual portion of the sample was used. Detection limits were adjusted accordingly.

Sample XMZ488 [L0005,YELLOW COLOR ON METAL PIPE,LOC.3] : Metals: Due to limited amount of sample available for analysis, a smaller than usual portion of the sample was used. Detection limits were adjusted accordingly.

Results relate only to the items tested.

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Bureau Veritas Job #: C3Y6667
Report Date: 2023/11/08

QUALITY ASSURANCE REPORT

Pinchin Ltd
Client Project #: 333414
Sampler Initials: RR

			Matrix Spike		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
9035726	Lead (Pb)	2023/11/08	84	75 - 125	<0.00010	%	18	35	96	75 - 125

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

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Bureau Veritas Job #: C3Y6667
Report Date: 2023/11/08

Pinchin Ltd
Client Project #: 333414
Sampler Initials: RR

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:

Cristina Carriere

Cristina Carriere, Senior Scientific Specialist

Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by Rodney Major, General Manager responsible for Ontario Environmental laboratory operations.

Bureau Veritas 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvna.com

06-Nov-23 09:25
Nilushi Mahathantila
C3Y6667

SBS ENV-936

6740 Campobello Road, Mississauga, Ontario L5N 2L8
Phone: 905-817-5700 Fax: 905-817-5779 Toll Free: 800-563-6266
CAM FCD-01191/6

CHAIN OF CUSTODY RECORD

Page ____ of ____

Invoice Information	Report Information (if differs from invoice)	Project Information (where applicable)	Turnaround Time (TAT) Required
Company Name: Pinchin Ltd.	Company Name: Pinchin Ltd.	Quotation #:	[x] Regular TAT (5-7 days) Most analysis
Contact Name: Rashmi Rai	Contact Name: Andres Gimenez	P.O. #/ AFE#:	PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address:	Address:	Project #: 308414	Rush TAT (Surcharges will be applied)
Phone: 647 283 6414 Fax:	Phone: Fax:	Site Location:	[ ] 1 Day [ ] 2 Days [ ] 3-4 Days
Email: rrai@pinchin.com	Email: agimenez@pinchin.com	Site #:	
		Site Location Province: ____ ON	Date Required: 14 November, 2023
		Sampled By: Rashmi Rai	Rush Confirmation #:

Regulation 153: [ ] Table 1 [ ] Res/Park [ ] Med/ Fine; [ ] Table 2 [ ] Ind/Comm [ ] Coarse; [ ] Table 3 [ ] Agri/ Other; [ ] Table ____; FOR RSC (PLEASE CIRCLE) Y / N

Other Regulations: [ ] CCME [ ] Sanitary Sewer Bylaw; [ ] MISA [ ] Storm Sewer Bylaw; [ ] PWQO Region ____; [ ] Other (Specify) ____; [ ] REG 558 (MIN. 3 DAY TAT REQUIRED); [ ] REG 406 Table ____

Include Criteria on Certificate of Analysis: Y / N

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO BUREAU VERITAS

Analysis Requested

SAMPLE IDENTIFICATION	DATE SAMPLED (YYYY/MM/DD)	TIME SAMPLED (HH:MM)	MATRIX	# OF CONTAINERS SUBMITTED	TYPE OF CONTAINER (GLASS, PLASTIC, ETC.)	ETEX/ PHC F1	PHC-F2 - F4	VOCs	REG 153 METALS & INORGANICS	REG 153 OTHER METALS	REG 153 METALS (Hg, CrVI, OTHER MERAL VARS - S)	Lead (Pb) in Paint	PCBs						HOLD - DO NOT ANALYZE
L0001. White on mortar wall, Loc. 1	11/2/2023		BULK									x							
L0002. Beige color on Mortar wall, Loc. 1	11/2/2023		BULK									x							
L0003. Yellow color on metal structure, Loc. 1	11/2/2023		BULK									x							
L0004. Dark grey on drywall, wall, Loc. 1	11/2/2023		BULK									x							
L0005. Yellow color on metal pipe, Loc. 3	11/2/2023		BULK									x							

LABORATORY USE ONLY		
CUSTODY SEAL Y / N		COOLER TEMPERATURES
Present	Intact	
N	N	
COOLING MEDIA PRESENT: Y / N		

COMMENTS:

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	BV JOB #
			[signature]	2023/11/06	1525	

Unless otherwise agreed to in writing, work submitted on this Chain of Custody is subject to Bureau Veritas' standard Terms and Conditions. Signing of this Chain of Custody document is acknowledgment and acceptance of our terms available at https://www.bvna.com/coc-terms-and-conditions

APPENDIX III

Methodology

1.0 GENERAL

An inspection was conducted to identify the type of Hazardous Building Materials incorporated in the structure and its finishes.

Information regarding the location and condition of hazardous building materials encountered and visually estimated quantities were recorded. The locations of any samples collected were recorded on small-scale plans. As-built drawings and previous reports were referenced where provided.

Sample collection was conducted in accordance with our Standard Operating Procedures.

1.1 Asbestos

The inspection for asbestos included friable and non-friable asbestos-containing materials (ACM). A friable material is a material that when dry can be crumbled, pulverized, or powdered by hand pressure.

A separate set of samples was collected of each type of homogenous material suspected to contain asbestos. A homogenous material is defined by the US EPA as material that is uniform in texture and appearance, was installed at one time, and is unlikely to consist of more than one type or formulation of material. The homogeneous materials were determined by visual examination and available information on the phases of construction and prior renovations.

Samples were collected at a rate that is in compliance with the requirements of local regulations and guidelines. The sampling strategy was also based on known ban dates and phase out dates of the use of asbestos; sampling of certain building materials is not conducted after specific construction dates. In addition, to be conservative, several years past these dates are added to account for some uncertainty in the exact start / finish date of construction and associated usage of ACM. In some cases, manufactured products such as asbestos cement pipe were visually identified without sample confirmation.

The asbestos analysis was completed using a stop-positive approach. Only one result meeting the regulated criteria was required to determine that a material is asbestos containing, but all samples must be analyzed to conclusively determine that a material is non-asbestos. The laboratory stopped analyzing samples from a homogeneous material once a result equal to or greater than the regulated criteria is detected in any of the samples of that material. All samples of a homogeneous material were analyzed if no asbestos is detected. In some cases, all samples were analyzed in the sample set regardless of result.

The analysis was performed in accordance with Test Method EPA/600/R-93/116: Method for the Determination of Asbestos in Bulk Building Materials, July 1993.

Analytical results were compared to the following criteria.

Jurisdiction*	Friable	Non-Friable
Ontario	0.5%	0.5%

Where building materials are described in the report as “non-asbestos” or “does not contain asbestos,” this means that either no asbestos was detected by the analytical method utilized in any of the multiple samples or, if detected, it is below the lower limit of an asbestos-containing material in the applicable regulation. Additionally, these terms are used for materials which historically are known to not include asbestos in their manufacturing.

Asbestos materials were evaluated in order to make recommendations regarding any remedial work. The priority for remedial action was based on several factors:

- Friability (friable or non-friable);
- Condition (good, fair, poor, debris);
- Accessibility (ranking from accessible to all building users to inaccessible);
- Visibility (whether the material is obscured by other building components).
- Efficiency of the work (for example, if damaged ACM is being removed in an area, it may be most practical to remove all ACM in the area even if it is in good condition).

1.2 Lead

Samples of distinctive paint finishes, and surface coatings present in more than a limited application, where removal of the paint is possible was collected. The samples were collected by scraping the painted finish to include base and covering applications.

Analysis for lead in paints or surface coatings was performed in accordance with EPA Method No. 3050B/Method No. 7420; flame atomic absorption.

Analytical results were compared to the following criteria.

Jurisdiction*	Units (%)	Units (ppm) / (mg/kg)
Ontario	0.1	1000

Other lead building products (e.g. batteries, lead sheeting, flashing) were identified by visual observation only.

1.3 Silica

Building materials known to contain crystalline silica (e.g. concrete, cement, tile, brick, masonry, mortar) were identified by visual inspection only. Pinchin did not perform sampling of these materials for laboratory analysis of crystalline silica content.

1.4 Mercury

Building materials, products, or equipment (e.g. thermostats, barometers, pressure gauges, lamp tubes), suspected to contain mercury was identified by visually inspection only. Dismantling of equipment suspected of containing mercury was not performed. Sampling of these materials for laboratory analysis of mercury content was not performed.

1.5 Polychlorinated Biphenyls

The potential for light ballast and oil filled transformers to contain PCBs was based on the age of the building, a review of maintenance records and examination of labels or nameplates on equipment, where present and accessible. The information was compared to known ban dates of PCBs and Environment Canada publications.

Dry type transformers were presumed to be free of dielectric fluids and hence non-PCB.

Fluids (mineral oil, hydraulic, Aroclor or Askarel) in transformers or other equipment were not sampled for PCB content.

1.6 Visible Mould

The presence of mould or water damage was determined by visual inspection of exposed building surfaces. If any mould growth or water damage was concealed within building cavities it was not addressed in this assessment.

Template: Methodology for Hazardous Building Materials Assessment, HAZ, January 26, 2023

APPENDIX IV

Location Summary Report

HMIS
HAZARDOUS MATERIALS INVENTORY SYSTEM

LOCATIONS LIST

PINCHIN
1.855.PINCHIN www.pinchin.com

Client:Accord Plastics Corp.
Building Name: Accord Plastics Corp.
Survey Date: 2023-11-02
Building Phases: A: 1987

Site: 56 Edilcan Drive, Vaughan, ON

Last Re-Assessment:

Location No.	Name or Description	Area ft^2	Floor No.	Bldg. Phase	Notes
1	Production Area (Warehouse)	15000	G	A	
2	Exterior	0	E	A	
3	Roof	15000	R	A	
4	Mezzanine Garage	150	M	A	

APPENDIX V

Hazardous Materials Summary Report / Sample Log

HMIS
HAZARDOUS MATERIALS INVENTORY SYSTEM

HAZARDOUS MATERIALS SUMMARY / SAMPLE LOG

PINCHIN
1.855.PINCHIN www.pinchin.com

Client:Accord Plastics Corp. **Site: 56 Edilcan Drive, Vaughan, ON** **Building Name: Accord Plastics Corp.** **Survey Date: 2023-11-02**

HAZMAT	Sample No	System/Component/Material/Sample Description	Locations	Bldg. Phase	LF	SF	EA	%	Type	Positive	Friability
Asbestos	S0001 ABC	Other | Roof | | Built-up Roofing Material	3	A	0	15000	0	0	None Detected	No	
Asbestos	S0002 ABC	Other | Roof | Caulking |	3	A	2	0	0	0	None Detected	No	
Asbestos	S0003 ABC	Other | Roof | Firestopping (mastic) |	3	A	0	2	0	0	None Detected	No	
Asbestos	S0004 ABC	Duct | | Mastic |	3	A	6	0	0	0	None Detected	No	
Asbestos	S0005 ABC	Mechanical Equipment | Air Handling Unit | Caulking |	3	A	2	0	0	0	None Detected	No	
Asbestos	S0006 ABC	Duct | Base | Caulking |	3	A	4	0	0	0	None Detected	No	
Asbestos	S0007 ABC	Other | Roof | Caulking |	3	A	10	0	0	0	None Detected	No	
Asbestos	S0008 ABC	Wall | Expansion Joint | Caulking |	2	A	20	0	0	0	None Detected	No	
Asbestos	S0009 ABC	Wall | | Drywall And Joint Compound |	1	A	0	450	0	0	None Detected	No	
Asbestos	S0010 ABC	Ceiling | | Drywall And Joint Compound |	1	A	0	150	0	0	None Detected	No	
Asbestos	S0011 ABC	Wall | | Masonry |	2	A	0	10000	0	0	None Detected	No	
Asbestos	S0012 ABC	Wall | | Masonry |	1,4	A	0	30100	0	0	None Detected	No	
Asbestos	S0013 ABC	Other | Window | Caulking |	4	A	10	0	0	0	Chrysotile	Yes	NF
Asbestos	V0000	Ceiling | | None Found |	1,4	A	0	15000	0	0	Non Asbestos	No	
Asbestos	V0000	Duct | All | Not Insulated |	1	A	0	0	0	0	Non Asbestos	No	
Asbestos	V0000	Floor | All | Concrete (poured) |	1	A	0	15000	0	0	Non Asbestos	No	
Asbestos	V0000	Floor | | Metal |	4	A	0	150	0	0	Non Asbestos	No	
Asbestos	V0000	Mechanical Equipment | Air Handling Unit | Not Insulated |	1,3	A	0	0	11	0	Non Asbestos	No	
Asbestos	V0000	Piping | | Fibreglass |	1,4	A	0	0	0	0	Non Asbestos	No	
Asbestos	V0000	Piping | | Not Insulated |	1,4	A	0	0	0	0	Non Asbestos	No	
Asbestos	V0000	Piping | Gas Pipe Line | Steel |	3	A	40	0	0	0	Non Asbestos	No	
Asbestos	V0000	Structure | Beam Deck Joist | Steel |	1,4	A	0	15150	0	0	Non Asbestos	No	

HMIS
HAZARDOUS MATERIALS INVENTORY SYSTEM

HAZARDOUS MATERIALS SUMMARY / SAMPLE LOG

PINCHIN
1.855.PINCHIN www.pinchin.com

HAZMAT	Sample No	System/Component/Material/Sample Description	Locations	Bldg. Phase	LF	SF	EA	%	Type	Positive	Friability
Paint	L0001	Wall | Masonry | White	1	A	0	10000	0	0		No	-
Paint	L0002	Wall | Masonry | Beige	1,4	A	0	10100	0	0		No	-
Paint	L0003	Structure | Metal | Yellow	1	A	0	250	0	0		No	-
Paint	L0004	Wall | Drywall And Joint Compound | Dark Grey	1	A	0	450	0	0		No	-
Paint	L0005	Piping | Metal |	3	A	40	0	0	0	Lead (High)	Yes	-
Lead Product	V9000	Batteries In Emer. Lights	1	A	0	0	10	0	Lead Product	Yes	-
PCB	V0000	Transformer	1	A	0	0	2	0	-	No	-
Hg	V9000	Mercury Vapour Lamp	1,4	A	0	0	120	0	Hg	Yes	-

Legend:

Sample number	
S####	Asbestos sample collected
L####	Paint sample collected
P####	PCB sample collected
M####	Mould sample collected
V####	Material visually similar to numbered sample collected
V0000	Known non Hazardous Material
V9000	Material is visually identified as Hazardous Material
V9500	Material is presumed to be Hazardous Material
[Loc. No.]	Abated Material

Units	
SF	Square feet
LF	Linear feet
EA	Each
%	Percentage

NF	Non Friable material.
F	Friable material
PF	Potentially Friable material

APPENDIX VI

HMIS All Data Report

HMIS
HAZARDOUS MATERIALS INVENTORY SYSTEM

ALL DATA REPORT

PINCHIN
1.855.PINCHIN www.pinchin.com

Client: Accord Plastics Corp. **Site: 56 Edilcan Drive, Vaughan, ON** **Building Name: Accord Plastics Corp.**
Location: #1 : Production Area (Warehouse) **Floor: G** **Room #:** **Area (sqft): 15000**
Survey Date: 2023-11-02 **Last Re-Assessment: 0000-00-00**

ASBESTOS																
System	Component	Material	Item	Covering	A*	V*	AP*	Good	Fair	Poor	Unit	Sample	Asbestos Type	Amount	Hazard	Friable
Ceiling		Drywall and joint compound			C	Y		150			SF	S0010ABC	None Detected	N.D.	None	
Ceiling		None Found			C	Y		14850			SF	V0000	Non-Asbestos		None	
Duct	All	Not Insulated			C	Y						V0000	Non-Asbestos		None	
Floor	All	Concrete (poured)			A	Y		15000			SF	V0000	Non-Asbestos		None	
Mechanical Equipment	Air Handling Unit	Not Insulated			C	Y		10			EA	V0000	Non-Asbestos		None	
Piping		Fibreglass		Canvas	C	Y						V0000	Non-Asbestos		None	
Piping		Not Insulated			C	Y						V0000	Non-Asbestos		None	
Structure	Beam Deck Joist	Steel			C	N		15000			SF	V0000	Non-Asbestos		None	
Wall		Drywall and joint compound		Paint	A	Y		450			SF	S0009ABC	None Detected	N.D.	None	
Wall		Masonry			A	Y		30000			SF	S0012ABC	None Detected	N.D.	None	

Client: Accord Plastics Corp. **Site: 56 Edilcan Drive, Vaughan, ON** **Building Name: Accord Plastics Corp.**
Location: #1 : Production Area (Warehouse) **Floor: G** **Room #:** **Area (sqft): 15000**
Survey Date: 2023-11-02 **Last Re-Assessment: 0000-00-00**

PAINT								
System	Item	Good	Poor	Unit	Sample	Sample Description	Amount	Hazard
Wall	Masonry	10000		SF	L0001	White	Pb: 0.00098 %	No
Wall	Masonry	10000		SF	L0002	Beige	Pb: 0.00054 %	No
Structure	Metal	250		SF	L0003	Yellow	Pb: <0.0020 %	No
Wall	Drywall and joint compound	450		SF	L0004	Dark grey	Pb: <0.00046 %	No

Client: Accord Plastics Corp. **Site: 56 Edilcan Drive, Vaughan, ON** **Building Name: Accord Plastics Corp.**
Location: #1 : Production Area (Warehouse) **Floor: G** **Room #:** **Area (sqft): 15000**
Survey Date: 2023-11-02 **Last Re-Assessment: 0000-00-00**

PB PRODUCTS				
Component	Quantity	Unit	Sample	Hazard
Batteries In Emer. Lights	10	EA	V9000	Yes

Client: Accord Plastics Corp. **Site: 56 Edilcan Drive, Vaughan, ON** **Building Name: Accord Plastics Corp.**
Location: #1 : Production Area (Warehouse) **Floor: G** **Room #:** **Area (sqft): 15000**
Survey Date: 2023-11-02 **Last Re-Assessment: 0000-00-00**

MERCURY				
Component	Quantity	Unit	Sample	Hazard
Mercury Vapour Lamp[1]	100	EA	V9000	Yes

1 - T5

Client: Accord Plastics Corp. **Site: 56 Edilcan Drive, Vaughan, ON** **Building Name: Accord Plastics Corp.**
Location: #1 : Production Area (Warehouse) **Floor: G** **Room #:** **Area (sqft): 15000**

Survey Date: 2023-11-02 **Last Re-Assessment: 0000-00-00**

PCB						
Component	Quantity	Unit	Sample	Sample Description	Amount	PCB
Transformer[1]	2	EA	V0000			No

1 - Dry type

Client: Accord Plastics Corp. **Site: 56 Edilcan Drive, Vaughan, ON** **Building Name: Accord Plastics Corp.**
Location: #2 : Exterior **Floor: E** **Room #:** **Area (sqft): 0**
Survey Date: 2023-11-02 **Last Re-Assessment: 0000-00-00**

ASBESTOS																
System	Component	Material	Item	Covering	A*	V*	AP*	Good	Fair	Poor	Unit	Sample	Asbestos Type	Amount	Hazard	Friable
Wall		Masonry			A	Y		10000			SF	S0011ABC	None Detected	N.D.	None	
Wall[1]	Expansion Joint	Caulking			A	Y		20			LF	S0008ABC	None Detected	N.D.	None	

1 - Grey color

Client: Accord Plastics Corp. **Site: 56 Edilcan Drive, Vaughan, ON** **Building Name: Accord Plastics Corp.**
Location: #3 : Roof **Floor: R** **Room #:** **Area (sqft): 15000**
Survey Date: 2023-11-02 **Last Re-Assessment: 0000-00-00**

ASBESTOS																
System	Component	Material	Item	Covering	A*	V*	AP*	Good	Fair	Poor	Unit	Sample	Asbestos Type	Amount	Hazard	Friable
Duct[1]		Mastic			A	Y		6			LF	S0004ABC	None Detected	N.D.	None	
Duct[2]	Base	Caulking			A	Y		4			LF	S0006ABC	None Detected	N.D.	None	
Mechanical Equipment	Air Handling Unit	Not Insulated			A	Y		1			EA	V0000	Non-Asbestos		None	
Mechanical Equipment[3]	Air Handling Unit	Caulking			A	Y		2			LF	S0005ABC	None Detected	N.D.	None	
Other[4]	Roof	Built-up Roofing material			C	Y		15000			SF	S0001ABC	None Detected	N.D.	None	
Other[5]	Roof	Caulking			A	Y		2			LF	S0002ABC	None Detected	N.D.	None	
Other[6]	Roof	Caulking			A	Y		10			LF	S0007ABC	None Detected	N.D.	None	
Other[7]	Roof	Firestopping (mastic)			A	Y		2			SF	S0003ABC	None Detected	N.D.	None	
Piping	Gas Pipe Line	Steel			C	Y		40			LF	V0000	Non-Asbestos		None	

1 - Black and silver color
2 - Black color
3 - Dark brown
4 - Flat built-up roof comprised of crushed stone ballast, felts and tar, fiberboard, tar layer and fibreboard on steel deck.
5 - Red caulking on vent
6 - Dark brown on roof flashing
7 - Black color firestop on electrical conduit

Client: Accord Plastics Corp. **Site: 56 Edilcan Drive, Vaughan, ON** **Building Name: Accord Plastics Corp.**
Location: #3 : Roof **Floor: R** **Room #:** **Area (sqft): 15000**
Survey Date: 2023-11-02 **Last Re-Assessment: 0000-00-00**

PAINT								
System	Item	Good	Poor	Unit	Sample	Sample Description	Amount	Hazard
Piping[1]	Metal	40		LF	L0005		Pb: 1.9 %	Lead (High)

1 - Gas pipe lines

Client: Accord Plastics Corp. **Site: 56 Edilcan Drive, Vaughan, ON** **Building Name: Accord Plastics Corp.**
Location: #4 : Mezzanine Garage **Floor: M** **Room #:** **Area (sqft): 150**
Survey Date: 2023-11-02 **Last Re-Assessment: 0000-00-00**

ASBESTOS																
System	Component	Material	Item	Covering	A*	V*	AP*	Good	Fair	Poor	Unit	Sample	Asbestos Type	Amount	Hazard	Friable
Ceiling		None Found			C	Y		150			SF	V0000	Non-Asbestos		None	
Floor		Metal			A	Y		150			SF	V0000	Non-Asbestos		None	
Other[1]	Window	Caulking			A	Y		10			LF	S0013ABC	Chrysotile	0.5-5%	Confirmed Asbestos	NF
Piping		Fibreglass		Canvas	C	Y						V0000	Non-Asbestos		None	
Piping		Not Insulated			C	Y						V0000	Non-Asbestos		None	
Structure	Beam Deck Joist	Steel			C	N		150			SF	V0000	Non-Asbestos		None	
Wall		Masonry			A	Y		100			SF	V0012	None Detected	N.D.	None	

1 - Grey

Client: Accord Plastics Corp. **Site: 56 Edilcan Drive, Vaughan, ON** **Building Name: Accord Plastics Corp.**
Location: #4 : Mezzanine Garage **Floor: M** **Room #:** **Area (sqft): 150**
Survey Date: 2023-11-02 **Last Re-Assessment: 0000-00-00**

PAINT								
System	Item	Good	Poor	Unit	Sample	Sample Description	Amount	Hazard
Wall	Masonry	100		SF	V0002	Beige	Pb: 0.00054 %	No

Client: Accord Plastics Corp. **Site: 56 Edilcan Drive, Vaughan, ON** **Building Name: Accord Plastics Corp.**
Location: #4 : Mezzanine Garage **Floor: M** **Room #:** **Area (sqft): 150**
Survey Date: 2023-11-02 **Last Re-Assessment: 0000-00-00**

MERCURY				
Component	Quantity	Unit	Sample	Hazard
Mercury Vapour Lamp[1]	20	EA	V9000	Yes

1 - T5

Legend:

Sample number	
S####	Asbestos sample collected
L####	Paint sample collected
P####	PCB sample collected
M####	Mould sample collected
V####	Material is visually identified to be identical to S####
V0000	Known non hazardous material
V9000	Material visually identified as a Hazardous Material
V9500	Material is presumed to be a hazardous material

Units	
SF	Square feet
LF	Linear feet
EA	Each
%	Percentage
LF	Linear feet

Other	
A	Access
V	Visible
AP	Air Plenum
F	Friable material
NF	Non Friable material
PF	Potentially Friable material
Pb	Lead
Hg	Mercury
As	Arsenic
Cr	Chromium

Access	
A	Accessible to all building occupants
B	Accessible to maintenance and operations staff without a ladder
C	Accessible to maintenance and operations staff with a ladder. Also rarely entered, locked areas
D	Not normally accessible

Condition	
Good	No visible damage or deterioration
Fair	Minor, repairable damage, cracking, delamination or deterioration
Poor	Irreparable damage or deterioration with exposed and missing material

Visible	
Y	The material is visible when standing on the floor of the room, without the removal or opening of other building components (e.g. ceiling tiles or access panels).
N	The material is not visible to view when standing on the floor of the room and requires the removal of a building component (e.g. ceilings tiles or access panels) to view and access. Includes rarely entered crawlspaces, attic spaces, etc. Observations will be limited to the extent visible from the access points.

Air Plenum	
Yes or No	The material is in a return air plenum or in a direct airstream or there is evidence of air erosion (e.g. duct for heating or cooling blowing directly on or across an ACM). This field is only completed where Air Plenum consideration is required by regulation.

Colour Coding	
	The material is known to contain regulated concentrations of asbestos; either by analytical results or visible identification (use of the V9000 code).
	The material is presumed to contain asbestos; based on visual appearances; typically a material known to historically contain asbestos; however, not sampled due to limited access or the destructive nature of the sampling.

3.4 APPLICATION

.1 Lay out traffic lines and markings as indicated on the Drawings and in accordance with manufacturer's instructions.

.2 Apply traffic paint to achieve uniform colour and density. Coverage shall be 3 sq.m/L (150 sq.ft./gal).

.3 Provide adequate shielding or masking during spray application of traffic paint.

.4 Make lines 100 mm wide unless otherwise indicated.

.5 Lines shall be parallel and have neat, straight, clean sharp edges. Lines shall be of uniform colour and density.

.6 Paint markings to be within plus or minus 12 mm of dimensions indicated.

.7 Refinish ragged edges or lines incorrectly laid out. Remove incorrect lines. Make inconspicuous.

3.5 PROTECTION

.1 Supply and install temporary barricades and traffic cones to protect freshly painted line Work from being marked or otherwise disturbed until after paint is dry.

.2 Remove temporary barricades and traffic cones when Work is complete and ready for traffic.

END OF SECTION